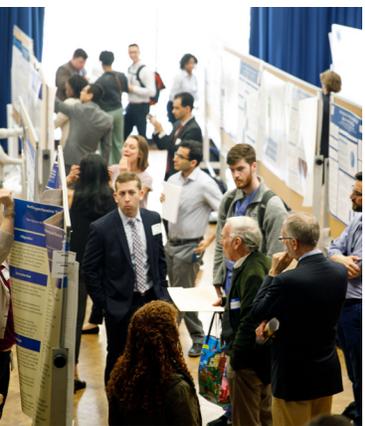


# GW Research SHOWCASE



## 2021 ABSTRACT SUBMISSIONS

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

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# GW Research SHOWCASE

## SCHEDULE OF EVENTS

| DATE        | TIME   | ABOUT <i>(All links to programs can be found on the website)</i>   |
|-------------|--|--|
| APRIL<br>12 | <b>11AM-12PM ET</b><br>COMMUNITY BASED PARTICIPATORY RESEARCH AT GW  | CBPR is an approach to research that involves community members as equal partners in the research process. It values their knowledge, perspective, recognizes their assets and contributions, and connects research to community action and social change. This panel, moderated by the Nashman Center for Civic Engagement and Public Service, invites several GW researchers to share examples of their work in CBPR in order to illustrate the values and principles of this work across several disciplines.             |
|             | <b>12-4PM ET</b><br>POSTER PRESENTATIONS<br><i>(BY INVITATION ONLY)</i>  | <b>Undergraduate and graduate students in the Milken School of Public Health</b> will present their research posters to judges and compete for prizes. These presentations are not open to the public so if you would like to register to attend, please contact the student presenter.  |
| APRIL<br>13 | <b>12-4PM ET</b><br>POSTER PRESENTATIONS<br><i>(BY INVITATION ONLY)</i>  | <b>Undergraduate and graduate students in the arts, business, education, engineering, humanities, law, mathematics, sciences and other topics</b> will present their research posters to judges and compete for prizes. These presentations are not open to the public so if you would like to register to attend, please contact the student presenter.   |
|             | <b>4-5PM ET</b><br>THE 20/21 KNAPP FELLOWS: STUDENT COMMUNITY ENGAGED SCHOLARSHIP  | The Knapp Fellowship, coordinated by the Honey W. Nashman Center for Civic Engagement and Public Service, provides up to \$10,000 annually to support undergraduate or graduate student projects that intersect scholarly activity with community engagement. In this session, this year's Knapp Fellows will present the process and outcomes of their respective research projects, and discuss their learning experiences along the way.  |
|             | <b>5-5:30PM ET</b><br>NATIONAL SCIENCE FOUNDATION I-CORPS PROGRAMS INFO SESSION  | David McCarthy from the GW Office of Innovation and Entrepreneurship will conduct a short Info Session about the National Science Foundation I-Corp Programs available to GW faculty, students, and staff. The I-Corps programs provide grants of \$3,000 and \$50,000 to researchers who want to explore the possible uses and applications of their work.  |
| APRIL<br>14 | <b>11AM-12PM ET</b><br>RETHINKING DC YOUTH AND POLICING: STUDENT RESEARCH DISCUSSION   | This session will provide an overview of the approaches and findings from GW's Rethinking DC Youth and Policing course. This research-based course is designed to provide a space for students to engage juvenile justice and youth diversion programs research and recommend policy and actions that will be anti-racist and aim to lead to more youth diversions from arrest in the DC area.   |
|             | <b>12-4PM ET</b><br>POSTER PRESENTATIONS<br><i>(BY INVITATION ONLY)</i>  | <b>Students and residents in the School of Medicine and Health Sciences as well as the School of Nursing</b> will present their research posters to judges and compete for prizes. These presentations are not open to the public so if you would like to register to attend, please contact the student presenter.  |
|             | <b>5-6PM ET</b><br>GW WOMEN IN RESEARCH: PICTURE A SCIENTIST FILM DISCUSSION   | GW Research Showcase is pleased to host a campus-wide virtual screening of Picture a Scientist, which chronicles the groundswell of researchers who are writing a new chapter for women scientists. After watching the film, GW community members are invited to join GW professors from CCAS, SEAS, and SPH to discuss their thoughts on issues raised in the film as well as their experiences as women in their respective fields.  |
|             | <b>6-6:45PM ET</b><br>CITIZEN SCIENTISTS: PUBLIC HEALTH STUDENT ENGAGEMENT IN THE EXAMINATION OF COVID-19 PREVENTIVE BEHAVIORS | A GW School of Public Health team is participating in the national-level study to enhance surveillance of masking and distancing behaviors that directly contribute to control of viral spread. Information collected from this study will be shared with our university community, local health departments, and other stakeholders to better inform pandemic control efforts. Join this session to find out more about the national project and the students' field experiences collecting data and synthesizing findings. |

# GW Research SHOWCASE

DATE

TIME

ABOUT *(All links to programs can be found on the website)*

APRIL  
15

**4-4:30PM ET**

PUBLIC INTEREST TECHNOLOGY PANEL

The professional field of public interest technology is working to shape the way we think about technology to solve public problems in an inclusive and impactful manner. This cross-cutting field of research brings together disciplines such as engineering, data science, humanities, public policy and law. Join this panel discussion to find out more about the quickly-growing field.

**5-6PM ET**

HOW TO GET INVOLVED IN STUDENT RESEARCH AT GW: DISCUSSION WITH CURRENT STUDENTS

Representatives from the GW Undergraduate Review and GW COMPASS will reflect on their student research experience at GW as well as what opportunities both groups provide to student researchers on campus. We'll discuss how to get involved in research, how to get a mentor, how to locate campus resources, how to get published, and much more.

**6:30-8PM**

NEW VENTURE COMPETITION AWARD SHOW

Twelve finalist teams have emerged from the more than 200 teams who entered. Join the Award Show to see the winners of \$500k in prizes announced and the creative and innovative ideas our GW students have been working on for months.

APRIL  
16

**10AM-2PM ET**

SPECIAL PRIZE POSTER PRESENTATIONS

Undergraduate and graduate students whose research has been selected for additional prize categories will present to judges from the following offices:

- SustainableGW
- Office of Diversity, Equity, and Community Engagement
- Nashman Center for Civic Engagement
- Office of the Vice President for Research

**ALL DAY EVENT**

DIGITAL HEALTH SUMMIT

The Digital Health Summit explores current and future technologies forging transformation in both academic and healthcare environments. Industry leaders will examine innovation as a disruptor to the status quo and the competencies necessary for integration of digital technologies essential to interprofessional team engagement and, safe, effective and efficient patient care.

**1:05-1:40PM ET**

Introduction to Research and Scholarship in Digital Health

**1:40-2:40PM ET**

Focus on Research with Digital Health Applications

**5-7PM ET**

GW UNDERGRADUATE REVIEW 2021 JOURNAL RELEASE EVENT

We invite you to celebrate the release of Volume IV of the GW Undergraduate Review (GWUR)! Established in 2016, the GWUR is the premier publication of research from undergraduate students at The George Washington University.

**For more information**

visit [researchshowcase.gwu.edu](https://researchshowcase.gwu.edu)

or email [ResShowcase@gwu.edu](mailto:ResShowcase@gwu.edu)



@GWResShowcase

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

RESEARCH SHOWCASE

# BASIC BIOMEDICAL SCIENCES

## INSTITUTE FOR BIOMEDICAL SCIENCES

### Role of the Cranial Mesenchyme in Neural Tube Defects

Neural tube defects (NTDs) are among the most common structural birth defects leading to long-term disability or even death. NTDs result from a failure of neural tube closure as the flat neural plate rolls into a tube to form the central nervous system. This process requires morphogenesis of both the neural tissue and underlying cranial mesenchyme (CM) comprised of paraxial mesoderm (PM-CM) and neural crest (NC-CM) derived cells. Abnormal PM-CM and NC-CM are both implicated in NTDs.

While the cellular movements and shape changes that drive morphogenesis within the neural plate are well characterized, how morphogenesis of the CM contributes to neural tube closure and the respective contribution of the PM-CM and NC-CM remains poorly understood. My thesis project will test the hypothesis that expansion of the CM is a driving force for neural fold elevation.

Movement of the CM was observed using simultaneous multi-view (or SiMView) light-sheet microscopy and analyzed using Massive Multi-view Tracker (MaMuT) software in ImageJ. Previous data in the lab utilized a CM explant assay to demonstrate increased CM movement occurs in the *Hectd1* mutant mouse model with NTDs. My experiments utilized this assay combined with lineage tracing to determine whether PM-CM or NC-CM is the migratory population in the CM.

Our live imaging studies indicate that cells move in a dorsal lateral direction during neural fold elevation consistent with cell movement driving elevation. Explant assays suggest that NC-CM cells are the cells migrating in wild type embryos. Future experiments will explore the cell lineages migrating in *Hectd1* mutant, molecular and cellular mechanisms responsible and how this disrupts neural fold elevation.

### Primary Presenter

Claire Charpentier

### Status

Graduate Student - Doctoral

### Authors

Claire Charpentier, Irene Zohn

### Research Mentor/ Department Chair

Irene Zohn

RESEARCH SHOWCASE

# BASIC BIOMEDICAL SCIENCES

## INSTITUTE FOR BIOMEDICAL SCIENCES

### Differences in the Platelet mRNA Landscape Portend Racial Disparities in Platelet Function

Aberrant platelet activity has been linked to an increased risk of cardiovascular disease as well as poorer outcomes in cancer patients, two conditions that affect African Americans (AA) at greater rates and severities than European Americans (EA). We performed RNA-Seq on platelets isolated from healthy AA (N=21) and EA (N=23) volunteers and compared gene expression between the two populations. We identified 480 genes (324 up-regulated and 156 down-regulated in AAs) that were significantly differentially expressed between AA and EA platelets representing a variety of cellular locations, molecular functions, and biological processes. Of interest, some categories that were overrepresented in this list included genes involved phospholipase C signaling and calcium mobilization, which are known pathways involved in platelet activation. Light transmission aggregometry showed that in response to collagen, AA platelets aggregated more and at a faster rate than EA platelets, indicative of increased platelet activity even in healthy AAs. We also noted that several of the dysregulated genes were cytokines that are known to be released upon platelet activation, including IL32, PROK2, CCL3L1, CCL4L2, and LGALS1. Of these, IL32 and PROK2, both up-regulated in AA platelets, were further investigated. Neutralizing antibodies for IL32 and PROK2 were seen to increase and decrease platelet aggregation respectively, and increased IL32 cytokine levels decreased platelet aggregation. AA platelets were also seen to increase the invasiveness of prostate cancer cells, but the addition of IL32 neutralizing antibodies reduced this increase.

### Primary Presenter

Kaitlin Garofano

### Status

Graduate Student - Doctoral

### Authors

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### Research Mentor/ Department Chair

Norman Lee

RESEARCH SHOWCASE

# BASIC BIOMEDICAL SCIENCES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### A Systematic Review of Artificial Intelligence Techniques to Identify Potential COVID-19 Treatments

COVID-19 was declared a pandemic by the World Health Organization in March 2020. Globally, there have been over 100 million confirmed cases and more than two million deaths. An extremely limited number of medications are available as COVID treatments approved by the FDA. Artificial Intelligence (AI) and Machine Learning allow researchers to leverage existing data to make new discoveries. This review summarizes the different AI techniques, including deep learning, which have been applied to identify new treatment candidates for COVID. The medications identified by AI techniques included the FDA-approved drug remdesivir and the FDA emergency use authorized baricitinib. A number of other treatment candidates were also identified.

A systematic review was conducted to identify relevant articles from PubMed, Scopus, and Google Scholar from January 2020 to February 2021. Results reviewed from 22 articles reveal various AI-based methods that have successfully identified potential drugs to be repurposed for treatment of COVID-19. Despite, promising statistical and clinical results of the mentioned drugs, further evaluation is needed for further clinical implications.

Vaccines have recently been approved as a preventative therapy, but the review findings remain relevant for potential virus mutations, the unvaccinated population, and for the methodology to approach future pandemics.

### Primary Presenter

Emma Engler

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Graduate Student - Masters

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### Research Mentor/ Department Chair

Krystl Haerian

RESEARCH SHOWCASE

# BASIC BIOMEDICAL SCIENCES

## VETERANS AFFAIRS MEDICAL CENTER

### Role of Proximal Tubular Transporters in Calcium Stone Formation

Proximal tubular (PT) cells reabsorb most of the calcium ( $\text{Ca}^{2+}$ ), phosphate ( $\text{PO}_4^{3-}$ ), bicarbonate ( $\text{HCO}_3^-$ ), and oxalate ( $\text{C}_2\text{O}_4^{2-}$ ) ions. We recently found an apical  $\text{Ca}^{2+}$  channel, Transient Receptor Potential Canonical 3 (TRPC3), in mice PT cells and TRPC3 KO (-/-) mice exhibit calcium phosphate (CaP) crystals at the loop of Henley (LOH). However, the other predisposing factors for such CaP crystal formation are unknown. Here we examined the functional status of  $\text{HCO}_3^-$ ,  $\text{PO}_4^{3-}$ , and  $\text{C}_2\text{O}_4^{2-}$  transporters in PT cells of wild type (WT) and TRPC3-/- mice using electrophysiology to assess their contribution in the development of LOH CaP crystals. While in both WT and TRPC3-/- PT cells,  $\text{HCO}_3^-$  induced-currents were concentration-dependent, it was much smaller in TRPC3-/- PT cells, suggesting a diminished  $\text{HCO}_3^-$  transport due to deletion of TRPC3. Moreover, with inhibition of NBCe1 by S0859, the current activities were inhibited in both WT and TRPC3-/- PT cells. Notably, the  $\text{PO}_4^{3-}$  induced currents were also rise with the concentration in both WT and TRPC3-/- PT cells. Furthermore, the application of PF-06869206 (NaPi-iiia inhibitor), mildly inhibited such  $\text{PO}_4^{3-}$  current in WT PT cells, whereas it did not affect much in TRPC3-/- PT cells, suggesting less  $\text{PO}_4^{3-}$  reabsorption by TRPC3-/- PT cells. Next, we applied thiosulfate (O3S2-2) as a competitive inhibitor of the SLC26a6 transporter upon  $\text{C}_2\text{O}_4^{2-}$  current activation and observed a reduced  $\text{C}_2\text{O}_4^{2-}$ -induced conductance which was greater in TRPC3-/- PT cells. Together, these results suggest that the predisposing conditions due to excess  $\text{HCO}_3^-$ ,  $\text{PO}_4^{3-}$  in TRPC3-/- mice PT luminal fluid may have favored the CaP crystal formation at LOH.

### Primary Presenter

Samuel Shin

### Status

Student - Post-Baccalaureate

### Authors

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### Research Mentor/ Department Chair

Bidhan Bandyopadhyay

RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Internal State-Dependent Conditioned Stimulus Delivery Using Cardiovascular Telemetry

To further understand mechanisms of neuropsychiatric disease(s) and their impact on physiological systems, improved pre-clinical models and innovative methodology are needed to assess the internal physiological state of the animal in real-time. To address this challenge we developed a customizable software-based program for Ponemah that takes into account the animals diurnal and resting cardiovascular state in a home-cage environment. Using an integrated Pavlovian fear conditioning and cardiovascular telemetry approach in mice, we demonstrate for the first time a novel software add-on application that can remotely trigger a conditioned stimulus (CS) (i.e., audible tone) based on the animals instantaneous cardiovascular state while in its home-cage environment. This new cardiovascular behavioral experimental tool extends the ability to quantify integrated physiological correlates of learned fear and may aid in further understanding mechanisms related to enhanced cardiovascular and autonomic arousal in fear and anxiety based disorders.

### Primary Presenter

Ben Turley

### Status

Undergraduate Student

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### Research Mentor/ Department Chair

Paul Marvar

RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Measures to Evaluate Generative Adversarial Networks Based on Direct Analysis of Generated Images

The Generative Adversarial Network (GAN) is a state-of-the-art technique in the field of deep learning. A number of recent papers address the theory and applications of GANs in various fields of image processing. Fewer studies, however, have directly evaluated GAN outputs. Those that have been conducted focused on using classification performance (e.g., Inception Score) and statistical metrics (e.g., Fréchet Inception Distance). Here, we consider a fundamental way to evaluate GANs by directly analyzing the images they generate, instead of using them as inputs to other classifiers. We characterize the performance of a GAN as an image generator according to three aspects: 1) Creativity: non-duplication of the real images. 2) Inheritance: generated images should have the same style, which retains key features of the real images. 3) Diversity: generated images are different from each other. A GAN should not generate a few different images repeatedly. Based on the three aspects of ideal GANs, we have designed the measure: Likeness Score (LS) to evaluate GAN performance, and have applied them to evaluate three typical GANs. We compared our proposed measures with three commonly used GAN evaluation methods: Inception Score (IS), Fréchet Inception Distance (FID) and 1-Nearest Neighbor classifier (1NNC).

We briefly reviewed the three existing measures and indicated their limitations and drawbacks. IS depends on the Inception network trained by ImageNet. The pre-trained classifier may not be suited for use on some specific types of images that are not included in ImageNet (e.g., medical images) or for non-classification purposes, and IS also has no ability to detect overfitting. FID also depends on the pre-trained Inception network and a Gaussian distribution assumption of feature vectors from the network. Our proposed method is designed to avoid those disadvantages. We have built a framework to describe ideal GANs using three criteria and discussed how the new methods fixed the problems of several existing methods. LS do not need a pre-trained classifier nor a priori knowledge of distributions, and they evaluate a GAN based on the three criteria we defined. In particular, the LS is a model-independent measure and offers a distinctly new way to measure the separability of real and generated data. Besides evaluation of GANs, LS could measure data complexity as well. In addition, we discuss how the evaluation could help us deepen our understanding of GANs and improve their performance.

### Primary Presenter

Shuyue Guan

### Status

Graduate Student - Doctoral

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### Research Mentor/ Department Chair

Murray Loew

RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### 3D Printing of Biomimetic Flexible Multilayer Blood Vessels

To date, there is a growing demand to develop tissue-engineered small-diameter vascular grafts for clinical use due to the limitation of vascular autografts and commercially available artificial grafts. Among various tissue fabrication techniques, 3D printing has gained enormous attention for generating artificial tissue due to its capability in replicating the complexity and biomimicry of native tissues. Currently, biocompatible polylactic acid (PLA) or its derivatives have been used to fabricate vascular scaffolds via fused deposition modeling (FDM) based printers. The resulted scaffolds can provide a proper degree of mechanical strength to endure high blood pressure. However, they lack the flexibility to regulate blood flow for the vessel's dilation and constriction, and do not have ideal porosity to provide nutrition exchange and oxygen diffusion for the nearby connective tissue. Therefore, it still remains very challenging to create a small-diameter blood vessel graft that can fully resemble the native physiological properties, including elasticity, flexibility, and bio-functionality, for tolerating blood pressures, controlling blood flow, maintaining the vessel wall permeability barrier, and regulating coagulation (thromboresistant). In this study, we 3D printed novel small-diameter vessel grafts with a rubber-like elastomer, in which a biomimetic multilayer blood vessel structure was successfully created in the presence of human-induced pluripotent stem cells (iPSCs) to overcome the aforementioned limitations. The printed vessels exhibited high accuracy and reproducibility by varying size and length. The results of tensile modulus demonstrated our printed vessel grafts had superior flexibility compared to a PLA control, and the value was similar to the native vessel. Within the printed elastic tubular grafts, iPSC-derived endothelial cells (iECs) and iPSC-derived smooth muscle cells (iSMCs) were incorporated into fibrin gels to form endothelium and smooth muscle layers. Cell staining and CCK-8 testing results indicated desired viability and proliferation rates of iECs and iSMCs in our printed vessel grafts. Overall, this study provides a new and facile approach to fabricate novel small-diameter blood vessel grafts with appropriate flexibility and biomimicry, which holds great potential for clinical transplantation.

### Primary Presenter

Sung Yun Hann

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### Research Mentor/ Department Chair

Lijie Grace Zhang

RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Prediction of Histologic Grade and Type of papillary Renal Cell Carcinomas using Texture Features and Machine Learning

Despite early detection methods, Renal Cell Carcinoma (RCC) mortality has continued to increase. It is, therefore, critical to acquire accurate grading and typing of the tumor, leading to the correct course of patient treatment. Biopsy is not only invasive but can result in under-grading due to the intra-tumoral heterogeneity. The goal of this study was to determine whether histogram and texture features abstracted from CT scans could be used to accurately classify tumors as low/high Fuhrman grade and Type 1/2. Individual features were not found to have statistically significant ( $p < 0.5$ ) differences between low/high Fuhrman grade or Type 1/2. However, when using all histogram features, all texture features, or all histogram and texture features, the Histogram-Based Gradient Boosting Decision Tree model was able to correctly classify the tumors, with AUCs ranging from 0.97-1.0. The accurate prediction of papillary RCCs using machine learning techniques could lead to less invasive patient management and active disease surveillance.

#### Primary Presenter

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Graduate Student - Doctoral

#### Authors

RyeAnne Ricker

#### Research Mentor/ Department Chair

Murray Loew

RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### 3D-Printing in Radiation Oncology: Development and Validation of Custom 3D-Printed Brachytherapy Alignment Device and Phantom

Background: 3D-printing has emerged as a promising tool for brachytherapy simulation, training, and research. Brachytherapy is a form of radiation therapy that seeks to treat cancer through insertion of radioactive sources into a tumor. Radioactive sources are aligned into the patient by needles and tools such as a blocking needle template while undergoing a CT scan to ensure correct placement. In brachytherapy for cervix cancer, many patients have tumors or anatomy that do not conform to a standard blocking template for needle alignment. In this pilot study, we sought to create a 3D-printed device that provided customized needle alignment for a patient and developed a 3D-printed mold and anatomical “phantom” model based on a patient CT scan to test the device.

Materials and Methods: A CT scan of a cervix tumor from anonymized patient data was used to develop a 3D-printed brachytherapy alignment tool and phantom anatomical mold. Multiple materials were evaluated to match patient anatomy in density and Hounsfield Units (HU) present on CT scan, with additional considerations for toxicity, compliance, and practicality to create the alignment device. The alignment device and molds were developed in PLA, with silicone of T20 hardness used to create relevant anatomical organs from the patient scan (uterus, rectum, bladder). Tumor tissue was mimicked by addition of 1cc of iodine contrast agent to silicone. Device and needles were arranged, inserted into anatomical phantom, and scanned by CT to mimic brachytherapy procedure. Treatment plan was generated as a final validation of phantom and 3D-printed device.

Results: The 3D-printed silicone uterus of 1.08 g/cm<sup>3</sup> density and 40 HU mimicked human uterus on CT scan, with rectum and bladder also similar to normal in appearance. Constructed uterus dimensions of 6.5 cm x 5.5 cm x 3.3 cm were verified on imaging to be within + 1 mm of original patient scan. Tumor ring with 1cc of contrast agent appeared mildly brighter than cervix tissue, indicating higher concentration of iodine could improve contrast. The alignment device was validated by CT scan to template correct insertion of needles into phantom tumor tissue and uterus.

Conclusions: This pilot study provides a potential methodology to develop future anatomical phantoms and alignment devices using CT scans of patient data. Increased concentration of contrast agent is recommended for tumor region. Additional modifications to make models more pliable could make this a viable training tool for future residents and medical students to learn brachytherapy.

### Primary Presenter

Destie Provenzano

### Status

Graduate Student - Doctoral

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### Research Mentor/ Department Chair

Murray Loew

RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Feasibility of Therapeutic Ultrasound Application in Topical Scleral Delivery of Avastin

Macromolecules have been shown effective in vision-saving treatments for various ocular diseases such as age-related macular degeneration and diabetic retinopathy. Current delivery of macromolecules requires frequent intraocular injections and carries a risk of serious adverse effects. We have tested the application of therapeutic ultrasound as a minimally-invasive approach for delivery of Avastin into the diseased regions of the eye. Bevacizumab (Avastin), is an anti-VEGF antibody with molecular weight of 149 kDa. We tested the effectiveness and safety of delivery of Avastin through the rabbit sclera in vitro in a standard diffusion cell model. 400 kHz ultrasound at intensity of 1 W/cm<sup>2</sup> was applied for the first 5 minutes of a one-hour drug exposure. Sham treatments mimicked the ultrasound treatments, but ultrasound was not turned on. Temperature of the donor compartment was measured right before applying the ultrasound, and 2.5 and 5 min after. The maximum scleral temperature change was 16 °C estimated to be mostly due to the heat dissipation of the ultrasound transducer into a small volume of the donor compartment. Absorbance measurements were performed of the receiver compartment solution at 280 nm and were 0.14±0.14 (n=18) in the ultrasound group and 0.15±0.11 (n=15) in the Sham group with no statistical difference. Histology studies indicated no significant damage in ultrasound-treated scleras. As opposed to the previous studies indicating effectiveness of ultrasound in enhancing drug delivery through the cornea, our preliminary results here provide support that ultrasound at the tested parameters may not be as effective in the delivery of Avastin through the sclera.

#### Primary Presenter

Hanaa Almogbil

#### Status

Graduate Student - Doctoral

#### Authors

Hanaa Almogbil

#### Research Mentor/ Department Chair

Vesna Zderic

RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Flexible and Transparent Microelectrode and Interconnect for Electrophysiology and Optogenetics

Flexible and transparent microelectrodes provide unique functions for various emerging biological applications such as simultaneous optical and electrical interrogation for bio-systems, while conventional opaque metal-based electrodes create optical shadows between the cell/tissue and light source. The development of transparent microelectrodes including indium tin oxide (ITO), graphene, and carbon nanotube (CNT) enables efficient light transmission through the microelectrodes for optical stimulation during co-localized recording, but is still subject to the limitations such as poor mechanical and electrical properties. In addition, graphene and CNT microelectrodes have suffered controversial research results regarding long-term cytotoxicity and carcinogenicity. Therefore, for practical biointerfacing, it is important to further improve the optical, electrical, electrochemical, and mechanical properties of the transparent microelectrodes. Here, we present high-performance microelectrodes and interconnects with high optical transmittance (59-81%), low electrochemical impedance (5.4-18.4  $\Omega$  cm<sup>2</sup>) and sheet resistance (5.6-14.1  $\Omega$  sq<sup>-1</sup>), by using ITO and metal grid (MG) hybrid structures. It is worth noting that the hybrid structure also retains the excellent mechanical properties of the flexible MG in addition to the fragile ITO. The feasibility of the ITO/MG microelectrodes and interconnects are demonstrated by high-fidelity electrical recordings of transgenic mouse heart under simultaneous programmed optical stimulation. In vivo histological analysis reveals the full biocompatibility of the design. The result demonstrates the great application value of the ITO/MG interface in a wide range of physiological research.

### Primary Presenter

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Effect of Lipid Shell Composition and Hydrophilic Chain Configuration on the Behavior of Ultrasound Contrast Agent Microbubbles

Microbubbles are used as ultrasound imaging contrast agents. The compressible gas core enables them to generate harmonics and subharmonic of the exciting acoustic pressure wave which have been utilized in several imaging methods. To improve the lifetime of microbubbles, the gas core is encapsulated in a shell. Shells can be made of proteins, lipids, and polymers. However, encapsulations can affect the behavior of the microbubbles. In this study, we investigated the effect of lipid composition on the shell elasticity, dissolution behavior, and scattering response of the lipid shell microbubbles. Five different compositions of DPPC and DPPE-PEG2000 lipids were used to produce encapsulated microbubbles with Perfluorobutane (PFB) gas core. Optical microscopy was used to measure the size distribution of microbubbles. Resonance frequency of microbubbles was measured using frequency dependent attenuation coefficient measurements. Exponential Elasticity Model (EEM) of bubble dynamics was fitted to obtained attenuation curves to estimate the interfacial elasticity of different lipid shells. The change in the attenuation curve in 30 minutes was used to study the dissolution behavior of microbubbles. Lastly, scattering response of microbubbles to 2.25 MHz excitation and acoustic pressures in the range of 30–1400 kPa were measured.

It was found that addition of PEG to the lipid shell affects the behavior of microbubbles through changing the phase separation of the lipid mixture and configuration of PEG chains. While the addition of PEG improved the yield of bubble production with a maximum concentration at 2% PEG – 98% PEG composition, the mean size of microbubbles remained unchanged. Shells with higher PEG content (>5%), in which PEG chains conform a brush configuration, showed higher permeability in comparison to the shells with lower PEG content where PEG chains are in mushroom shape. In addition, the elasticity of the shells in the brush regime were significantly lower than the ones of the mushroom regime. The lower elasticity of the shells make bubbles in brush regime to resonate at lower frequencies (1-2 MHz) which make them generate significantly higher fundamental and subharmonic response to 2.25 MHz excitation in comparison to mushroom regime bubbles (4-6 MHz resonance frequency). These findings are helpful to determine optimal acoustic settings and injection procedures to achieve the best performance of microbubble contrast agents in ultrasound imaging.

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Iron Oxide Nanoparticle-Induced Conformational Change in Fibrinogen and Implications on Platelet Response

Although superparamagnetic Iron oxide nanoparticles (SPIONs) are used clinically for diagnostic (Shen et al., Mol. Pharm, 2017) and therapeutic applications (Singh et al., Nanomaterials, 2019), their interactions with human platelets have not been comprehensively characterized. In past studies, we observed that polyvinyl alcohol (PVA) coated SPIONs induced a dose-dependent antiplatelet effect. This effect was observed with multiple formulations, irrespective of the molecular weight of the polymer coating (12 kDa and 31 kDa) or the surface charges (positive, neutral, and negative). Here, we investigated three plausible mechanisms for this anti-platelet effect. We tested for (i) sequestration of the plasma proteins fibrinogen and von-Willebrand factor in the protein corona of the nanoparticles, (ii) the potential inability of these proteins to bind to platelet receptor GP IIb-IIIa due to steric hindrance, and (iii) the change in conformation of the protein fibrinogen, a plasma protein implicated in platelet aggregation. Interestingly, our results suggest that SPIONs directly affect the conformation of fibrinogen, thus indirectly impacting platelet function. This structural change of the protein was characterized by performing UV-vis and fluorescence spectroscopy. We observed a significant decrease in the maximum absorbance peak of fibrinogen in the presence of SPIONs at 204.4 nm with a right shift of 2.97 nm, indicating a change in conformation of fibrinogen. We then confirmed this result by measuring the steady-state fluorescence spectrum at 280 nm and the synchronous fluorescence spectrum with a  $\Delta\lambda$  offset of 60 nm. Our results demonstrated a decrease in the fluorescence intensity with both the spectra. Thus, the data validates our hypothesis that the antiplatelet effect is caused due to a change in conformation of fibrinogen. These results open the possibility of developing new anti-thrombotic modalities based on the SPION-fibrinogen interactions. This work has recently been published in Small (Kottana et.al. 2021).

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### In Vitro Characterization of Interactions between Lyophilized Platelets and Untreated Human Platelets

Lyophilized Platelets have attracted attention as a replacement for current platelet transfusion due to their ease of storage and long-term stability [Bynum et al., 2019, Transfusion]. The development of lyophilized platelet systems could greatly expand the availability of transfusable platelets since they can be stored under less strict conditions for longer periods, and with a lower risk of bacterial contamination [Fan et al., 2009, Sci. Bull.]. Furthermore, studies demonstrating the biocompatibility of lyophilized platelet formulations have indicated the possibility of using lyophilized platelets as a drug delivery system [Cellphire, 2017, NCT02223117; Barroso et al., 2018, Transfusion]. In order to explore these possibilities however, the interactions between lyophilized platelets and untreated platelets found in the blood must be determined. Thus, the objective of this project is to characterize the interactions of platelets and lyophilized platelets through flow cytometry (receptor availability assay), light transmission aggregometry, and an LDH (lactate dehydrogenase)-based adhesion assay under normal and thrombocytopenic (low platelet count) conditions. The flow cytometry data demonstrates that the platelets maintain critical receptors needed for adhesion and aggregation function. The aggregometry data however indicates that the lyophilized platelets have an inhibitory effect on platelet aggregation. Conversely, the lyophilized platelets promote platelet adhesion in vitro. These trends are also found to hold true across normal and thrombocytopenic conditions. The data indicates that the intact adhesion receptors on the lyophilized platelets are able to aid with platelet adhesion, however the largely inactivated aggregation receptors on the lyophilized platelet interfere with normal platelet aggregation. These trends indicate potential complications and further explain the interactions involved with a transfusion of lyophilized platelets. Furthermore, this information provides insights into how lyophilized platelets could be used as a drug delivery system. The inhibition of platelet aggregation by lyophilized platelets could provide an interesting functionality for an anticoagulant delivery system. Likewise, the increased adhesion with a lyophilized platelet transfusion could offer an opportunity for targeted delivery. Further research is needed to investigate these possibilities and develop appropriate delivery systems based on the characterization of the interactions of lyophilized platelets and untreated platelets presented here.

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### 3D Bioprinting of a Novel Blood Plasma based Construct for Complex Tissue Regeneration

Autografts and allografts currently represent the most widely accepted clinical approaches for tissue replacement and regeneration. However, these procedures are considerably limited by insufficient donor sources, donor-site tissue damage, and graft-to-defect structural mismatch. In recent years, 3D bioprinted tissue scaffolds, coupled with advanced stem cell technologies, have gained notable attention as being an alternative methodology to traditional tissue grafts for enabling defect-matched, patient-specific tissue regeneration. 3D bioprinting offers unparalleled precision and control over the placement of biomaterials and stem cells, which given the proper biochemical and mechanical cues, can mature into discrete tissue-types for various tissue regeneration applications. However, a major impediment to the more broad-scale clinical acceptance and utilization of 3D bioprinted scaffolds is the limited availability of printing materials which are biomimetic, cytocompatible, and confer low immunological response upon implantation. To address this shortage of viable printing materials which are appropriate for human tissue regeneration purposes, we have been developing a protocol to produce a new 3D bioink formulation, deemed "Plasma-ink", which is primarily composed of purified blood plasma and the biocompatible polymer Poly(ethylene glycol) diacrylate (PEGDA, mn700). The key innovation of our 3D Plasma-ink, is the ability to fabricate patient-specific tissue scaffolds utilizing a patient's own plasma, to provide for ideal graft-to-defect matching while mitigating the risk of immune-rejection of implants during the tissue regeneration process. As a proof-of-concept study to assess the regenerative potential of the Plasma-ink scaffolds, 8mm round porous tissue scaffold matrices were fabricated using our custom-made stereolithography (SLA) bioprinter, and an optimized mixture of purified bovine blood plasma and PEGDA. Once printed, the Plasma-ink scaffolds were seeded with a co-culture of human adipose-derived stem cells (ADSCs) and human umbilical vein endothelial cells (HUVECs). A 4-hour cell adhesion assay and a cell counting assay revealed that the Plasma-ink scaffolds provided for enhanced cell adhesion over the PEGDA control scaffolds, while promoting co-cultured cell proliferation rates. Cytocompatibility and Immunohistochemical analysis revealed that over 90% of the co-cultured cells were viable 24hrs post seeding, and together with the capillary sprouts observed growing on the surface of the Plasma-ink scaffolds, the introduction of neurogenic differentiation media conferred significant ADSC-derived neurogenesis, resulting in a distinct preliminary vascularized neural tissue.

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Development of an AI-based Domain-Specific Q&A System

Despite studies that found no evidence in the causation of Autism Spectrum Disorder (ASD) by vaccines, some still remain concerned that it is unsafe and can cause ASD. The Internet and news media has been highly influencing perception of the public since it is the fastest growing source of information. Our objective is to develop an artificial intelligence (AI) based knowledge-based query system that can provide informed answers to user's questions based on published scientific articles. Our system can retrieve the abstracts of relevant research papers from PubMed based on specific search terms, and get answers of query via Bidirectional Encoder Representations from Transformers (BERT) model that has been fine-tuned with question answering tasks on the Stanford Question Answering Dataset v2. With the set of candidate answers, it is designed to pick the best answer using the Term Frequency - Inverse Document Frequency (TF-IDF) statistical measures. Our system has shown promising results in retrieving answers on ASD-related questions. Specifically, when querying with the term "vaccine and autism" and question "does vaccine cause autism?", it produces approximately 500 answers from 900 total abstracts in PubMed with a final answer of "MMR vaccine does not cause autism". Efforts to improve the system and fine-tuning better models are still ongoing. In our future research steps, we will apply our structure for more advanced query systems in diverse domains and fields to expand the impacts.

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Breast Cancer Tumor Detection Via Analysis of Mean Thermal Signatures Over Time Using Quadrant Analysis and Heat Maps

Breast cancer is a disease with the highest incidence and mortality among women. Mammography, the current gold standard for breast cancer detection, has been found to fail at detecting small tumors and in women with dense breasts. Thermography is an imaging technique that utilizes infrared wavelengths (8-12 $\mu$ ) to create an image that represents object temperature as image intensity. For this reason, thermograms are able to clearly depict temperature changes. Patients with breast cancer and volunteers with no known tumors were imaged thermally with an N2 Infrared camera for a total of 15 minutes. Each thermal image was cropped and manually segmented using MATLAB. In MATLAB, images were separated into four quadrants based on nipple location. The average temperature of each quadrant was calculated and displayed through a heat map. This process was repeated with successive divisions of the quadrants into 16 and 64 sub-quadrants (levels 2 and 3, respectively). A similar approach was used on the volunteers, except that values were averaged over the 17 volunteers. From this, the mean and standard deviation of the temperature was calculated for each patient and volunteer at each time interval and level and plotted.

Our results showed there was a statistically significant increase in average temperature difference for patients 2, 4, 5, and 11. In all other cases, the average temperature difference of the patient was not significantly different from the average difference of all volunteers. In all cases, the average temperature differences among each patient over 15 minutes were significantly more variable than the differences across the volunteers. Average temperature differences became increasingly more accurate as the number of quadrants used in analysis increased. When comparing patients to volunteers, the most pronounced increase in temperature was most easily viewed in the level 3 heat map at time 14. Graphically, the largest difference between average temperatures over time is seen in the analysis at the level 1. Patients who showed a significantly larger average temperature difference between breasts had heat maps that reflected this increase, and the changes in temperature over time made it clear where the tumor was located.

While a statistically significant increase in average temperature difference was seen in a select number of patients, there was not a strong enough trend throughout all subjects. There was, however, a direct correspondence between an increased average temperature difference and an ability to locate the tumor on the cancerous breast.

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Therapeutic Ultrasound-Enhanced Transcorneal Natamycin Delivery

Fungal Keratitis is a rare yet serious corneal eye infection that leads to permanently altered vision and pain for the patient if not treated properly. Fungal Keratitis is most common in tropical regions, yet cases are increasing among contact wearers in the United States. Treatment of Fungal Keratitis is inhibited by multiple barriers presented by the unique biochemistry of the eye. Drug delivery is hindered by physical and biochemical properties, such as tear production, the epithelial layer of the cornea and blinking. Fungal Keratitis is most commonly treated with 5% Natamycin eye drops applied hourly for up to one year, and such involved treatment often results in low patient compliance. The aim of this study is to determine if high-intensity focused ultrasound can be applied to increase transcorneal drug delivery in cases of Fungal Keratitis without overheating surrounding ocular tissues.

OnScale, an ultrasonic wave modeling software, was used to create a virtual model of the eye and simulate the effects of different ultrasound parameters on the eye by monitoring temperature increase of surrounding tissues. The average increase in temperature was recorded across various tissues and a temperature map of the eye was modeled on OnScale. Overheating was defined as any temperature rise over 1°C in surrounding tissues. From the models, it was determined that 400 to 600 kHz frequency and at 0.5 W/cm<sup>2</sup> – 0.8 W/cm<sup>2</sup> intensity for 5 minutes of continuous exposure safely treats the cornea without damaging surrounding ocular tissues.

These results are currently being replicated in a laboratory setting using a jacketed Franz diffusion cell set-up placed in a water bath kept at 34°C and dissected rabbit eyes, due to their similarity to human eyes. The corneas are placed between a donor compartment filled with 5% Natamycin and a receiver compartment filled with Dulbecco's phosphate-buffered saline. Each cornea is exposed to the drug solution for 60 minutes, with the experimental group receiving 5 minutes of continuous ultrasound or pulsed ultrasound at 25% and 50% duty cycles in the beginning of treatment. Ultrasound transducers are being operated at 0.5 W/cm<sup>2</sup> – 0.8 W/cm<sup>2</sup> intensity and frequencies of 400-600 kHz. Histological images of the cross-section of the corneas used in experiments are being examined for cell damage under a microscope. By overcoming biological barriers in treatment, ultrasound-enhanced drug delivery might act as an inexpensive and minimally invasive treatment option. This research is ongoing.

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Bidirectional Optoelectronic Interfaces for Recording and Modulation of Biological Systems

Recent advances in optophysiology tools such as optogenetics have expanded and revolutionized biological research. Combining optogenetics and gold standard extracellular recording will allow simultaneous modulation and monitoring of cellular activity. However, bidirectional systems that can both deliver light to regions beneath the recording electrodes and perform high spatiotemporal resolution recording remain rarely explored. Here, I will present monolithic integrated multifunctional devices consisting of transparent microelectrodes and microscale light sources to enable simultaneous co-localized electrophysiological recording and optical modulation. The transparent microelectrodes exhibit high transmittances, superior electrochemical impedance, and minimized light-induced electrical artifacts for crosstalk-free high-fidelity electrophysiological recording. I will further discuss ex vivo studies on transgenic mouse hearts to demonstrate the multifunctional capabilities of our devices in electrical recording and optical pacing to treat abnormal heart rhythm at the same anatomic site. These microsystems have broad potentials for widespread biomedical applications in both basic and translational research.

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### A New Multi-Scale Co-Occurrence Matrix for Image Texture Classification

In this work we propose a new multi scale co-occurrence matrix (MSCM) for image texture classification. The most popular tool used to extract texture features is the gray level co-occurrence matrix (GLCM). The GLCM can be thought of as a type of 2D histogram, in which each bin in the histogram counts the number of occurrences in an image that neighboring pair of pixels have certain gray levels. Computing the Haralick texture features is the most popular way to extract texture features from the GLCM. A GLCM neighbor is defined by an angle  $\theta$  and distance  $d$ . Parameterized by a radius only, the MSCM is not limited to a few discrete angles as the GLCM is.

We used three image texture datasets to explore the ability of the MSCM to classify images based on texture. MSCMs with radii parameters from 1-40 and GLCMs with  $\theta=0, 45, 90, 135$  and  $d=1-5$  were created for each image. Twenty Haralick features were calculated from the MSCMs and GLCMs and were used to classify image texture. Classification was performed using up to five radii for MSCMs and five distances for GLCMs. Feature selection for the five MSCM radii used was performed using a chi-square test. The features are first standardized by subtracting their mean and scaling to unit variance. All classifications were performed using scikit-learn support vector machine (SVM) in Python 3.8. Leave-one-out classification was performed using optimized hyperparameters and classification accuracies are calculated.

Our early results indicate that the MSCM is a promising tool. We have so far achieved a classification accuracy of 95.0% and 97.5% for two of the three texture datasets. These are striking results as there is still a wide parameter space to search through and even higher classification accuracy can likely be achieved. Thus far, we have tested only one feature vector, which is a concatenation of the 20 Haralick features. Our future studies will focus on other combinations of the 20 features we have or other features entirely which could prove more useful for texture classification using MSCMs. Further, we plan to investigate the MSCM's usefulness in classifying small rotations in image texture. Since the MSCM is parameterized by a radius and not the four conventionally used directions in the GLCM, we suspect that the MSCM will be better at classifying texture in the presence of small rotations.

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RESEARCH SHOWCASE

# BIOMEDICAL ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Envisioning the Ideal Smartphone Ophthalmoscope: A Software/Hardware Solution

The three leading causes of blindness in the US (macular degeneration, diabetic retinopathy, and glaucoma) all manifest themselves as retinal abnormalities. Therefore, an accessible, convenient method for patients to regularly have their retinas examined stands to benefit eye health nationally. The COVID-19 Pandemic and the associated move toward tele-health demonstrate the utility of a solution operated by patients in their homes. Although others have attempted to tackle this challenge by designing smartphone adapters that capitalize on the ubiquity of the host devices, the image quality of such devices is marred by a narrow field of view compared to traditional table-top retinal cameras. Additionally, all of these devices require the assistance of an operator and perform best after the application of dilating eye drops, an unsafe task for the layperson. This research sought to determine the requirements for a smartphone ophthalmoscope that can enable patients to capture their own clinical-grade retinal images for teleophthalmology “visits.”

A preliminary experiment coupled with a literature review revealed that the solution will require image processing analysis software in addition to optical components. A test of the spatial resolution of the iPhone XS Max using the USAF 1951 test chart demonstrated that the phone’s camera limits the maximum spatial resolution to ~30 lp/mm, less than half the spatial resolution required by the ISO standard for retinal cameras. To overcome this limitation, the function by which a smartphone’s camera lens assembly converts physical details to image details, i.e. its modulation transfer function, can be determined and used to “re-sharpen” images via deconvolution. Further, the complex layered structure of the anterior eye necessitates an imaging system that can focus on different planes in 3-D space. To achieve this with the smartphone camera, the 2-D discrete Fourier transform or discrete cosine transform can be exploited to measure and optimize focus of features of interest. Finally, physical optics are needed to direct illumination and imaging light; the most promising method for doing so with respect to field of view directs the former through the pars-plana region of the eye and collects the latter through the pupil. These insights provide the basis for future development of the ideal smartphone retinal camera by leveraging the increasing computing power of handset chipsets.

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RESEARCH SHOWCASE

# BUSINESS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Telehealth: The Inevitable or a Consumer Preference?

The COVID-19 pandemic has impacted many organizations directly and moved a number of healthcare workers online, creating an increase in telehealth appointments for patients seeking medical care. As the field continues to navigate this unprecedented time, the question of whether patient appointments will continue virtually or return to being in-person and what types of care will be reimbursed post-pandemic remain unclear. This paper explores consumer preference as it relates to telehealth appointments by utilizing quantitative and qualitative research via the collection of original data from the Children's Hospital of Orange County (CHOC) Online Family Advisory Panel, the CHOC Family Advisory Council, and people up to three degrees from my personal connections. The research provides insights about consumer behavior and choice and if the convenience of telehealth appointments is enough of a factor for consumers to switch from providers who do not offer this option.

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RESEARCH SHOWCASE

# BUSINESS

## SCHOOL OF BUSINESS

### A Comprehensive and Scientifically Valid Approach to Risk Management

Risk management pervades almost every aspect of our lives. From cyber risk to investing risk to managing risks for the next pandemic-- the methods being used today lack either comprehensiveness by not considering qualitative as well as quantifiable losses to objectives or scientific rigor by violating principles of scientific measurement. This presentation addresses both the need for, current limitations to, and an approach for comprehensive and scientifically valid risk management.

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RESEARCH SHOWCASE

# BUSINESS

## SCHOOL OF BUSINESS

### Democracy, Legal Systems, and Renewable Energy and Storage Technology Innovations

Compared to other types of technology innovations, green technology (GT) innovations produce additional public good benefits in the form of improved environmental quality enjoyed by all people in general. Yet, GT innovations tend to be undersupplied precisely because the firms inventing them are less likely to be rewarded for the enhanced environmental public goods produced by the use of these GT innovations. Hence, the institutional country context needs to be considered because it can greatly determine how firms can take advantage of the public good benefits produced by their GT innovations. We examine the impact of the political and judicial institutions on the production of renewable energy and storage technology innovations and breakthroughs in those same GT innovations with a total sample of 7,298 patents applied for between the years 1972 and 2006 across 48 countries, resulting in a total of 1,680 country-year observations. We find that civil law acts as a moderator weakening the positive effect democracy has on inducing renewable energy and storage technology innovations. It is essential for firms to understand how differences in the political and judicial systems across countries can be exploited to gain an advantage in developing GT innovations. Institutional differences can impact both sources of knowledge as well as R&D funding for firms developing GT innovations allowing them to develop technologies that produce public good benefits.

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RESEARCH SHOWCASE

# BUSINESS

## SCHOOL OF BUSINESS

### Understanding Employee Responses to COVID-19: A Behavioral Corporate Social Responsibility Perspective

The purpose of this study is to critically synthesize and integrate conceptual and empirical research on the behavioral perspective on corporate social responsibility (CSR) and explain why it is useful and necessary, especially in the wake of the COVID-19 pandemic. First, we explain why CSR can result in both positive and negative outcomes and provide future research directions and recommendations for practice and policymaking. Specifically, we argue that CSR policies in response to COVID-19 are created by organizations but are implemented by individual employees and that the way employees perceive and react to CSR actions are key determinants of CSR's implementation and success. Specifically, we explain how CSR can be embedded within or peripheral to a firm's core functioning. While embedded CSR is linked to several positive outcomes if correctly implemented together with employees, peripheral CSR is linked to "the dark side" of CSR and can result in negative employee outcomes. Second, we outline seven broad opportunities for future research regarding the numerous knowledge gaps and opportunities on the impact of COVID-19 on CSR across countries, business, industries and sectors. These future research opportunities are related to (1) Human Resources Management practices, (2) bridging the micro-macro divide, (3) measuring CSR's impact on stakeholders outside the firm, (4) effects of CSR programs in reaction to COVID-19, (5) indicators of employee resistance to CSR, (6) hybrid public-private collaborations, (7) social inclusiveness, inequity and vulnerable populations. Finally, regarding practical implications, we detail (1) the types of CSR actions that governments and organizations can implement and their relative effectiveness; (2) why "one size fits all" top-down CSR does not work; (3) how firms can use human resource management practices to re-engage employees through finding meaning in work; and (4) the "dark side" of CSR. Overall, we conclude that CSR research has focused mostly on why and when firms choose to engage in CSR. A behavioral perspective on CSR facilitates, through an employee-centric conceptual framework, a deeper understanding of when and why employee reactions lead to positive and unintended negative outcomes, especially during the COVID-19 pandemic.

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## SCHOOL OF BUSINESS

### Virtuality at Work: A Doubled-Edged Sword for Women's Career Equality?

Organizational scholarship on virtuality at work (i.e., work interactions where employees are not face-to-face and communicate at a distance using technology) and women's career equality are growing research streams; however, these research domains are not well-integrated. This is problematic, given rising inequality tensions for women and the growth in virtual work, both of which have recently been further accelerated by the work-from-home mandates during the COVID-19 pandemic. Research suggests that increased virtuality at work may simultaneously help and harm women's career equality, defined as women's equal access compared to men to career opportunities and equal experience of intrinsic and extrinsic work and nonwork outcomes. For example, working at home to a greater extent may increase women's work hours to enhance performance but make it more difficult to manage their work/family boundary. The literature lacks a comprehensive integrative review to promote understanding of these mixed effects; yet, such an understanding is critical to advancing women's career equality.

To address this research need, in our paper, we (1) integrate largely disconnected lines of research by conducting a systematic interdisciplinary review of 89 published empirical articles across different organizational disciplines and research domains that have examined the varied implications of virtuality at work for women's career equality; (2) apply the lens of person-environment fit and social role theories to synthesize the review results and develop an integrative conceptual model that shows the double-edged sword (i.e., helpful and harmful effects) of virtuality at work for women's career equality; and (3) identify a future agenda for research and practice on how to leverage the benefits for women while mitigating the negative effects.

Overall, our review findings and conceptual model show a "virtuality and gender paradox" where higher degrees of virtuality may help women by providing more opportunities to join, stay, and participate in the workplace, but simultaneously harm their long-term upward mobility into leadership roles by enhancing negative social processes (stereotyping and discrimination) that can attenuate the rewards women accrue from working virtually compared to men. Moreover, these effects of virtuality on women's career equality may vary based on characteristics of the workgroup, organization, occupation, and country in which work is performed. Given that women's career prospects lag significantly behind those of men, our review sheds important light on how virtuality as an increasingly common feature of contemporary work environments has significant implications for women's career equality.

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RESEARCH SHOWCASE

# BUSINESS

## SCHOOL OF BUSINESS

### A Latent-Factor Self-Exciting Process for Software Failures

Software debugging is the process of detecting and removing bugs during software development. Although modifications are usually done very carefully during development, it is not possible to rule out the introduction of new bugs when changes are made. We consider a self-exciting point process, which can incorporate the case of reliability deterioration due to the potential introduction of new bugs to the software during the development phase. In order to model this phenomenon, since the introduction of bugs is an unobservable process, latent variables are introduced to incorporate this characteristic into the models. The models are then applied to well know datasets in software reliability and discussions on the results are provided.

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RESEARCH SHOWCASE

# BUSINESS

## SCHOOL OF BUSINESS

### Can an Algorithm Decide Your Favorite Songs? Using Music Interviews to Amplify the Power of Human Creativity

Today, most music is digital, and nobody really has a unique physical collection that represents themselves musically. Ethan Diamond, the CEO of Bandcamp said “Everyone having everything looks a lot like everyone having nothing.” We have access to millions of songs and curated playlists, but what collection of songs and hidden gems truly make our collection unique from a curated playlist or an algorithm. And how does one explore and expand their palate.

To find these the hidden gems, unique songs, albums, and combinations of all. The project was formatted in an interview style podcast. To get the project started, interview questions were formed to help guests give unique answers. To book a guest, the process involved reconnecting with new and old connections from various backgrounds. Guests essentially booked themselves, first by listening to a podcast episode detailing why the podcast exists, and what it expects from them. They follow the link to a quiz, which they must pass in order to receive an invitation to book a spot on the podcast calendar. Once booked, interviews required the use a video conference app, recording software and then proceed with the interview itself. Postproduction included audio edits, host writing description of the guests, episode topics, and the guest’s unique playlists. Songs, albums and artists, mentioned were gathered and saved on a spreadsheet.

Once finished, upload to the podcast host and share via word of mouth and on social media. The algorithms and curated playlists from big music streaming platforms are powerful and great. But they don’t always allow the user to find unique albums and sounds because many playlists are built around popularity. Everyone’s background, interests, upbringing, circle of family and friends, all contribute to what music we enjoy and what we have preferences for. To get a unique and truly personalized sound and playlist, human interaction is still vital to finding the hidden gems, especially for music.

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David Halliday

RESEARCH SHOWCASE

# BUSINESS

## SCHOOL OF BUSINESS

### Studying the COVID-19 Impact on Firms: Text Mining of MD&As in SEC Filing Reports

The Management Discussion and Analysis (MD&A) section of an annual report describes the company's current financial performance, gives an outlook into their future plans, and provides information regarding the conditions of the external environment in terms of potential opportunities and/or risks. The MD&A is one of the required items of SEC Filing 10-K, which must be reported by all publicly traded companies annually. This study looks at 10-K reports filed both immediately before the onset of the novel Coronavirus disease (COVID-19) and after with an aim of finding how the MD&As have shifted as a result of the pandemic. Contemporary Natural Language Processing (NLP) methods and machine learning algorithms are employed to extract the MD&A section from numerous 10-K Filings, clean and pre-process the text, vectorize the cleaned text using Doc2Vec, etc., with the goal of finding similarities and differences among the reports written before and after the onset of the COVID-19 pandemic. The use of sentiment analysis and various unsupervised methods help to show how well firms are responding to the pandemic, what they have done to compete, how their future returns may be impacted, and how particular industries as a whole are affected. We anticipate that this ongoing research will add to recent research findings that have demonstrated the successful use of machine learning methods in detecting changes in reporting that may be predictive of firms' future actions and outcomes.

### Primary Presenter

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RESEARCH SHOWCASE

# BUSINESS

## SCHOOL OF BUSINESS

### Jewish Diaspora and Emerging Financial Centres in the Early Modern Period

This study aims to examine the shift of European financial capitals from South to North during the early modern period by examining the dynamics of the Jewish Diaspora after the Spanish inquisition. As England became the dominant financial centre in subsequent centuries, I seek to understand how Jewish migratory patterns impacted information flow, economic development, and the identity formation of the Anglo-Jewry. Moreover, the social dynamics which the Jews faced reflected the larger changing social dynamics of the time as the Reformation caused a shift in identity and ideology across Europe. I will compile data from financial records, parish documents, and individual accounts to analyze the network and pattern of the migration which took place during this period. The study implements social network analysis to reveal the degree of connectedness the Jewish community had across Europe. Furthermore, this technique will enable me to understand the impact the Jewish Diaspora had on financial innovation and progress.

### Primary Presenter

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RESEARCH SHOWCASE

# CANCER/ONCOLOGY

## INSTITUTE FOR BIOMEDICAL SCIENCES

### Designing an NK Cell-Based Therapy to Treat Solid Tumors

Adoptive cell therapy is the process of using a patient or donor's cells to treat disease. It has been very successful in treating liquid tumors, but a few challenges remain in the treatment of solid tumors. First, T cells must be autologous (from the patient), not allogeneic (from a donor), in order to avoid graft-versus-host disease. This requirement can be a problem for patients that are leukopenic as a result of their cancer and treatments. Second, solid tumor cell populations express a variety of antigens, unlike liquid tumor cell populations which usually express a single targetable antigen. Thus, solid tumor cells can undergo antigen escape and become resistant to T cell therapy. Third, solid tumors secrete soluble factors, especially TGFbeta, that decrease immune responsiveness. Finally, the extracellular matrix and tight cell-cell junctions of solid tumors pose a physical barrier to immune cell infiltration. We aimed to design an immunotherapy that overcomes all of these challenges. In order to overcome the first two, we used NK cells instead of T cells. Allogeneic NK cells are safe and show a graft-versus-tumor effect without causing graft-versus-host disease. NK cells can also target a wider variety of antigens than T cells, decreasing the likelihood of antigen escape. To address the third problem, we modified the NK cells to be resistant to TGFbeta and to secrete IL-15, a cytokine that maintains NK cell activation. Finally, we co-administered heparanase, an enzyme that degrades some components of the extracellular matrix, with the NK cells. We used flow cytometry, calcein-AM cytotoxicity assays, cocultures, and spheroid and transwell invasion assays to assess the efficacy of our treatment in vitro. We demonstrated that the modified NK cells were resistant to TGFbeta and able to completely eliminate two types of tumor cell lines in a 6-day coculture. We also demonstrated that these modifications did not alter the cells' expansion, phenotype, or viability. While our heparanase work is still underway, we demonstrated thus far that heparanase may increase NK cell invasion into tumor spheroids and through a Matrigel matrix, and that heparanase can be conjugated to a Prussian blue nanoparticles if needed to prolong its half-life and accumulation in tumors. In the next two years, we will wrap up our heparanase studies and begin testing this treatment method in vivo.

### Primary Presenter

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RESEARCH SHOWCASE

# CANCER/ONCOLOGY

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Occupational Exposures and Thyroid Cancer: A Systematic Review

**Objectives:** There are many studies that show various occupational and environmental exposures can disrupt thyroid function and hormones, but there is not a lot of data about occupational and environmental exposures and their associations with thyroid cancer. This review examines the epidemiological studies of occupational exposures and thyroid cancer incidence.

**Methods:** The published literature was searched using PubMed and Scopus databases for all articles through January 2021 that had in their text “occupational exposure” “worker” “occupation” “thyroid cancer” “papillary cancer” “follicular cancer” “medullary cancer” and “anaplastic cancer.” After excluding 50 studies, I summarized the findings of 8 articles that examined thyroid cancer incidence in relation to occupations or occupational exposure.

**Results:** Most of the associations between occupational exposures and thyroid cancer were observed for radiation exposed workers within health care occupations. There were associations observed in studies of pesticide exposed workers and within agricultural occupations, but findings for other exposures and occupation groups were weak. The majority of new studies had few exposed cases and assessed exposure based on occupation or industry category, employer report, self-report, or general job exposure matrices.

**Conclusion:** This review examined the epidemiological studies of occupations and occupational exposures and thyroid cancer incidence and concludes that additional studies are necessary to determine which occupational exposures and risk factors may cause the outcome of thyroid cancer. Further, the inconsistent findings for many of the occupational exposures that were reviewed and assessed suggest that more studies with larger numbers of cases and improved exposure assessments are necessary to examine the true association between occupational exposures and thyroid cancer.

### Primary Presenter

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RESEARCH SHOWCASE

# CANCER/ONCOLOGY

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### The Influence of Differential Methylation on Repetitive Element Expression in Ovarian Cancer Initiation and Progression

Ovarian cancer is currently the most lethal gynecologic malignancy. Worldwide, it is the 7th most common form of cancer and the 8th leading cause of cancer-related death in women, taking the lives of approximately 140,200 patients annually. Epithelial ovarian cancer—which accounts for over 90% of ovarian cancers—has a five-year survival rate for Stage 1 of 89%, a number that decreases to 41% and 20% for Stage III and Stage IV respectively. Despite the increasingly grim outlook of late-stage ovarian cancer, most ovarian cancers are detected at Stages III and IV due to the lack of early diagnostic methods and ambiguous disease presentation.

In recent years, repetitive elements (REs) have emerged as a potential early diagnostic marker for ovarian cancers. While expression of REs is largely silenced in normal cells via methylation, they are often transcribed in cancer, likely due to broad hypomethylation of cancer genomes. Although broad overexpression of REs has been observed in ovarian cancer, specific REs that are consistently upregulated in cancer progression have not been identified, nor have their impacts on disease progression been evaluated. These REs could serve as biomarkers for earlier cancer diagnosis. In addition, there has not been sufficient research analyzing differential RE expression and methylation in tandem to discern if hypomethylation truly causes RE expression during cancer initiation.

The aim of this study was to identify significantly upregulated or downregulated REs and their associated methylation profiles in a cancer progression model. Differential expression of REs was determined through RNAseq analysis and methylation profiles were determined using whole-genome bisulfite sequencing data. Our results indicate that RE expression increases in a cancer progression model as expected, corresponding with global hypomethylation. Furthermore, more than half of the differentially methylated regions (DMRs) in our model overlap with exons, indicating potential errant expression of protein coding genes. Further work is currently being done to determine the differential methylation of REs of interest.

### Primary Presenter

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RESEARCH SHOWCASE

# CANCER/ONCOLOGY

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Interstitial Photothermal Therapy as a Novel Approach to Treat Neuroblastoma

Current multi-faceted regimens to treat high-risk neuroblastoma have had limited success in improving the 50% long-term survival rate in patients, with relapse commonly observed. In this study, we propose a novel approach for nanoparticle-based photothermal therapy (PTT) to eradicate neuroblastoma. We have previously shown Prussian blue nanoparticle (PBNP)-based surface PTT (PBNP-S-PTT) effectively ablates the local tumor. When PBNP-S-PTT is applied with immunotherapies for a photothermal immunotherapy combination, these local antitumor effects were enhanced to generate systemic antitumor immune memory that prevented growth of tumor re-challenge and regressed untreated tumors. To improve the clinical relevance of the photothermal immunotherapy combination, we aimed to enhance the antitumor effects of PBNP-PTT by delivering the laser interstitially, with interstitial PTT (I-PTT) providing direct tumor access to maximize thermal treatment, similarly to the clinically available laser interstitial thermal therapy (LITT). Our preclinical approach comprises of interstitial illumination of intratumorally injected PBNPs to treat neuroblastoma tumors with PBNP-I-PTT, and comparing the therapeutic and immune effects with PBNP-S-PTT. Our findings indicate that PBNP-I-PTT can heat cells more efficiently, leading to a 2 to 3-fold reduction in cell viability while increasing 2-fold the expression of surface careticulin, which is one of the 3 markers we evaluate to determine immunogenic cell death. Intracellular expression of HMGB1 and ATP decreased similarly with PBNP-I-PTT and PBNP-S-PTT. In a preliminary animal study, the ablation of neuroblastoma with PBNP-I-PTT demonstrated complete tumor ablation using I-PTT diffuser, unlike I-PTT flat-cut for which 40% of mice developed tumor recurrence. On-going studies will assess the immune infiltration into the tumor post I-PTT treatment. These initial findings indicate that PBNP-I-PTT is an effective approach for local tumor ablation that can be applied in the photothermal immunotherapy combination to provide a novel approach for clinical treatment of neuroblastoma and other deep-seated tumors.

### Primary Presenter

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# CANCER/ONCOLOGY

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Impact of Advanced Clinical and Translational Research Educational Programs on Oncology Specialties and Career Development

#### Background:

The Clinical and Translational Science Award (CTSA) Program currently supports more than 50 leading medical research institutions in the United States with the aims of training, promoting and developing future translational science researchers, with particular emphasis on advanced Clinical and Translational Research (CTR) education. No prior studies have evaluated career development in oncologists who have completed CTR training. The objective of this study is to examine the impact of advanced CTR training on career development, return-on-investment and research productivity in Oncology specialties.

#### Methods:

With IRB approval, we conducted a survey study of U.S.-based Hematology/Oncology (H/O), Radiation Oncology (RO), and Surgical Oncology (SO) members of the American Society of Clinical Oncology who completed CTR training. Data was anonymized and collected through Research Electronic Data Capture (REDCap). Outcomes were compared using Chi-square test for frequency data.

#### Results:

We received 225 survey responses (62.1% H/O, 23.3% RO, 13.2% SO, 1.4% others). About 28.4% (n=64) of the respondents had a PhD or Master's degree in CTR (Group A) compared to 71.6% (n=161) with graduate certificates or non-degree granting courses in CTR (Group B). Specialty ratio was equally distributed between both groups. Overall, 79.7% vs 57.5%;  $P < 0.001$  of respondents worked in academia, of which 55.2% had tenure track positions. Over 49 different CTSA Programs throughout the U.S. were represented. In terms of impact with new research projects, the ability to secure funding and opportunities for multidisciplinary collaboration, satisfaction with CTR training was higher among Group A compared with Group B ( $P < 0.001$ ;  $P < 0.01$ ;  $P < 0.01$  respectively). In terms of research output, higher satisfaction was seen in Group A (67.2% vs 47.4%;  $P < 0.01$ ), however total publications per year were not statistically significant ( $P = 0.135$ ). Usefulness of a CTR degree on career advancement, a difference of 50.0% vs 19.1%;  $P < 0.001$  was noted. Similarly, usefulness regarding new job opportunities and return-on-investment also favored Group A ( $P < 0.001$ ). Overall satisfaction with training was significantly higher in Group A (73.4% vs 48.7%;  $P = 0.004$ ).

#### Conclusions:

This study is the first to report satisfaction ratings for CTR training among oncology specialties. Although no significant difference was observed in terms of publication output, those with higher levels of advanced degrees were more satisfied with their CTR training, and viewed it as more impactful to career advancement and research productivity. The evidence presented is useful for informing career development for oncology residents and fellows offered CTR degrees during their training.

### Primary Presenter

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RESEARCH SHOWCASE

# CANCER/ONCOLOGY

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### **p38 Isoform Signaling in Human Cutaneous Skin Melanoma: Insights from In Vitro Studies and Database Mining Analyses**

Skin cutaneous melanoma (SKCM) accounts for 75% of skin cancer deaths, with incidence rates continuing to rise alarmingly. Therapeutic strategies for advanced melanoma, such as targeted therapies and immunotherapies, are rapidly emerging, but drug resistance and toxicity remain challenges for many patients. Understanding the underlying molecular mechanisms in SKCM is key to identifying novel biomarkers critical for predicting treatment response and discovering new targeted therapy approaches. The p38 protein kinases coordinate adaptive cellular responses to extracellular stimuli and modulate important processes dysregulated in tumorigenesis, such as proliferation, differentiation and survival. Although p38 signaling is of potential importance in melanoma, the isoform-specific functions of the p38s in SKCM are largely unelucidated. We examined the effects of pharmacologic and RNAi-mediated inhibition of p38 isoforms in human melanoma cell lines A375 and WM164 using colony formation assay. We report that p38alpha/p38beta inhibition with SB203580, pan-p38 inhibition with Compound 62, or a simultaneous knockdown of both p38alpha and p38delta enhanced colony formation ability in both cell lines, highlighting both specific and redundant roles for p38 isoforms in negative regulation of human melanoma cell survival. We also analyzed the gene expression, prognostic value, and clinical correlations of the p38 isoforms in The Cancer Genome Atlas SKCM sample datasets, utilizing bioinformatic tools such as GEPIA, LinkedOmics, TIMER, and GSCALite. We report that p38gamma expression was upregulated, while p38delta was downregulated in SKCM. In addition, a low level of p38delta correlated with worse disease-free survival. These findings support a novel tumor-promoting role for p38gamma and confirm a tumor-suppressing role for p38delta. Furthermore, higher p38delta was correlated with increased immune cell infiltration, including CD8+ T cells and dendritic cells, and increased T cell exhaustion, suggesting that targeting p38delta in the SKCM tumor microenvironment may stimulate antitumor immunity. Our study highlights the potential paths for translational research efforts.

### **Primary Presenter**

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RESEARCH SHOWCASE

# CARDIOLOGY/CARDIO VASCULAR RESEARCH

## INSTITUTE FOR BIOMEDICAL SCIENCES

### Sexually Dimorphic Effects on Cardiac Electrophysiology

Historically, cardio-toxicological assessment and safety testing has been performed using male animal models and human subjects. As such, it remains unclear how sex differences impact both underlying cardiovascular physiology and responsiveness to external perturbations. Exogenous estrogenic chemicals, such as bisphenol A (BPA), are commonly employed in the manufacturing of consumer and medical-grade plastic products. The latter can result in significant BPA exposure to cardiac surgery patients. Considering its endocrine disrupting properties, BPA may exacerbate intrinsic sex differences in cardiac electrophysiology. This study aimed to examine inherent sexual dimorphisms in cardiac electrophysiology and cardiac response to estrogenic compounds.

Electrophysiology and EKG parameters were recorded from Langendorff-perfused whole rat heart preparations at baseline and after acute exposure to estrogenic compounds.

At baseline, female hearts displayed faster atrioventricular conduction compared to male hearts (PR duration: 37.4 ms male, 32.6 ms female,  $p=0.0083$ ). No significant difference was observed in baseline AV refractoriness between sexes (AVNERP: 71.7 ms male, 72.6 ms female). BPA exposure resulted in slowing of atrioventricular conduction in both sexes (PR duration: 39.8% male,  $p<0.0001$ ; 33.1% female,  $p=0.0007$ ) (AVNERP: 36.1% male,  $p<0.0001$ ; 20.7% female,  $p=0.0021$ ), although no difference was observed between sexes. Finally, optical mapping revealed slowed intracellular calcium handling in excised heart preparations (130.5 ms control, 144.1 ms BPA-treated,  $p<0.0001$  (220 ms PCL)). These findings closely align with our recent whole-cell voltage clamp recordings, which showed an immediate inhibitory effect of BPA on the L-type calcium channel current ( $IC_{50} = 30.8 \mu M$ ).

Using an ex vivo model, we identified inherent sex-specific differences in cardiac electrophysiology. Contrary to existing literature, the effects of BPA on cardiac electrophysiology were not sex-specific and are likely mediated by direct effects on the L-type calcium channel current. Future work includes the use of in vivo models to validate these observations.

### Primary Presenter

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RESEARCH SHOWCASE

# CARDIOLOGY/CARDIO VASCULAR RESEARCH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### A Case of COVID Myocarditis Without Pulmonary Disease

Myocarditis is an inflammatory disease of cardiac muscle that can be caused by both noninfectious and infectious agents, including COVID-19. Patients with COVID-19 commonly present with signs of myocardial injury, particularly troponin elevation. A recent study reported that 12% of COVID-19 patients had associated acute cardiac injury, the majority being in those with pre-existing heart disease and patients >50 years old.

A 22-year-old man with recent diagnosis of COVID-19 after developing shortness of breath was admitted to our hospital on day 5 of symptoms with acute worsening of dyspnea and chest pain. On admission, he was tachycardic to the 120s, febrile to 38.6°C and hypotensive with systolic pressures in the 80s. On exam he was ill-appearing and confused. His initial labs were significant for white blood cells 22 K/uL, troponin 2.9 ng/mL, and rising lactate to 14 mmol/L. Echocardiogram demonstrated severe biventricular failure with ejection fraction(EF) of 20-25%. He had rapidly increased pressor requirements despite IV fluids, was urgently intubated and cannulated for extracorporeal membrane oxygenation(ECMO) and Impella in the ICU. In addition, he received high-dose methylprednisolone for his myocarditis. Workup for other causes, including toxic and infectious etiologies was negative. His condition improved and his Impella and ECMO were removed by day 12, and then extubated. His repeat echocardiogram on day 19 showed return to normal ventricular function. His COVID test returned negative on day 22 and he was subsequently discharged.

Here we present a young patient with no medical history who developed myocarditis and heart failure secondary to COVID-19. He was treated for clinically suspected myocarditis with methylprednisolone and improved. Remarkably he did not appear to have severe lung disease and never required supplemental oxygenation. Upon review of the literature, only one other patient of this age group has been reported with COVID myocarditis, a 21-year-old South Korean woman. Her clinical course was not reported. In a study that predated COVID-19, 26.6% of patients admitted with suspected acute myocarditis had either an EF <50 percent, sustained ventricular arrhythmias, or a low cardiac output syndrome. Patients who presented with these complications had worse long-term outcomes. COVID-19 myocarditis is an important presentation that is rarely found in young patients.

### Primary Presenter

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RESEARCH SHOWCASE

# CARDIOLOGY/CARDIO VASCULAR RESEARCH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Staph, Don't Go Breaking my Heart

#### Introduction

Bacterial infections of the pericardial space are an uncommon cause of pericardial effusions. The reported incidence of this is <1% of all cases of pericarditis. Infection can rapidly increase pericardial fluid volume and pressures leading to tamponade. Bacterial pericarditis usually occurs as a secondary infection by contiguous spread from a surrounding intrathoracic focus of infection or by hematogenous spread from a distant source. Dialysis, thoracic surgery, chemotherapy, immunocompromise, and AIDS are risk factors for purulent pericarditis.

#### Case Presentation

A 71 year old man with a past medical history of end-stage renal disease on hemodialysis, hyperlipidemia, and diabetes mellitus presented with 5 days of weakness, dry cough, and dyspnea after missing multiple dialysis sessions. Vital signs stable and his exam was notable only for trace edema. Notable labs included troponin level of 3.21 ng/ml, BNP 23,600 pg/mL, creatinine level 15.6 mg/dL, BUN 118 mg/dL and potassium level of 6.8 mEq/L. EKG: ST elevations in inferior-lateral leads and ST depressions in V1 and aVR leading to an emergent cardiac catheterization, which revealed no abnormalities. An echocardiogram showed a moderate-sized pericardial effusion with no signs of tamponade or chamber collapse. Despite urgent dialysis, serial echocardiograms showed an increase pericardial effusion with a fibrous layer. Given the evidence of hemodynamic compromise with hypotension and tachycardia, the patient underwent pericardiocentesis with aspiration of 510 mL of fluid. Analysis of the fluid revealed 46,060 white blood cells, 98% neutrophils, and intracytoplasmic bacteria. Cultures grew pan-sensitive *Staphylococcus aureus*. The patient was started on Cefazolin with dialysis for four weeks. His blood cultures both peripherally and from his AV fistula were negative. After treatment course and ongoing dialysis, his follow-up echocardiogram revealed no further effusion.

#### Discussion

We describe a rare presentation of purulent pericarditis in a patient with dialysis and uremia. Almost all reported patients with purulent pericarditis have fever, which this patient never developed. Only 50% of patients develop the classic signs of acute pericarditis, with 25-37% having chest pain like this patient. No source of bacterial seeding was found in this patient, making it either a primary bacterial pericarditis. Mortality in patients who are treated for purulent pericarditis is estimated to be 40%, while it is 100% for those who are untreated. It is important to consider infectious pericarditis in new pericardial effusions due to the rapid progression of the disease and high mortality rate

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RESEARCH SHOWCASE

# CARDIOLOGY/CARDIO VASCULAR RESEARCH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Brugada Pattern in an Afebrile Patient with Acute COVID-19 Infection

COVID-19 has been associated with significant risk for cardiac arrhythmias particularly in patients with underlying cardiac conditions or prior histories of arrhythmia. It has been shown that a Brugada pattern can be unmasked in febrile patients with COVID-19.

Severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) has shown to incite numerous multi-systemic syndromes since it was first reported in Wuhan, China in late 2019.<sup>1</sup> Most notably, coronavirus disease 2019 (COVID-19) displays a predilection for the respiratory system and can precipitate acute respiratory distress syndrome (ARDS) in severe cases. Given the virus's high degree of transmissibility and the potential for poor outcomes, it has proven to be a serious public health threat and was deemed a global pandemic by the World Health Organization (WHO) in March 2020. While the pulmonary manifestations are the most characteristic and well described of the organ systems, COVID-19 can also trigger various cardiovascular pathologies, including acute coronary syndromes, myocarditis, arrhythmias, heart failure, and certain vasculitides. COVID-19 carries arrhythmogenic properties which can unmask or exacerbate cardiac arrhythmias and channelopathies such as Long QT syndrome, Short QT syndrome, and Brugada Syndrome (BrS). Here we report a case of Brugada ECG pattern during an acute COVID-19 infection in a patient previously without any identifiable risk factors.

A 44-year-old Hispanic man with no significant medical history presented with generalized fatigue, headaches, productive cough of whitish to yellow sputum, myalgias, abdominal pain and non-bloody diarrhea with fevers (T.max of 102.6°F) for six days prior to admission and worsening shortness of breath for two days. He reported getting a COVID-19 test one week prior to admission at an urgent care center which was positive. The electrocardiogram (ECG) showed a brugada-type 1 pattern "coved" ST-segment elevation that concaves down with inverted T waves in V1-V2 leads with no reciprocal changes. managed conservatively with antipyretic (Tylenol) and benzonatate for symptomatic relief and was discharged after 48 hours of monitoring.

BrS is often elicited from various inciting stressors, such as fever, alcohol, and certain medications, including those commonly used in critical care scenarios. Fever is a particularly well described variable in the etiology and prognosis of BrS, with higher temperatures increasing the risk for cardiac arrest in BrS. The severe inflammatory response seen with COVID-19 can lead to fever-induced arrhythmias and, to some extent, dictate the prognostic outcomes. Health care providers should be aware of this phenomenon, prioritize treatment of fever and avoid exacerbating factors.

### Primary Presenter

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RESEARCH SHOWCASE

# CARDIOLOGY/CARDIO VASCULAR RESEARCH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Pediatric Transfusion-Associated Hyperkalemic Cardiac Arrest

Background: Red blood cell (RBC) transfusions are a life-saving intervention, with nearly 14 million RBC units transfused in the United States each year. However, the safety and efficacy of this procedure can be influenced by variations in the collection, processing, and administration of RBCs.

Specifically, procedures or manipulations that increase potassium (K<sup>+</sup>) levels in stored blood products can predispose patients to hyperkalemia and transfusion-associated hyperkalemic cardiac arrest (TAHCA).

Study design: We aimed to review the literature on the incidence of transfusion-associated hyperkalemia, highlight the association with TAHCA, and identify potential mitigation strategies to reduce the risk of TAHCA in pediatric patients.

Results: We identified 21 case reports and case series documenting TAHCA in pediatric patients. Hyperkalemia and cardiac arrhythmias were reported in pediatric patients when blood products were transfused quickly, blood products were delivered directly to the heart without time for electrolyte equilibration, or when blood products accumulated extracellular K<sup>+</sup> due to storage time or irradiation. We note that hyperkalemia and/or TAHCA may be underreported due to incomplete hemovigilance reporting. Collectively, these reports suggest that the risk of hyperkalemia may be mitigated by using fresh blood products, reducing storage time after blood product irradiation, and implementing manipulations that wash or remove excess extracellular K<sup>+</sup>.

Discussion: Advances in blood banking have improved the availability and quality of RBCs, yet, vulnerable patient populations are sensitive to transfusion-associated hyperkalemia. Mitigation strategies may help to reduce the risk of TAHCA, which is associated with an increased mortality rate following rapid blood transfusions.

### Primary Presenter

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RESEARCH SHOWCASE

# CARDIOLOGY/CARDIO VASCULAR RESEARCH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Risk Factors for Myocarditis and Dilated Cardiomyopathy in Children Presenting to the Emergency Department

**Background:** Myocarditis and dilated cardiomyopathy (M/DCM) are rare but important causes of morbidity and mortality in pediatric patients. Specifically, myocarditis is the most common cause of heart failure in children, and mortality ranges from 6-24%. DCM has significant overlap with myocarditis, with many patients presenting with myocarditis progressing to DCM. Diagnosis of these diseases is challenging because of the heterogeneity of presenting symptoms, but failure to diagnose can be fatal.

**Objective:** To compare clinical findings in patients with M/DCM to age- and chief-complaint-matched controls.

**Methods:** Retrospective case-control study of patients  $\leq 21$  years-old presenting to the emergency department of a quaternary care children's hospital between 2010 and 2019. Cases were identified using ICD 9/10 codes and were confirmed by medical record review. Patients with previously diagnosed heart disease or presenting with fulminant disease were excluded. Controls were identified in a 3:1 ratio to cases by random selection of patients matched on age and chief complaint category (respiratory, cardiac, GI, or fever). Medical history, physical exam, and diagnostic testing variables were identified from the medical record and compared using odds ratios with 95% confidence intervals.

**Results:** Between 2010-2019, we identified 47 eligible cases of M/DCM and 147 matched controls. Median age was 15.3 years (IQR: 6.2-17.0 years) with a bimodal distribution of 64%  $\geq 12$  years and 21%  $\leq 2$  years. Chest pain was the most common chief complaint in older children whereas respiratory symptoms were common in younger children. Table 1 depicts the findings associated with M/DVM in bivariable analyses. Cases were more likely to report vomiting or decreased appetite, and less likely to report cough or congestion. On physical exam, cases were much more likely to be tachycardic or tachypneic. Cases were also more likely to have an abnormal ECG. Labs were infrequently obtained in controls and thus were unable to be analyzed.

**Discussion:** The results of this case-control study are largely consistent with previous descriptive studies that were performed without controls. Key findings on history, physical exam, and diagnostic testing are strongly associated with the diagnosis of myocarditis/DCM. Multivariable analyses are ongoing and will provide the strength of independent association with each variable. Future multi-centered studies are needed to confirm these findings with the final goal to create a clinical prediction rule.

### Primary Presenter

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RESEARCH SHOWCASE

# CARDIOLOGY/CARDIO VASCULAR RESEARCH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Reproducibility of RNA-Seq Methods in Evaluating Blood RNA Biomarkers of Coronary Artery Disease

Cardiovascular disease remains the major cause of death in developed countries, with atherosclerosis leading to approximately 650,000 myocardial infarctions (MI) each year in the United States. While the current diagnostic gold standard for coronary artery disease (CAD) is coronary angiography via cardiac catheterization, less invasive blood tests identifying a regulatory T cell (Treg) imbalance have shown impressive sensitivity and specificity for CAD. Whole blood RNA analyses via single-molecule next-generation sequencing (NGS) of RNA (RNAseq) have identified transcripts associated with CAD (TRACs) that illustrate an mRNA signature of a Treg-like defect in CAD patients. Results have been variable, however, based on the specific single molecule sequencer product employed. The prospect of an accurate and reliable blood test to predict the development of atherosclerosis excites many and would fundamentally alter the diagnostic landscape for CAD. The objective of the project was to determine the degree of reproducibility among the primary techniques previously used to identify and quantify the Treg imbalance underlying atherosclerosis. Specifically, the single molecule sequencer from SeqLL and that from Illumina have been utilized previously and reflect some heterogeneity in their results. This knowledge would enable investigators to discern superior techniques and ultimately empower clinicians and to make use of the most reliable methods. Whole blood RNA was analyzed by single-molecule next-generation sequencing (NGS) of RNA (RNA-Seq) to identify TRACs in a discovery group and a validation group presenting for coronary catheterization. Whole blood RNA was depleted of ribosomal RNA (rRNA) and then sequenced on a SeqLL Single Molecule Sequencer. The resulting short reads were aligned to the human transcriptome and the number of reads per kilobase of exon per million (RPKM) was determined and compared between groups by a combined fold-change/p-value filter. This model was replicated in an additional study, and an identical design was undertaken using a sequencer from Illumina, and transcript reads were analyzed by sequencer product. Sequencing identified a profile of Treg imbalance in patients with even mild coronary stenosis (>20%) as confirmed on coronary angiography. The SeqLL platform identified a subset of 39 transcripts highly-associated with CAD that were replicated in a follow-up study ( $p < 0.001$ ), while the Illumina follow-up study displayed minimal meaningful overlap with its initial findings. The SeqLL sequencing platform of amplification-free, single molecule sequencing seems to be more reproducible than the amplification-dependent Illumina NextSeq. Future investigations will be directed toward establishing a clinically relevant amplification-free method of quantifying RNA in patient blood.

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RESEARCH SHOWCASE

# CARDIOLOGY/CARDIO VASCULAR RESEARCH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Outcomes of Risk-Adjusted Decision Making: Using the Hybrid Strategy in Neonates with Ductal-Dependent Systemic Circulation and Multiple Risk Factors

**Objective:** The Norwood operation is the first stage of the classic operative pathway used to treat neonates with hypoplastic left heart syndrome (HLHS) or its variants and is currently the standard of care. The hybrid strategy consisting of bilateral pulmonary artery banding (BPAB) with or without ductal stenting has been shown as an alternative to treat patients with ductal-dependent systemic circulation. We sought to evaluate the outcomes of the initial hybrid strategy for neonates with HLHS or its variants and multiple risk factors since its implementation at our center.

**Methods:** Single-center, 3-year retrospective review of neonates who underwent hybrid stage I operation since its implementation as a palliative surgical strategy at Children's National Hospital. All patients with a diagnosis of HLHS or its variants who underwent BPAB between December 2017 and January 2021 were included. Presence and number of preoperative risk factors, and mortality were assessed.

**Results:** 29 neonates met inclusion criteria; median (range) age and body weight at hybrid stage I were 3 days (0-43) and 2.9kg (1.1-4.2), respectively. Nineteen patients (66%) received full hybrid palliation with ductal stenting. Median number of preoperative risk factors per patient was 6 (1-9). Inotropic support was required in 23 patients (79%) and intubation was required in 20 (70%). Twenty patients had aortic atresia (69%). Extracardiac anomalies or organ disease were noted in 20 patients (69%). Median maximum preoperative lactate was 5.0 (1.3-19.8). Operative mortality for hybrid stage I was 3% (1/29). There was 90% survival after delayed Norwood operation (9/10); one patient died following completion of bidirectional Glenn operation in this group. Two patients in the cohort received orthotopic heart transplantation and three patients received a biventricular repair with 100% survival. Overall survival in the cohort was 72% (21/29) at a median (range) follow-up time of 9 months (0-37). Survival after hybrid stage I, stage II, and Fontan completion was 97% (28/29), 83% (10/12), and 100% (1/1), respectively. Seven patients are awaiting a stage II operation and seven are awaiting Fontan completion.

**Conclusions:** High-risk neonates with ductal-dependent systemic circulation can be successfully palliated using a hybrid strategy, and risk-adjusted decision making can be applied to bridge these patients to either a delayed Norwood or CSII operation. Outcomes at our center show that this approach promises to be an alternative operative pathway for neonates with HLHS or its variants and multiple preoperative risk factors.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Implementation of Telemedicine in a Pediatric Preoperative Anesthesia Clinic During COVID-19: Evaluating Patient Satisfaction

The COVID-19 pandemic has presented an unprecedented challenge in delivering healthcare to patients around the world. Telemedicine was adopted as a way to deliver healthcare during this pandemic while reducing staff exposure to potentially ill patients, preserving PPE, and minimizing the crowding of patients in waiting rooms. Our institution's pediatric Anesthesiology Preoperative Care Clinic (POCC) was presented with the opportunity to implement telehealth in order to assess patients' risks prior to surgery. This is the first examination of patient satisfaction of telemedicine use in POCC since the start of the COVID-19 pandemic. This study explores patient satisfaction with video-based telemedicine visits utilizing telemedicine satisfaction survey in pediatric patients and their guardians presenting to an anesthesiology preoperative clinic. Between September 1, 2020 and December 15, 2020, a total of 325 patients received clinic-based preoperative consultations, of which 204 encounters were conducted using a video-based telemedicine platform. Survey responses were obtained from 101 of the 204 encounters. The majority of participants (>93%) either agreed or strongly agreed with statements regarding the benefits of the preoperative visit, concerns being addressed, clarity of the video, ability to talk easily and understand recommendations, maintenance of patient privacy, saving traveling time, overall satisfaction with the visit and participating in telemedicine again. Fewer participants (84% agree or strongly agree) felt the technology was easy to use. The lowest mean score was with effectiveness of a telemedicine visits being as good as an in-person visit (4.2), still a clear majority had positive responses with 84% who agreed or strongly agreed the telemedicine visit was as effective as an in-person visit. The utilization of telehealth in Anesthesiology POCC has allowed healthcare practices to mitigate spread of COVID-19 in addition to other illnesses while also preserving PPE. While only a limited physical exam can be ascertained from a telehealth visit, anesthesiologists in preoperative clinic are otherwise able to obtain a comprehensive history over protected video-based visits. Specifically, in a pediatric preoperative clinic setting, patients and guardians had positive experiences with telemedicine visits. Most respondents agreed that telemedicine visits were as effective as in-person visits. However, follow-up with participants regarding limitations of virtual visits and potential difficulties with technology use could lead to further improvements with telehealth visits. Moving forward, given the positive feedback regarding this study, telemedicine can continue to be an effective tool to provide increased healthcare access.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### The Tale of Small Fiber Neuropathy, POTS, and Knuckle Hyperpigmentation- Is COVID-19 the Culprit?

A 47-year-old woman diagnosed with Postural Orthostatic Tachycardia Syndrome (POTS) in her twenties presented to the primary care clinic in June 2020 with multiple complaints. She reported episodes of facial swelling, palpitation, dizziness, brain fog, cold sensation, heaviness in the feet, and diffuse deep bone pain. A few weeks later, she developed hypoglycemic episodes, diarrhea, and seventeen-pound loss over five months. On physical exam, she had macular violaceous erythema without edema at the dorsal aspect of the metacarpophalangeal and distal interphalangeal joints (Gottron Sign). Vital signs were remarkable for a heart rate of 150 upon standing, 130 when sitting, 70 when lying down, and hypotension. Neurological examination was normal. Over seven months, she had extensive laboratory workup completed at various centers. She tested negative for SARS-CoV-2. Epidermal nerve fiber biopsy showed significantly reduced epidermal nerve fiber density consistent with small fiber neuropathy. She received antihistamine, volume expansion with hydration, salt tablets, midodrine, fludrocortisone and pulse steroid therapy, which significantly improved her symptoms while awaiting intravenous immunoglobulin. POTS is an elevation in the heart rate upon standing with manifestations of orthostatic intolerance such as dizziness and palpitation. Multiple syndromes are associated with POTS, including Small Fiber Neuropathy (SFN). SFN presents with both dysautonomia and neuropathic pain.

Our patient was diagnosed with an episode of POTS during her twenties, associated with only tachycardia and orthostatic hypotension. The recent recurrence of the POTS-related symptoms, along with the presence of other systemic manifestations, warranted an investigation for additional explanations. Early diagnosis and recognition of SFN and the association with POTS could have led to a more focused and cost-effective evaluation. Thus, increasing awareness among internal medicine physicians about SFN and POTS is crucial, especially since a subset of patients with COVID-19 may present with autonomic nervous system problems, including POTS after diagnosis. While our patient tested negative for SARS-CoV-2, it does not exclude prior infection. Since post-COVID syndrome remains a diagnosis of exclusion, she will need continued follow-up for potential paraneoplastic syndromes and autoimmune disorders that could be associated with her constellation of neurologic and dermatologic manifestations.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Don't Let the Monitor Fool You: Pulse Check Variation between Shockable and Non-Shockable Rhythms

#### Introduction

Out of hospital cardiac arrest (OHCA) is the leading cause of global mortality (1). Increasing chest compression fraction improves survival (2). Current American Heart Association (AHA) guidelines recommend maintaining pulse check times to less than 10 seconds in order to increase the compression fraction (3). To our knowledge, no study has addressed whether pulse check times vary based on the presenting rhythm. Therefore, we aimed to determine if there was a difference in pulse check times between OHCA patients presenting with shockable vs non-shockable rhythms.

#### Methods

This was a prospective, observational study at an urban academic hospital. Three resuscitation bays were continuously videotaped to capture resuscitations of OHCA patients. Each OHCA resuscitation was analyzed by two independent observers for standardized metrics as well as the presenting cardiac rhythm. A total of 97 patient videos were collected between 2017 and 2019. Of those, 25 presented with a shockable rhythm (22 with ventricular fibrillation, 3 with ventricular tachycardia). We examined the relationship between shockable vs. non-shockable prehospital rhythms and the duration of the first pulse check. We used a t-test to examine the association between the two cohorts.

#### Results

Results indicate that the mean first pulse check length is 27% greater (11 vs 14 seconds) in the shockable group, compared to the non-shockable group ( $p < 0.10$ ).

#### Conclusion

In this prospective, observational study, there was a statistically significant difference in the length of the first pulse check between shockable and non-shockable rhythms. Possible underlying causes may include provider hesitancy to resume compressions with an organized rhythm, self doubt as to palpation of a pulse with an organized rhythm, or not resuming compressions as the defibrillator charges for a shock. Our study serves as an important reminder to keep pulse checks less than 10 seconds no matter the rhythm. Further studies are needed to analyze the reason behind longer pulse checks with shockable rhythms and to troubleshoot the root cause of these delays.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Staving Off Intubation: Characteristics of Outcomes in Early Versus Delayed Intubation in COVID-19

**Intro:** Early in the COVID-19 pandemic, hypoxic patients were immediately intubated for fear of decompensation and aerosolizing the virus with non-invasive ventilation (NIV). Reports revealed a high mortality for intubated patients, prompting NIV such as high flow nasal cannula (HFNC) or noninvasive positive pressure ventilation (NIPPV). The literature lacks description of the outcomes between patients who were intubated immediately versus only after failing NIV. We describe the characteristics of patients who were intubated “early,” defined as being intubated without NIV attempts, versus “delayed”, defined as intubated after failed initial NIV use.

**Methods:** A prospective registry was created of all COVID-19 patients admitted to our urban academic medical center from March 2020 to July 2020. We analyzed this database to investigate escalation of respiratory support. Variables of interest included intubation, use of HFNC, NIPPV, and mortality. Logistic regression explored associations with mortality.

**Results:** A total of 109 patients were initiated on NIV. 102 began on HFNC and 7 on NIPPV. A total of 47 patients were intubated early. Of those started on HFNC, 24 (23.5%) were escalated directly to intubation. 23 (22.5%) received NIPPV, of which 16 (69.6%) required intubation. Of those started on NIPPV initially, 5 required intubation and 2 were downgraded to HFNC. Comparing early versus delayed intubation, the odds ratio for surviving intubation, adjusted for age and BMI, with a trial of NIV prior to intubation was 0.057 (0.002 – 0.562). For NIPPV, 94.4% (17 of 18) of patients intubated “delayed” died, while 69.2% (27 of 39) patients intubated “early” died. Unadjusted odds ratio for surviving intubation when having HFNC prior to intubation was 0.289 (0.081-0.923), but lost statistical significance when adjusted for age and BMI. 64 patients (58.7%) who were started on NIV were never intubated during admission.

**Conclusions:** This study suggests that NIV may be useful modalities in the treatment of hypoxemia secondary to COVID-19 to prevent intubation, however the likelihood of survival decreases in those who fail NIV. Delayed intubations are associated with mortality when adjusted for age and BMI. Further research is needed to investigate who may benefit most from NIV as a supportive measure to prevent intubation.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Do COVID-19 Patients Who Receive High-Flow Nasal Cannula Have More Comorbidities and Worse Outcomes?

**Introduction/Hypothesis:** High-flow nasal cannula oxygen therapy (HFNC) has gained attention as an alternative respiratory support for critically ill COVID-19 patients, however, the evidence behind HFNC has been unbalanced as it covers various comorbidities in hypoxic and hypercapnic respiratory failure. We sought to identify what group of patients needed HFNC and to assess whether its use impacted length of stay and survival.

**Methods:** A retrospective cohort study was performed at a single center urban academic center. Data collected included age, gender, BMI, medical comorbidities, length of hospital stay and mortality for all patients hospitalized with COVID-19. We compared the characteristics of the patients who received HFNC at any point during their hospitalization to all patients hospitalized with COVID-19.

**Results:** The total number of COVID-19 patients was 363. HFNC was used in 115 admitted patients, of which, 74 were in the ICU with a mean length of stay of 7 days. Overall this group had an average hospital length of stay of 15 days in total as opposed to 10.2 days in non-HFNC utilizers. The most common comorbidities seen in the cohort were hypertension (76.4%), diabetes mellitus (37.4%), asthma (14.6%), COPD (11.24%), and obstructive sleep apnea (4.5%). In patients who received HFNC, 41.2% survived compared to 71.8% of all COVID-19 patients.

**Conclusions:** Factors determining the outcome of patients using HFNC are not well understood. Our patients who received HFNC were more likely to have underlying cardiopulmonary disease than non-HFNC utilizers. Furthermore, they had a longer length of stay and a higher mortality rate in comparison to all COVID-19 patients. While we specifically identified patients who received HFNC, some of these patients received other forms of supplemental oxygen therapy during their hospital stay which may confound the characteristics of this group. It is also possible that patients receiving HFNC were sicker in general, which may explain their disparity in mortality and hospital stay duration. Further research needs to be done in order to clarify if HFNC in COVID-19 patients, particularly those with cardiopulmonary comorbidities, is beneficial in delaying escalation of oxygen therapy and potentially prolonging survival.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Thrombectomy and Anticoagulation in Treatment of Lemierre Syndrome

**Case:** A 55 year old woman with no medical history presented after two weeks of sore throat, fever, fatigue, and night sweats. Notably, she had delayed seeking care due to fear of contracting COVID-19. Physical exam showed a dehydrated woman with throat pain and submandibular lymphadenopathy in no acute distress. Lab work was notable for leukocytosis to 33.1, electrolyte disturbances, acute kidney injury, and markedly abnormal liver function tests. A CT of the soft tissues of the neck revealed a C1-C2 prevertebral abscess measuring 3 x 1.5 cm, enlargement of the right tonsil, and thrombosis of bilateral internal jugular (IJ) veins. Blood cultures grew pan-sensitive *Streptococcus intermedius*. She was started on IV ampicillin/sulbactam and a heparin drip. However, she subsequently clinically deteriorated requiring intubation. A repeat CT showed the abscess had grown to 5.1 cm, concern for cervical spine osteomyelitis, and noted an occlusive thrombus of the right IJ as well as pulmonary septic emboli. Interventional radiology performed a right IJ thrombectomy after which the patient was extubated without complications. She was continued on IV ampicillin/sulbactam and metronidazole for a total of six weeks out of concern for osteomyelitis. She was transitioned from heparin to therapeutic enoxaparin and ultimately to apixaban to complete three months of anticoagulation.

**Impact/Discussion:** Awareness of Lemierre Syndrome (LS), a septicemia secondary to thrombophlebitis of the tonsillar and peritonsillar veins related to tonsillar/peritonsillar abscess, has been rising in recent decades. *Fusobacterium necrophorum* is the most commonly identified bacterial pathogen in the syndrome. Antibiotic therapy is the mainstay of treatment, focused on anaerobic coverage. Although LS is frequently characterized by thrombophlebitis and septic emboli, the role of anticoagulation remains controversial. Likewise, surgical or endovascular intervention is rare and limited to cases refractory to antibiotic therapy. There are currently no randomized controlled trials or adequately powered studies on the role of long-term anticoagulation in treatment. This case presents an instance of LS initially refractory to empiric antibiotics despite appropriate coverage in which the patient improved after thrombectomy and was continued on long-term anticoagulation.

**Conclusion:** Thrombectomy and anticoagulation should be considered in cases of Lemierre Syndrome refractory to antibiotics. Further research is needed to define the role of these therapies in treatment of LS. The recent rise in cases may be due to increasing antibiotic stewardship and exacerbated by the COVID pandemic as patients delay seeking care.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### The Growth of Palliative Practice and End of Life Care in an Academic Teaching Intensive Care Unit

Background: Dying in the ICU has changed over the last twenty years due to increased utilization of palliative care.

Research Question: To examine how palliative care integration (PM) into critical care medicine has changed outcomes in end of life including the utilization of do not resuscitate and comfort care orders.

Study Design and Methods: Retrospective observational review of critical care patients who died during admission between two decades, 2008-09 and 2018-19, in a single urban tertiary care academic medical center in Washington, D.C. We sought to measure PM involvement across the two decades and its association with end of life care including do not resuscitate (DNR) and comfort care orders.

Results: 571 cases were available for analysis. Mean age was  $65 \pm 15$ , 46% were female. In univariate analysis significantly more patients received PM in 2018-19 (40% vs 27%,  $p=.002$ ). DNR status increased significantly over time (74% to 84%,  $p=.002$ ) and was significantly more common in patients who were receiving PM (96% vs 72%,  $p<.0001$ ). Comfort care also increased over time (56% to 70%,  $p=.0008$ ), and was more common in PM patients (87% vs 53%,  $p<.0001$ ). The incidence of death in the ICU decreased significantly over time (94% to 86%,  $p=.002$ ) and was significantly lower in PM patients (76% vs 96%,  $p<.0001$ ). In multivariable analysis, the adjusted odds of getting comfort care for those receiving vs those not receiving PM were 14.51 (5.49-38.36,  $p<.0001$ ) in 2008-09 vs 3.89 (2.27-6.68,  $p<.0001$ ) in 2018-19.

Interpretation: PM involvement increased significantly across a decade in our ICU and was significantly associated with incidence of DNR and comfort care orders as well as the incidence of dying in the ICU. The increase in DNR and comfort care orders independent of PM over the past decade also reflect the changing role of intensivists in delivering PM.

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## RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Correlational Analysis of EAA With Other Inflammatory Markers in Critically Ill SARS-CoV-2 Patients

**Introduction/Hypothesis:** The Endotoxin Activity Assay (EAA) is a lab analysis to detect primed neutrophils in inflammatory states such as sepsis. Its use as a potential biomarker in SARS-CoV-2 patients has not been previously studied. Other markers such as CRP, ESR, LDH, ferritin, d-dimer, WBC count, procalcitonin, and IL-6 have all been shown to be reliable predictors of inflammatory states. We sought to find out the correlation between EAA and other inflammatory markers in patients admitted to the ICU with SARS-CoV-2 infection.

**Methods:** This is a prospective cohort analysis of SARS-CoV-2 patients admitted to the ICU at a single academic hospital from March to June 2020. Values for all study variables were obtained from each COVID-positive patient on days 1, 2, and 7 of ICU stay, and also for the onset of mechanical ventilation, vasopressors, acute kidney injury, and increase in ferritin  $>50\%$  from the level at admission. Logistic and linear regression analyses were used to compare EAA with IL-6, CRP, ferritin, ESR, LDH, d-dimer, WBC, and procalcitonin.

**Results:** A total of 214 EAA results were recorded from 99 patients, with characteristics of: median age 61.84, 45% female, 74% Black, 21% Hispanic, 4% White, and 1% Asian. A significant linear regression equation was found between EAA and CRP:  $F(1, 168)=19.20$ ,  $p<.0001$ , with an  $R^2$  of 0.1031 and Pearson's  $r$  of 0.32109, indicating a moderate correlation. Significant Spearman Correlation Coefficients were found between EAA and CRP, LDH, and D-dimer:  $r_s(169)=0.2896$ ,  $p=0.0001$ ;  $r_s(180)=0.179$ ,  $p=0.01$ ;  $r_s(165)=0.169$ ,  $p=0.03$ , suggesting a mild correlation. Other markers did not show a significant correlation with EAA: IL-6  $r_s(35)=0.144$ ,  $p=0.40$ ; Ferritin  $r_s(173)=0.0533$ ,  $p=0.48$ ; ESR  $r_s(37)=0.067$ ,  $p=0.69$ ; WBC  $r_s(213)=0.057$ ,  $p=0.40$ ; Procalcitonin  $r_s(14)=0.014$ ,  $p=0.96$ . **Conclusions:** EAA has a statistically significant positive correlation with CRP, LDH, and D-dimer, but not with IL-6, ferritin, ESR, WBC, and procalcitonin. Further studies exploring the relationship between EAA and other biomarkers can establish the validity and reliability of EAA in inflammatory states such as COVID sepsis. This can help identify the role of EAA as an adjunct biomarker to assess the efficacy of therapeutic strategies and to prognosticate and predict mortality in patients with SARS-CoV-19.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Topical Capsaicin for the Treatment of Cannabinoid Hyperemesis Syndrome: A Systematic Review and Meta-Analysis

Cannabinoid hyperemesis syndrome (CHS) is a condition that is being recognized and treated more frequently in emergency departments (EDs) across the United States. Currently, ED providers rely on antiemetics, antipsychotics and benzodiazepines to alleviate the symptoms. Topical capsaicin, a transient receptor potential vanilloid 1 agonist, has been proposed in recent years as a low-cost and effective alternative to the traditional antiemetic regimen when treating CHS. The aim of this systematic review and meta-analysis is to demonstrate the reliability and the gaps of what is known about this treatment modality.

Articles were extracted from PubMed, SCOPUS, and Google Scholar databases. Publication dates ranged from the inception of the databases to October 2020. Initial searches found 328 studies. After careful review and screening by two investigators, 7 studies met the inclusion criteria and were included for our meta-analysis. Variables that were evaluated included the prevalence of hospital admissions for patients treated with capsaicin, time to relief of symptoms after capsaicin administration, and ED length of stay (LOS). I-square and Q-statistic values were used to assess heterogeneity.

Among the 7 studies, there was a total of 106 patients. Two studies reported time to resolution of symptoms following capsaicin administration and ED LOS. Means for these outcomes were 325 (95% CI 234–787) and 379 (95% CI 10–747) minutes respectively. I-square was 44%, and Q-statistic was 11 with 6 degrees of freedom, with a p-value of 0.1.

With acceptable time to resolution of symptoms after topical administration and ED LOS, capsaicin appears to be an effective treatment option for symptomatic relief of CHS. This appropriate time to resolution of symptoms may be attributed to the drug's rapid onset of action which also may have led to the acceptable ED LOSs. However, despite usage of various treatment modalities, the most effective treatment for CHS is cessation of cannabis use, and this should be reiterated to patients accordingly. Given capsaicin's long half-life in peripheral tissues, resolution to symptom relief still takes time after application. Thus, capsaicin could possibly be used as a bridge therapy for cannabis cessation. As overcrowding in the ED continues to be an ongoing challenge, the previous findings still highlight that succinct symptomatic treatment with capsaicin and subsequent discharge of patients with CHS may help alleviate the strain on hospital beds and ED resources.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Resource Utilization among Patients with Syncope Presenting to the Emergency Department

#### Introduction

Syncope is a common problem encountered in the emergency department (ED) and a significant source of ED resource utilization, including advanced imaging modalities. Current guidelines do not recommend routine Computed Tomography (CT) imaging of the head for patients seen in the ED due to syncope. Despite this, prior studies have suggested suboptimal adherence to these recommendations. In this study, we investigate resource allocation in the ED for syncope-related visits, including advanced imaging modalities using a large national database.

#### Methods

Data from the CDC's National Hospital Ambulatory Medical Care Survey (NHAMCS) for years 2008-17 were compiled and analyzed. Intrinsic survey and constructed variables were utilized to identify and investigate all syncope-related ED visits in the US during the study period that met study criteria. Appropriate bivariate and multivariate statistical analyses were applied in order to identify and compare the resource utilization, demographics and ED visit dynamics of syncope and non-syncope-related ED visits.

#### Results

During the study period, there were over 15 million ED visits for syncope. A high percentage of syncope visits received head CT compared to non-syncope visits (34% vs 4.5%  $p < 0.001$ ). When investigated by age-grouping utilization of head CT ranged from 26.5 (95% CI 18.9-27.5) for ages 18-40 to as high as 40.2% (95% CI 33.8-47.1) for ages 80 and higher. Compared to non-syncope ED visits, syncope-related ED visits were older and more likely to have Medicare or private insurance. They were also more likely to have cardiac enzyme (27% v. 11%) and blood glucose testing (37% v. 21%).

#### Discussion

Syncope continues to be a large and growing share of visits to US EDs. Despite well supported, evidence-based recommendations which do not recommend routine utilization of head CT in syncope-related ED visits, these data suggest that emergency physicians routinely over-utilize this modality. Additional research should investigate the clinical reasoning behind this apparent over-use.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Ethnic Disparities in Outcomes Amongst COVID-19 Patients in Our Nation's Capital

**Introduction/Hypothesis:** African American and Hispanic patients have been disproportionately affected by infection with SARS-CoV-2 and subsequent coronavirus disease (COVID-19). Initial data suggests that these populations are more likely to suffer severe illness requiring hospitalization compared to Whites. We sought to further investigate the effects of race and ethnicity on critical care outcomes in hospitalized COVID-19 patients within the ethnically diverse area of the District of Columbia.

**Methods:** We performed a single-center, review of a prospective registry of 233 patients hospitalized with COVID-19 at an urban, academic hospital in Washington, D.C. Demographic and clinical data was gathered from chart review. We compared mean admission SOFA and APACHE scores, along with rates of ICU admission, intubation and mortality between White, Black, Hispanic, and Other ethnicities.

**Results:** Of the admitted patients 3.8% (n=9) were White, 70% (n=166) were Black, and 17% (n=41) Hispanic, with 7.7% (n=18) unknown or Other race. The mean admission SOFA score for White, Black and Hispanic patients were 3.14, 2.65 and 1.88, respectively. The mean APACHE scores for Whites, Blacks, and Hispanics were 15.25, 17.85, and 14.75, respectively. 56% (n=5) of Whites, 29% (n=48) of Blacks, and 41% (n=17) of Hispanics were admitted to the ICU. Intubations occurred in 44% (n=4) of Whites, 17% (n=28) of Blacks, and 37% (n=15) of Hispanics. Mortality rates were 22% (n=2) , 30% (n=49) , and 29% (n=12) in Whites, Blacks, and Hispanics, respectively.

**Conclusions:** According to estimates by the US census bureau, the population of the District of Columbia is 46% White, 46% Black, and 11.3% Hispanic. Our data demonstrates a disproportionate hospitalization rate in minorities affected by COVID-19. Despite lower ICU admission and intubation rates, Blacks had a high mortality rate. There was a disproportionately high utilization of the ICU care, intubation and mortality amongst Hispanics. Further investigation is necessary to examine causes of these significant health disparities and to prevent further health inequalities amongst minorities.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Interventions against Social Isolation of Senior Citizens: A Systematic Review of Existing Literature and Interventions Developed during COVID-19

Social isolation and loneliness are widespread among the elderly, especially those confined to living in nursing homes and long-term care facilities. We completed a systematic review evaluating the effectiveness of 22 interventions used to combat social isolation in older adults. A scoring mechanism based on The Joanna Briggs Appraisal Checklist was utilized to understand the quality of the studies, minimize risk of bias, and develop effective recommendations. Searches were conducted in “MedLine”, “PubMed”, “PsycINFO”, and “Aging and Mental Health” databases. There was an abundance of literature pertaining to the negative consequences of isolation in the older population, however there was limited research regarding long-term interventions to combat isolation. The 22 studies were selected based on the following inclusion criteria: interventions were targeted towards older adults experiencing loneliness, a method was proposed to combat isolation, studies recorded an outcome from participants and addressed interventions to alleviate isolation, outcomes were reported to analyze treatment impact, articles were published in English and articles consisted of quasi-experimental, observational, randomized clinical trials or systematic reviews. Studies completed on group and person-centered interventions against social isolation were the highest quality according to the Joanna Briggs scores, and they addressed long-term implications. In these studies, the social isolation experienced by seniors decreased after the intervention, and this effect continued in follow up studies. Other interventions such as volunteering-based interventions also alleviated isolation; however, follow-up studies were not completed to determine long-term efficacy. Given the increase in social isolation faced by seniors during the pandemic, the current literature on interventions can be used by long term care workers to create effective interventions to reduce social isolation.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Factors associated with Clinical Severity in Emergency Department Patients Presenting with Symptomatic SARS-Cov- 2 Infection

**Objective:** To measure the association of race, ethnicity, comorbidities and insurance status with need for hospitalization of symptomatic Emergency Department (ED) patients with Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection.

**Methods:** This study is a retrospective case-series of symptomatic patients presenting to a single ED with laboratory-confirmed SARS-CoV-2 infection from March 7-August 9, 2020. We collected patient-level information regarding demographics, public insurance status (Medicare or Medicaid), comorbidities, level of care and mortality using a structured chart review. We compared demographics and comorbidities of patients who were (1) able to convalesce at home, (2) required admission to general hospital ward, (3) required admission to intensive care unit (ICU), or (4) died within 30 days of the index visit. Multivariable and univariable logistic regression analyses were performed to report adjusted odds ratios (aOR) and the associated 95% confidence intervals (95% CI) with hospital admission versus ED discharge home and need for ICU admission versus general hospital ward admission.

**Results:** In total, 993 patients who presented to the ED with symptoms were included in the analysis with 370 (37.3%) patients requiring hospital admission and 70 (7.1%) patients requiring ICU care. Patients requiring admission were more likely to be Black or African American, to be Hispanic or Latino, or to have public insurance (either Medicaid or Medicare.) In multivariable logistic regression analysis comparing which patients required hospital admission, Black race (aOR 1.4, 95% CI 0.7-2.8) and Hispanic ethnicity (aOR 1.1, 95% CI 0.5-2.0) were associated less with need for admission than public insurance (Medicaid: aOR 3.4, 95% CI 2.2-5.4; Medicare: aOR 2.6, 95% CI 1.2-5.3; Medicaid and Medicare: aOR 3.6 95% CI 2.1-6.2) and the presence of hypertension (aOR 1.8, 95% CI 1.2-2.7), diabetes (aOR 1.6, 95% CI 1.1-2.5), obesity (aOR 1.7, 95% CI 1.1-2.5), heart failure (aOR 3.9, 95% CI 1.4-11.2), and hyperlipidemia (aOR 1.8, 95% CI 1.2-2.9) were identified as independent predictors of hospital admission. When comparing those who needed ICU admission versus general hospital ward admission, Medicaid (aOR 2.2, 95% CI 1.0-5.1) and Medicare (aOR 2.0 95% CI 0.7-5.8) were associated with ICU admission but Black patients were less likely (aOR 0.6 95% CI 0.1 - 2.4) and Hispanic patients were weakly (aOR 1.05 95% CI 0.54 - 2.02) associated with ICU admission.

**Conclusion:** Comorbidities and public insurance are predictors of more severe illness for patients with SARS-CoV-2. This study suggests that the disparities in severity seen in COVID-19 among Black and Hispanic patients may be attributable, in part, to low socioeconomic status and chronic health conditions.

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# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Neuropsychological Assessment and Self-reported Behavioral Outcomes in Children and Adolescents with Turner Syndrome

Turner syndrome (TS) is a genetic disorder characterized by the absence of part or whole second X-chromosome in a phenotypic female. The clinical presentation is extremely variable and includes skeletal abnormalities, short stature, lymphedema, cardiac and renal abnormalities, primary ovarian insufficiency, autoimmune disease, hearing loss, metabolic syndrome and neurocognitive issues.

Girls with TS also exhibit a typical pattern of non-verbal learning issues, with challenges in visual-spatial and executive functioning, attention and memory. They also have a higher incidence of depression, anxiety and social isolation. Mental health is an important priority for these patients and their families, and timely recognition of psychosocial impairment can significantly impact patients' academic achievement and quality of life. Data on self-reported outcomes in TS, however, are limited. A validated 4-question short form was created from the PROMIS (Patient Reported Outcomes Measurement Information System) Pediatric 25 question bank to assess patient and parent self-reported scores for depression, anxiety, and peer relationships in TS patients seen in the multidisciplinary TS clinic at Children's National Hospital between 1/1/2019 and 6/1/2020. Clinical data were abstracted from medical records and correlated with PROMIS scores. Descriptive analyses of the T-scores were completed using a non-parametric Wilcoxon rank-sum test and the dyad results were analyzed for agreement between parent and patient reporting. Completed neuropsychology assessments from the same time frame were also analyzed.

Data from 26 patients (mean age 13y, range 4.6-20.6y) were analyzed. The median self-reported outcomes for anxiety, depression and peer relationships did not differ from population norms, and parent and child reported outcomes did not correlate except for the domain of anxiety. These scores did not differ by height, age or estrogen supplementation. Data from comprehensive neuropsychology assessments were also reviewed (N=11, mean age 11.5, range 2.3-20.3y). As expected, these patients had a higher incidence of autism spectrum disorder (3/11), ADHD (2/11), global developmental delays (2/11), special education plans (8/11), learning disorder with impairment in mathematical abilities (3/11), abnormal speech (4/11), anxiety disorder (3/11), difficulties with executive functioning (9/9), and impaired visual spatial abilities (5/9). Subjective evaluation and parent interviews reveal common concerns about peer acceptance and academic performance across all ages.

Our preliminary data suggest that generic PROMIS short forms do not adequately capture TS specific emotional, neurocognitive and academic challenges, and highlight the need for a validated disease-specific questionnaire that captures the concerns of this population.

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## RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Evaluation of Thromboelastography in Patients with Gastrointestinal Bleeding

**Introduction:** Thromboelastography (TEG) is a low-cost, point-of-care diagnostic test used to quantitatively assess platelet function, clot formation, and fibrinolysis. TEG is increasingly employed to guide transfusion therapy in trauma and surgical cases to decrease mortality and blood product transfusion. These populations are distinctly different from the medical population which carries different comorbidities, risk factors and baseline antiplatelet/anticoagulant use. The most common subset of medical patients with acute bleeding are those with gastrointestinal bleeding (GIB). The utility of TEG in patients with GIB is not well described. We sought to assess whether TEG has a benefit in patients with clinically significant GIB by examining blood product utilization.

**Methods:** Single-center, retrospective review of 558 patients admitted to George Washington University Hospital with a diagnosis of GIB between 01/01/2017 and 12/31/2019. Patient demographics, comorbidities, APACHE II and SOFA scores, vitals, and lab values were collected from the medical records, as well as outcomes such as vasopressor use, blood product use, and mortality. After exclusion, a total of 51 patients that received TEGs and 176 patients that received the standard of care (no TEG) were analyzed by multivariate analysis to account for baseline differences between both arms.

**Results:** Analysis of the baseline variance between both study arms demonstrated between-group differences for higher APACHE scores (16.4 vs. 13.7,  $p<0.05$ ), higher rate of malignancy (37.9% vs. 18.5%,  $p<0.05$ ), higher baseline lactate (4.1 vs. 2.9,  $p<0.05$ ), higher shock index (1.2 vs. 1.0,  $p<0.05$ ) in the TEG arm. After adjusting for these differences the outcomes data demonstrated that utilization of TEG resulted in 1.9 units more pRBC transfused at day 0 and 1.5 units more FFP at day 0 - both results which demonstrated significance with  $p<0.05$ . In spite of the increased rate of transfusion within the TEG arm, there was no difference in outcomes-based data including ICU LOS, ventilator days, vasopressor use, in-hospital mortality, rate of renal replacement therapy and incidence of transfusion-related adverse events (e.g. TRALI, TACO, ALI).

**Conclusions:** The use of TEG for patients presenting with GIB resulted in increased pRBC and FFP transfusions without any change in clinical outcomes as compared to the standard of care. Our findings underscore the need for an RCT to further elucidate the role of TEG in medical patients before routine adoption of its use in these patients.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### The Effects of Comorbidity and Age on Mortality in COVID-19 Patients: An Application of the Charlson Comorbidity Index

As of abstract submission, the SARS-CoV-2 coronavirus (COVID-19) has killed over 2.5 million people worldwide. Early risk factors for mortality were identified as advanced age and various comorbidities. As more patients began requiring hospitalization and advanced airway management, many hospitals faced equipment shortages. Resource-limited areas overwhelmed by a heavy infection burden considered ventilator rationing and withholding life-saving interventions from individuals over a certain age due to inevitably increased mortality. To build a better framework for resource allocation, we examined whether healthy elderly individuals have increased mortality over their younger counterparts with comorbid conditions. The Charlson Comorbidity Index (CCI) is a popular risk adjustment tool for 10-year survival in patients but was never applied to COVID-19 patients. We hoped to determine whether age or the CCI is superior in predicting mortality in COVID-19 patients.

Between March – July 2020, a prospective registry containing all COVID-19 admissions to George Washington University Hospital was created. A receiver operator characteristic (ROC) curve was created for both age and CCI as a predictor of mortality. Data was then divided into age brackets with a breakdown of CCI quartiles for each bracket.

In total, 369 patients were studied. Mean age was 61.5 years and CCI was 3.91. The ROC curve for CCI yielded an Area under the Curve (AOC) of 0.6476 (0.57–0.72), while that for age yielded an AOC of 0.6737 (0.60–0.75). ROC contrast estimation of these two predictors did not indicate that one was significantly better than the other. However, analysis of age groups by CCI revealed certain healthy older age groups with better survival than their younger counterparts with comorbidities counterparts. 91–100-year-olds with a lower quartile CCI (0–5,6) had a 0–33.3% mortality rate, markedly better than 81–90 year-olds with a CCI of 7 (57.1%) or  $\geq 9$  (75%) and even 61–70-year-olds with a CCI of 5–6 (53.8%) and 7–10 (50.0%).

Comparing both age and CCI did not show a difference in mortality prediction for the population represented in this registry. However, our study suggests that one must reconsider withholding treatment from the healthy elderly population, as these patients may have better survival than their younger, but more comorbid, counterparts. Further studies are needed to evaluate these trends and to possibly look at a larger COVID-19 patient sample, rather than just those admitted to GW hospital.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Do COVID-19 Patients Who Received High-Flow Nasal Cannula Have More Comorbidities and Worse Outcomes?

#### Introduction:

High-flow nasal cannula oxygen therapy (HFNC) has gained attention as an alternative respiratory support for critically ill COVID-19 patients, however, the evidence behind HFNC has been unbalanced as it covers various comorbidities in hypoxic and hypercapnic respiratory failure. We sought to identify what group of patients needed HFNC and to assess whether its use impacted length of stay and survival.

#### Methods:

A retrospective cohort study was performed at a single center urban academic center. Data collected included age, gender, BMI, medical comorbidities, length of hospital stay and mortality for all patients hospitalized with COVID-19. We compared the characteristics of the patients who received HFNC at any point during their hospitalization to all patients hospitalized with COVID-19.

#### Results:

The total number of COVID-19 patients was 363. HFNC was used in 115 admitted patients, of which, 74 were in the ICU with a mean length of stay of 7 days. Overall this group had an average hospital length of stay of 15 days in total as opposed to 10.2 days in non-HFNC utilizers. The most common comorbidities seen in the cohort were hypertension (76.4%), diabetes mellitus (37.4%), asthma (14.6%), COPD (11.24%), and obstructive sleep apnea (4.5%). In patients who received HFNC, 41.2% survived compared to 71.8% of all COVID-19 patients.

#### Conclusion:

Factors determining the outcome of patients using HFNC are not well understood. Our patients who received HFNC were more likely to have underlying cardiopulmonary disease than non-HFNC utilizers. Furthermore, they had a longer length of stay and a higher mortality rate in comparison to all COVID-19 patients. While we specifically identified patients who received HFNC, some of these patients received other forms of supplemental oxygen therapy during their hospital stay which may confound the characteristics of this group. It is also possible that patients receiving HFNC were sicker in general, which may explain their disparity in mortality and hospital stay duration. Further research needs to be done in order to clarify if HFNC in COVID-19 patients, particularly those with cardiopulmonary comorbidities, is beneficial in delaying escalation of oxygen therapy and potentially prolonging survival.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Potential Biomarkers for Severe ARDS in the Setting of SARS-CoV-2 ICU Admission

**Introduction/Hypothesis:** Acute respiratory disease syndrome (ARDS) is due to compromised lung oxygen exchange in the setting of severe alveolar inflammation. This can be assessed and diagnosed using the ratio of alveolar oxygen saturation (PaO<sub>2</sub>) to the fraction of inspired oxygen (FiO<sub>2</sub>). In hospitalized COVID-19 patients, the role of trending inflammatory markers to categorize levels of ARDS severity in the clinical setting has yet to be established. In this study, we describe the correlational relationship of five biomarkers to the PaO<sub>2</sub>/FiO<sub>2</sub> ratio (P/F ratio), a key diagnostic criterion, and a measure of severity in ARDS.

**Methods:** This is a prospective cohort analysis of SARS-CoV-2 patients admitted to the ICU at a single urban academic center from March to June 2020. Levels of endotoxin activity assay (EAA), CRP, ferritin, LDH, and d-dimer were obtained from intubated patients throughout their ICU stay. PaO<sub>2</sub> and FiO<sub>2</sub> values matching the same days as the biomarkers and demographic information were abstracted from the medical record. The inflammatory markers were matched to the P-F ratios of the same day, and Spearman correlation analysis was performed to detect the relationship between them.

**Results:** A total of 45 intubated COVID patients were included, with baseline characteristics of: median age 55 years and 33% female, 62% Black, 27% Hispanic, 9% Asian, and 2% White. Spearman correlation coefficient ( $\rho$ ) showed statistically significant relationships between P/F ratios and EAA, IL-6, CRP, and ESR, with respective values of:  $\rho(89)=-0.2366, p=0.02$ ;  $\rho(13)=-0.7143, p=0.006$ ;  $\rho(77)=-0.3670, p=0.001$ ;  $\rho(17)=-0.5569, p=0.02$ .  $\rho$  was also calculated between P/F ratios and Ferritin, D-dimer, WBC, and LDH with respective values of:  $\rho(77)=0.0819, p=0.47$ ;  $\rho(78)=-0.2105, p=0.06$ ;  $\rho(88)=-0.1046, p=0.33$ ;  $\rho(73)=0.0420, p=0.72$ , showing no statistically significant relationship between these variables.

**Conclusion:** EAA, IL-6, CRP, and ESR levels had a statistically significant negative correlation with the P-F ratio. Elevations in these biomarkers correlated with worsening P/F ratios, suggesting that they could serve as useful biomarkers to predict ARDS severity. Additional studies are needed to further understand the trend of these biomarkers and validate their clinical use in prognostication in ARDS.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Investigation of Factors Affecting Providers' Fear of Contracting COVID-19 During Intubations: Results from a USA National Survey

**Introduction:** With more than 300,000 physicians infected with COVID-19, preserving the wellness of providers is essential. Endotracheal intubation is a hazardous procedure risking contraction of SAR-CoV-2 due to airway proximity and aerosolization. Since an estimated 8% of COVID-19 patients eventually require endotracheal intubations, there have been studies addressing the safety concerns regarding COVID-19 intubations. In our study, we investigate factors affecting providers' fear of contracting COVID-19 during intubations.

**Methods:** In this multi-center cross-sectional study, we disseminated an IRB-approved 24-question survey, pilot-tested for reliability and validity, to providers from different specialties, training levels, and geographic locations across the USA using a snowball sample approach to assess factors affecting providers' fear when intubating COVID-19 patients. A scale of 1-10, with 10 being the most fearful, was used to assess providers' fear of contracting COVID-19 by asking the following questions: "On a scale from 1-10, how would you rate your fear of contracting COVID-19 during your FIRST intubation of a confirmed or suspected COVID-19 patient?" A similar question was asked for subsequent intubations. Data was analyzed using Pearson's chi-squared, Mann-Whitney U, and Wilcoxon rank tests.

**Results:** We analyzed 186 responses from providers at 32 hospitals after excluding incomplete surveys and surveys that reported no experiences with COVID-19 intubations. While there were no significant differences in fear levels during the first COVID-19 intubation, providers with a history of quarantine for potential COVID-19 exposure reported more fear during subsequent COVID-19 intubations than those without a history of quarantine ( $p=0.021$ , median 5 vs 4). Factors that did not significantly affect the fear of contracting COVID-19 during first or subsequent intubations included having a designated intubation team, having children, being a primary caretaker for someone over the age of 80, and having friends or close relatives contract COVID-19.

**Conclusions:** Fear is a known psychological response to quarantine. As the provider's fear levels during initial COVID-19 intubations were not significant, increased fear of contracting COVID-19 during subsequent intubations can be attributed to the negative psychological outcomes, financial loss, isolation, and stigma associated with quarantine. This may also suggest that providers associated their personal infection with a prior intubation, leading to increased fear during future intubations. The cumulative risk of exposure from multiple COVID-19 intubations could explain why providers experienced more fear during repeat intubations. Educational interventions and psychological support have been shown to improve the mental health of physicians combating the COVID-19 pandemic.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Exploring the Association between Provider Years in Training and Comfort and Fear Levels during Primary and Subsequent Intubation Attempts of COVID-19 Patients

**Introduction:** Given the risk of transmission, severe degrees of hypoxia, and PPE requirements, providers have encountered additional challenges while intubating COVID-19 patients. Several studies have demonstrated that senior physicians are more likely to achieve successful endotracheal intubations on the first attempt and show better confidence leading resuscitations. We explore the association between provider age and years in training and comfort during COVID-19 intubations.

**Methods:** In this IRB-approved national multi-center, prospective, cross-sectional study, we used a snowball sampling approach to administer a 24-question survey to providers across different specialties, training levels, and geographic locations in the United States. This survey included questions about the provider's background, institutional training, and preparedness intubating COVID-19 patients. Data was analyzed using Pearson's chi-squared, Mann-Whitney U, and Wilcoxon rank tests.

**Results:** We analyzed 186 responses from providers at 32 hospitals. Providers were more comfortable with intubation in general than with intubation of COVID-19 suspected patients (median 10, IQR = 5-10, vs. 8, IQR = 1-10,  $p < 0.0005$ ). Providers with more than 16 years of experience reported greater comfort with intubation in general and intubation of COVID-19 patients than providers with 0 to 5 years of experience (median 10, IQR = 6-10, vs. 9, IQR = 5-10,  $p < 0.0005$  and median 9, IQR = 3-10, vs. 8, IQR = 1-10,  $p = 0.006$ ). Between primary and subsequent intubation attempts of COVID-19 suspected patients, fear of contracting COVID-19 declined from a median rating of 7, IQR = 1-10, to 4, IQR = 1-10 ( $p < 0.0005$ ). Across all age groups, there was no difference in fear level during the first intubation attempt of a COVID-19 suspected patient. During subsequent intubation attempts, however, providers aged 25 to 35 years old averaged a higher fear rating than providers older than 56 years old (median 5, IQR = 1-10, vs. 3, IQR = 1-9,  $p = 0.048$ ).

**Conclusions:** This study demonstrated that older and experienced providers were more comfortable with intubations in general and intubations of suspected or confirmed COVID-19 patients. While all age groups experienced similar fear levels during initial intubations of COVID-19 patients, providers older than 56 years old encountered less fear than providers aged 25 to 35 years old during subsequent intubations. Despite heightened risk of infection due to age, it is possible that older providers encountered less fear during subsequent intubations due to more practice managing airways and greater confidence with leading resuscitations.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Endotoxin Activity as a Marker for Disease Severity in SARS-CoV-2 Patients in the ICU

**Introduction/Hypothesis:** Endotoxin Activity Assay (EAA) measures the chemiluminescent response of the neutrophils to endotoxin using an anti-endotoxin antibody, and elevations in EAA have been shown to predict severity of illness in gram-negative bacterial sepsis. However, its use has not been evaluated in SARS-CoV-2 patients who also exhibit heightened inflammatory states. Our objective was to describe EAA levels in SARS-CoV-2 patients and determine if EAA level correlates with illness severity and mortality outcomes.

**Methods:** This is a prospective cohort analysis of SARS-CoV-2 patients admitted to the intensive care unit (ICU) at a single academic center, from March to June 2020. EAA levels were obtained from each patient on days 1, 2, and 7 of ICU stay. Levels were also taken for onset of severe respiratory distress requiring intubation, hypotension requiring vasopressors, and acute kidney injury. Demographics, comorbidities, and illness severity variables were abstracted from the medical record as well as hospital and ICU lengths of stay (LOS) and in-hospital mortality. Initial EAA values were categorized into low ( $<0.4$ ), intermediate ( $0.4-0.6$ ), and high ( $>0.6$ ). Logistic and linear regression analyses were used to compare initial EAA value with the ICU LOS, hospital LOS, APACHE score, SOFA score, and in-hospital mortality.

**Results:** A total of 94 patients were included in the study, with baseline characteristics as follows: median age 65 years, 43% female, and racial distribution of 72% Black, 23% White, and 3% Asian. The median initial EAA was 0.67. Linear regression analysis showed the following: ICU LOS ( $R^2=0.0244$ ,  $p=0.27$ ); Hospital LOS ( $R^2=0.0662$ ,  $p=0.07$ ); In-hospital Mortality ( $OR=2.333$ ,  $p=0.63$ ); APACHE score ( $r=-0.039$ ,  $p=0.80$ ), and SOFA score ( $r=-0.2136$ ,  $p=0.16$ ).

**Conclusions:** A positive correlation exists between EAA and hospital length of stay ( $p=0.07$ ), but a larger sample size may be required to confirm statistical significance. There are no statistically significant correlations between EAA and illness severity scores such as APACHE and SOFA. Elevated levels of endotoxin as assessed by EAA are seen in hospitalized COVID patients, but additional studies are warranted to better characterize the role of EAA as an indicator of mortality and illness severity in patients with SARS-CoV-2.

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RESEARCH SHOWCASE

# CLINICAL SPECIALTIES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Outcomes of Low Tidal Volume Ventilation in COVID-19 Intubated Patients

**Introduction:** Low tidal volume ventilation (LTVV), defined as 6 to 8cc of tidal volume per kilogram of ideal body weight (IBW), has been shown to reduce mortality and days requiring invasive ventilation when utilized in the acute respiratory distress syndrome (ARDS). The degree of hypoxemia in respiratory failure experienced in the SARS-COV2 infection (COVID-19) is similar to ARDS from other respiratory pathologies; however, there appears to be notable heterogeneity in lung compliance of COVID-19 patients as well as higher rate of mortality for ARDS supported with invasive mechanical ventilation in COVID-19. It remains unknown if lung protective tidal volume strategies confer a significant benefit for COVID-19 ARDS as they do for ARDS due to other etiologies. We aim to determine if LTVV was associated with decreased mortality, ventilator days, ICU length of stay, or decreased length of hospital stay.

**Methods:** A prospective observational study was performed with inclusion criteria of a positive COVID-19 test and intubation for non-operative indications. Ideal body weight was calculated to determine whether or not each patient ever exceeded or achieved LTVV, here defined as less than 6cc/kg of ideal body weight. The primary outcome was mortality. The secondary outcomes were length of stay in the hospital, ICU days, and ventilator days.

**Results:** A total of 75 COVID positive patients were intubated at our facility. 60 (80%) of these patients died. Exceeding 6cc/kg IBW LTVV trended towards more days in the ICU ( $p=.089$ ) and number of days intubated ( $p=.148$ ), but only increased hospital length of stay was statistically significant ( $p=.025$ ). Patients who did maintain LTVV at least one day did have decreased crude odds of mortality at 0.281 (95% CI .0482-1.6395). LTVV was not correlated with fewer ICU days ( $p=.846$ ), number of days intubated ( $p=.709$ ), or length of hospital stay ( $p=.699$ ).

**Conclusions:** Failure to maintain LTVV was associated with increased mortality and hospital LOS. It also trended toward an increase in ICU days days of mechanical ventilation. Further prospective studies are required.

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RESEARCH SHOWCASE

# CREATIVE ARTS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Understanding Anxiety in the COVID-19 Pandemic Through Art Making: A Heuristic Study

Throughout the current COVID-19 pandemic there have been many unknowns surrounding the virus, transmission, and proper precautions to take to mitigate risk. This has been a challenging time full of change and it has been difficult to know what is considered 'safe.' The author of this study engaged in an arts-based heuristic study to address symptoms of anxiety and maladaptive behaviors that began during the pandemic. As a student in the GW Art Therapy program there was a curiosity as to how art making may help to better understand these symptoms or alleviate them.

Cyanotype is an alternative photographic process that can be used to create photograms, or imprints of objects placed on top of the specially coated paper. The development process only requires sunlight and water with the final product creating a distinctive blue hue. The author of this study chose this material due to its connection with nature and being outdoors—something that is currently considered a safe practice in the pandemic. Being outdoors within nature also has an inherent healing quality lending to the choice to incorporate nature into this study. The resulting artistic images will be used in combination with visual journaling to further explore subjective feelings, emotions, and anxiety in response to the pandemic. To objectively measure anxiety a COVID-19 anxiety scale was developed by the author based on the State Trait Anxiety Scale (STAI) and the Coronavirus Pandemic Anxiety Scale (CPAS-11).

This study is currently ongoing, however the author aims to address the therapeutic benefits of working with the cyanotype material and its process. This material and its therapeutic uses have not been widely studied within the art therapy profession and it is surmised that future interventions may be informed by the results.

Implications for this study will provide information about this material and how it could be more widely used within the field of art therapy, especially when working with clients presenting with anxiety symptoms.

### Primary Presenter

Katherine Gaynor

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RESEARCH SHOWCASE

# CREATIVE ARTS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### **Around the Wheel in Thirty Days: A Journey Utilizing the Potter's Wheel to Understanding One's Chronic Pain with Mug Making**

This arts-based heuristic study was conducted to explore how art therapy practices could be utilized to understand one's personal experience with chronic pain through mug making on the pottery wheel. A secondary goal was to explore how the pottery wheel might be utilized in art therapy interventions with future clients who experience chronic pain. A mug was thrown every day for thirty days. The McGill Pain Questionnaire was completed at the beginning and end of the study. In addition, a Likert scale was used to measure subjective pain pre and post art making. This researcher began by looking at the current literature to gather information on what art therapy interventions with chronic pain. Utilizing the framework from the ATR-N assessment (Hass-Cohen & Findlay, 2009), which by design integrates emotional- cognitive bottom-up processing, sensory processing, and a top-down modulation of pain via cognition, a reflection worksheet was created. The four drawing prompts from the ATR-N were utilized to break the mug making process down into 4 sections which served as the basis of reflection after each stage of mug making. These reflections were used to complete the Grading Rubric for Assessing Artwork (GRAA, Franklin, 2020). The GRAA (Franklin, 2020) can be used to critically and objectively analyze the process and product of one's arts-based heuristic study.

Results of the study suggested that the researcher's awareness, understanding, and acceptance of subjective pain seemed to increase throughout the process. The researcher observed themes of acceptance of uncertainty and the inevitability of mistakes that are underscored with those found in existential theory. Together these themes can be used to inform recommendations for the utilization of the potter's wheel and mug making as an art therapy intervention for pain management.

### **Primary Presenter**

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RESEARCH SHOWCASE

# CREATIVE ARTS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Investigation of Art Therapy Application by Adopting Iranian Art and Culture

**Objective:** Iran is a country with rich art and culture in the early developmental stage of the art therapy profession. Because of Iran's history, the people have encountered traumatic experiences like revolution and war. Iranians can benefit from art therapy, but the theories and approaches have been developed in the West. The goal of this project is to investigate the application of art therapy by adopting art and art-making processes situated within Iranian culture.

**Method:** The study used a qualitative method as a means of program evaluation. A wellness oriented tele-art therapy workshop series was offered by an Iranian-American art therapy student to a group of 8 participants from Iran. The series was weekly for 4 weeks covering the following topics: 1) Introduction; autonomy 2) Peaceful connection; self-regulation 3) Where you wish to be; fostering hope 4) The resourceful hands; empowerment. The study also utilized heuristic and arts-based research in order to document the facilitator's response to the workshop series.

**Findings:** Over the duration of the workshops, participants shared stories that demonstrated isolation, hopelessness, and lack of control that resulted from personal trauma, especially during the COVID-19 pandemic and socio-political influences in Iran. Participant self-reports and facilitator observation demonstrated positive shifts in participants' emotional states at the end of the workshops. Participants described that basing the art materials and directives in Iranian art traditions made them feel more comfortable and interested in the process. Thematic analysis revealed several features of the use of Iran's art within the art therapy that promoted these changes: empowerment, self-esteem, sense of freedom and autonomy, self-awareness, connectivity within self and others, and self-regulation.

**Implications:** The utilization of culturally responsive art materials and methods derived from Iranian art into art therapy provided a safe and comfortable space for the participants to explore themselves freely. Using Iranian art materials and methods in Iran has the potential to increase the effectiveness of art therapy, create a bridge between Iranian and Western art therapy, and ensure art therapy rooted in Iranian culture.

### Primary Presenter

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RESEARCH SHOWCASE

# CREATIVE ARTS

## CORCORAN SCHOOL OF THE ARTS & DESIGN

### Promoting Wellness at GW Through The Incorporation of Sustainable Design Features: The Future for The GW Colonial Health Center

Now more than ever, the demand for wellness centers on university campuses is high as concerns for student's mental health continue to escalate. Sustainable and holistic design has emerged as an efficient method for creating wellness prompting spaces. The George Washington University has provided its students with a health center on campus, however, introducing sustainable practices and human well-being concepts to its design could push the center to have a greater impact on its students.

My building concept is focused on bridging the gap between the function and design of the health center to create a more holistic space that further promotes student well-being. The site is located on the GW Mount Vernon campus as it presents a stronger connection to nature and biophilic elements. Incorporating aspects of the WELL Building concepts and LEED standards into the design were explored to foster an atmosphere of comfort and healing. Shipping container structures were studied to introduce a sustainable exterior, and sustainable furnishings and finishes were used for the interiors.

The following concepts of the WELL certification, air, water, nourishment, light, movement, thermal comfort, sound, materials, mind, and community, were the foundation of creating the layout and form of the building. Eight of the health and wellness guidance crosswalks, (GSA Sustainable Facilities Tool) within the LEED certification were also added to the building. The site location combined with the two certifications generated a more productive and holistic final layout for the new health center.

The final design presents a three-story building surrounded by nature that is translated into its interior. The first level contains a reception area, a section dedicated to therapy sessions for students, and a separate area containing a meditation room, therapy garden, and reflection pool. The second level promotes everyday wellness habits as it houses a nutrition cafe and eating area, yoga rooms, a gym, and classrooms for wellness workshops. The final level includes single and double bedrooms devoted to mental health retreats for students and visiting family members. The shape of the building creates additional outdoor lounge areas for students and faculty. Although this design is unrealized, it prompts further discussion of how universities can incorporate design strategies to improve their students' well-being.

### Primary Presenter

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RESEARCH SHOWCASE

# DRUG ABUSE

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Dexmedetomidine in Alcohol Withdrawal Syndrome: Are We Intubating Less?

**Introduction:** When used for sedation of non-intubated patients during the treatment of alcohol withdrawal, dexmedetomidine may reduce symptom severity while preventing respiratory depression. The addition of dexmedetomidine to a Clinical Institute Withdrawal Assessment (CIWA) based benzodiazepine treatment strategy, the standard treatment modality for alcohol withdrawal, may reduce benzodiazepine usage and ultimately the need for intubation. We sought to determine whether the addition of dexmedetomidine to a CIWA-based benzodiazepine protocol reduced the risk of intubation for patients admitted to our intensive care units with severe alcohol withdrawal.

**Methods:** A single center, retrospective cohort study at our urban, academic medical center compared patients receiving dexmedetomidine in addition to the standard CIWA-based benzodiazepine protocol to standard therapy alone. Patients with CIWA score greater than 7 between January 2019 and March 2020 were included. We collected demographic and clinical data including CIWA score, benzodiazepine usage, dexmedetomidine usage, and intubation. The primary outcome measure was intubation. Odds ratio (OR) was determined for intubation events based on exposure to dexmedetomidine and benzodiazepine usage.

**Results:** A total of 68 charts were analyzed. The mean patient age was 51, 54 patients were men. 44 patients received standard CIWA-based benzodiazepine therapy without dexmedetomidine, of these 24 (54.5%) were intubated during hospitalization. Twenty-four patients received dexmedetomidine in addition to standard therapy; 7 of these patients (29.1%) were intubated, with OR = 0.34 [95% CI: 0.12-0.99; p=0.048]. The mean CIWA score was 14.9 for the standard therapy group and 17.4 for the group receiving dexmedetomidine (p=0.21). The mean dose of IV lorazepam given in the 12 hours prior to intubation were 0.9 mg for the standard therapy group and 1.8 mg for the dexmedetomidine group (p=0.65).

**Conclusions:** In this series of patients with severe alcohol withdrawal syndrome, the addition of dexmedetomidine to CIWA-based benzodiazepine therapy correlates with a significantly lower frequency of intubation. No significant benzodiazepine-limiting effect was demonstrated. Future prospective analysis is necessary to explore the relationship of these observations.

### Primary Presenter

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### **Newcomer Multilingual Learners’ Experiences in High School: A Case Study of Communities of Practice and Sense of Belonging**

This holistic, single-site case study elevated the voices of more than 400 newcomers from 34 countries, speaking 21 languages, and examined their experiences and feelings of belonging, arriving, and participating in a U.S. high school newcomer program community of practice. It was more important than ever to examine belonging in high school communities of practice for newly arrived immigrant students during a socio-political climate of xenophobia, racist rhetoric, Black Lives Matter social uprising, policy uncertainties for youth with deferred action on deportation, “Muslim bans,” and COVID-19 immigration and travel bans. Utilizing sociocultural theory (Vygotsky, 1978), Wenger’s (1998b) community of practice framework, and Allen and Kern’s (2017) belonging framework to understand the distinctive newcomer MLL experience in high school, a large administration of a survey with 391 respondents, 14 online student interviews, and student documents served as data. Implications and recommendations critically examined structures, practices, climate, and actions to foster a sense of belonging for newcomers. This case study provided nine connective points where this bounded community of practice fostered a sense of belonging for newcomers. Schools are a safe haven for newly arrived students. This research also highlighted how language and translanguaging (García, 2009; Wei, 2018) bind together a newcomer’s experience and can support, or dismantle, feelings of belonging, connection, value, and acceptance.

### **Primary Presenter**

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# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### They Have Always Been There: Education Support Professionals as Informal Mentors to Adolescent Students

This study explored Education Support Professionals' (ESP) experiences informal mentoring relationships with adolescent students at their schools, asking the following research question: How do ESP describe their experiences informally mentoring adolescent students? This question was broken down into two sub-questions: a) How do ESP describe their interactions and engagement with students they informally mentor? b) What do ESP describe as factors that mediate their interactions with students they informally mentor?

To answer these questions, the researcher interviewed seven ESP from across the U.S. and belonging to a diverse range of ESP families (e.g., transportation, custodial, clerical, paraeducator, etc.). The interview protocol and analytical approach used an Activity Theory model.

Three key findings emerged from the data: 1) In describing their mentoring interactions with adolescent students, ESP focused on their efforts to show their student mentees kindness, make them feel welcomed at the school, build their confidence and independence, and support them with family issues. ESP also described student mentees seeking them out for support and showing signs of appreciation for their support. 2) ESP described feeling they were viewed as 'lesser than' by teachers and administration in their school or school district, which they saw as limiting their opportunities to act as a team with other school staff to help educate the whole child. 3) ESP described their lack of inclusion in policy decisions and the policy-making process at the school and school district levels, as well as their lack of high-quality training, as factors that limited their opportunities to mentor adolescent students.

Several policy and research implications emerged from this study. Education leaders at the school and district levels should invite ESP to into the education process of students and provide high quality training on supporting students with both teachers and ESP learning together. Research implications include the recommendation that recruitment efforts avoid using terms such as "mentor," since nearly all of the ESP interviewed for this study explained that they did not see themselves as mentors. Researchers should also seek to collect longitudinal data that examines the impacts of ESP on student outcomes, as well as conduct research that employs direct observations of ESP-student interactions.

### Primary Presenter

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Improving Recruitment and Retention of Undergraduates into STEM Teaching

Our research addresses how to improve the recruitment and retention of STEM teachers for high need schools through service scholarships like the GW Noyce Scholarship Program and on-campus support. Grounded theory was used to structure and guide our research. Noyce staff interviewed and surveyed GWU students who are enrolled in teaching-focused courses, including Noyce Scholarship recipients committed to teaching after graduation. WebEx interviews were conducted, and the questions related to student perceptions of STEM teaching careers, service scholarships, the GW Noyce Scholarship program, and university efforts to promote teaching as a viable career path. Interviews were anonymized and coded to identify emergent themes in STEM student experience. Major themes that arose from the interviews included influence of academic advisors, career flexibility, fear of burnout, campus culture, service scholarship as recruitment tool, mentorship, financial burden and contextual teaching. The procedures for our work reported here with human subjects had the approval of our Institutional Research Board.

### Primary Presenter

Jasmine Sami

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### A Critical Literature Review of Sexual Education for Adolescents with Intellectual and Developmental Disabilities

A lack of comprehensive sexual education in special education classrooms is a standard, socially unjust practice with the potential to negatively impact the socialization, safety and quality of life of adolescents with intellectual and developmental disabilities (ID/DD). The voices of individuals with ID/DD and their unique socio-sexual experiences should be at the center of sexual education approaches. Unfortunately, this is not the case in many special education settings, and research on effective sexual education practices for diverse learners is limited. This crucial area of education is often overlooked in special education settings, leaving students without the sexual knowledge and support that they need to navigate their transition into adulthood. It is critical that special education programs honestly and openly evaluate current practices in sexual education to determine whether or not instruction is truly comprehensive in covering the social, emotional and sexual needs of adolescents with ID/DD. This critical literature review evaluates existing sexual education curricula for students with ID/DD, discusses barriers to providing high quality and comprehensive sexual education in special education settings, and provides recommendations for addressing those barriers to create sexual education learning experiences that are sensitive to neurodiversity and individual student needs. This critical review provides relevant information to educators and researchers alike for informing future practice and research on the topic of sexual education in the special education classroom. This review encourages educators and researchers to center the voices and experiences of individuals with ID/DD and their families to increase the safety and well-being of all students.

### Primary Presenter

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### The Ecology of Campus Sexual Assault: A Latent Class Analysis

Campus sexual assault (CSA) is a pervasive problem among US college students. Large scale, methodologically similar studies frequently find that between 20-25% of women and 6-7% of men are sexually victimized during their time at 4-year colleges and universities in the US (Cantor et al., 2015, 2019; Fisher, Cullen, & Turner, 2000; Krebs et al., 2007; Krebs, Lindquist, & Barrick, 2011). CSA is frequently associated with mental and physical health problems including depression, anxiety, PTSD, suicidality, insomnia, chronic pain, and gastrointestinal problems, making it a significant public health concern for institutions of higher education (IHEs; Campbell, Dworkin, & Cabral, 2008; Carey et al., 2018; Golding, 1999; Leone & Carroll, 2016; McDougall et al., 2016; Potter et al., 2018). Despite the dearth of research literature on CSA, there are several significant problems that have plagued the field from painting an accurate picture of the scope and context of the problem, including methodological challenges to gathering accurate incidence and prevalence rates and inconsistent language across research studies. The present study serves to partially fill the research gap by taking a latent variable mixture modeling approach to campus climate survey data in order to uncover subgroups of students based on their responses to elements of campus climate and understand the predictive capabilities of both individual and environmental variables as they relate to those latent subgroups. The purpose of the present study is to utilize a process-person-context framework in order to examine individual factors within the larger campus environment and sociopolitical landscape.

### Primary Presenter

Lindsay Smith

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# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Perceptions of the Assistant Principal Position from School Principals in Puerto Rico

At the time I conducted this research study, the Puerto Rico public school system did not include an AP position in their school leadership structure. Using quantitative descriptive statistics research, I conducted this study to assess the knowledge and perceptions of PR school principals regarding adding an assistant principal (AP) position into the PR public school system. I chose a Distributed Leadership Practice (Spillane, 2006) theoretical framework as the lens for the study. In the research study, I measured the willingness of school principals to delegate or distribute certain administrative, managerial, and instructional leadership duties to an AP. For the literature review, I investigated three primary factors described in a conceptual framework: (1) The School Principal Role and Responsibilities, (2) The School Assistant Principal Role and Responsibilities, and (3) The Puerto Rico School System's History and Evolution. The literature review revealed that the AP position could serve as a training field for principals, and that APs are a resourceful support to school principals (Barnett et al., 2012; Oliver, 2005).

The study had two primary research questions: (1) What are the perceptions of serving principals in Puerto Rico regarding the potential role and responsibilities of an assistant principal? (2) What is the degree of understanding and knowledge of serving principals in Puerto Rico regarding the roles and responsibilities of an assistant principal? For data collection, I used an electronic survey sent to a population of 1,292 school principals in public schools, with 486 responses at a 37.6% response rate. I designed the 24 question survey with demographic, Likert scale, and open-ended questions.

The data results revealed a statistically significant rate of support (52.1%) for delegating a portion of the principals' administrative and instructional leadership duties to an assistant principal. The study's results answered the research questions. The findings supported adding the AP position into the PR school system using a leadership practice model (Spillane, 2006). School principals named three primary responsibilities AP's could share: administrative responsibilities, support with instructional leadership, and student discipline. In addition, findings revealed females more inclined to delegate instructional leadership than males and that principals with more years of service in the PR school system supported adding an AP position into the PR school leadership structure. In a challenging school environment, the assistant school principal becomes an asset for the school principal, if there is synergy and coupling of vision for change and improvement shared by both school leaders (Morgan, 2018).

### Primary Presenter

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Multiple Case Study: Developing Leader Adaptive Capacity within Contexts of Increasing Complexity

As a proxy to the increasing complexity facing the armed services, this multi-case study analyzed the formal and informal development of adaptive capacity in fire service leaders within the context of increasingly complex situations driven by urbanization and climate change. Triangulating interviews, observations, and documentation review, this study included two urban fire service cases impacted by past complex climate events: City of Gatlinburg Fire Department in Tennessee where Chimney Tops II mega fire occurred in November 2016 and the fire service in Harris County, Texas where extreme flooding from Hurricane Harvey occurred in August 2017. This study sought to answer the primary research question: How do fire service leaders develop adaptive capacity within complex situations? Measured in lives and structures lost, the problem of increasing complexity in the fire service increases the criticality of localized adaptivity. This study contributes new empirical insight into how organizations support and enable leaders' development of adaptive capacity. This study synthesized aspects of professional responsibility and complexity leadership theories to conceptualize the complex and socio-material (webs of connected human, social, and material) dynamics that give rise to and support leader development of adaptive capacity. This study found three interconnected practices of shift duty, individual professional development, and incident response within and across which leader adaptive capacity developed. Moments of emergent leadership and professional learning found in this study developed leader adaptive capacity across these practices. These developmental moments broadened the socio-material webs which leaders leveraged to adapt within the complex situations of incident response. This study's practical implications may benefit several audiences including leaders in the fire service and other high stakes professions, those that design and facilitate leader development, and professional associations, among others. This study also contributes one theoretical lens to delve into the complex and socio-material aspects of leader adaptive capacity development.

### Primary Presenter

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### The Lived Experience of Parents Experiencing Poverty While Navigating The Special Education Process

This research study was situated in the policies of the Individuals with Disabilities Act (IDEA) and motivated by the different ways parents from different socioeconomic groups navigate special education. IDEA requires parents to make informed decisions about their child's special education needs. It assumes access to information is the same as having competency to navigate and utilize that information. In schools, much of the information in special education is provided in writing. The Parents Rights and Procedures manuals that describe parents' rights throughout the special education process are often written at a high school and greater reading level. Parents of low socio economic status (SES) communities tend to achieve lower levels of education than those not of low SES communities. If parents of a child with a disability from low SES communities are unable to access the written information to make informed decisions about their child's needs, how do they access and utilize information in their decision making process? How is their decision making experience impacted by the information they do/do not have when making decisions for their child's special education needs?

This phenomenological study examined the lived experience of nine parents from low socio economic communities as they made educational decisions about their child(ren) with special needs. Each parent qualified for free and reduced lunch and had a child that was currently receiving special education services. The study utilized a hermeneutic phenomenological approach to identify both the details of the parents lived experiences and how each made sense of their experience. Through the lens of a Heuristics and Biases Framework, data was analyzed to identify key themes about the parent's lived experiences.

Findings for this study were organized into themes that included the importance of communication, establishing positive relationships, the emotional toll on parents and difficulty finding information. Findings highlighted the significance of interactions in socio academic settings as well as how parents use the information they have to make decisions. The findings of this study add dimension to our understanding of this phenomenon and further develop the literature on the experiences and expectations put upon parents of children with a disability from low socio economic communities. The findings also have implications for further research, institutional attitudes and policies, as well as curricular and pedagogical approaches.

### Primary Presenter

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Unpacking Teacher Well-being: A Mixed Methods Measurement Study

This study used a convergent, quantitative dominant mixed methods design to investigate the construct of teacher well-being. Three-hundred-forty-five teachers participated in quantitative data collection which included the Teacher Well-being Scale (TWBS; Collie et al., 2016), the Teacher Subjective Well-being Questionnaire (TSWQ; Renshaw et al., 2016), the Workplace PERMA Profiler (Butler & Kern, 2016) and the Brief School Climate Inventory (La Salle et al., 2018). Among these participants, thirteen participated in additional semi-structured interviews. Quantitative data was analyzed using confirmatory factor analysis and item response theory. Qualitative data was analyzed using content analysis. Data were brought together through joint displays and analyzed using a novel process, integrated factor analysis.

Quantitative findings suggest that existing teacher well-being scales hold pre-established structural properties and are associated with other, related scales, but item fit varied. Item response theory revealed model-fit challenges using recommended response categories. Model-fit improved for both the TWBS and TSWQ once response categories were reduced. Additionally, some items were flagged for poor fit.

Qualitative findings indicated that teacher well-being includes factors at both the individual and environmental level. Specifically, individual dispositions such as having a positive attitude or ability to handle setbacks, supportive leadership, and collaborative school climates emerged as key facilitators of well-being. Job specific stress related to workload and negative relationships emerged as key barriers to well-being.

Integration of quantitative and qualitative data was supported by a process of integrated factor analysis. Scale items and qualitative codes were compared for areas of convergence (alignment) and divergence (disagreement). A revised teacher well-being scale is proposed based on integrated findings.

Synthesis of quantitative, qualitative, and integrated results suggest the following key findings: (a) teacher well-being is a multidimensional, psycho-social construct that must include both individual and environmental factors; (b) individual dispositions contribute to teachers' experiences and well-being at work; (c) the primary barriers to teacher well-being include job specific stress external to teaching; and (d) revising response categories can lead to stronger use and interpretation of teacher well-being scales.

### Primary Presenter

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### The Role of Emotion in Transformative Leader Development

This study examines the process of navigating emotions in transformative leader development, and is comprised of an analysis of interviews with senior leaders who have experienced executive coaching in the past 12 months. Emotions affect the deep structures that motivate and guide leaders' thinking and action, but the leader development literature does not provide a sufficient explanation for the role of emotions in transformative development. Therefore, executive coaches and adult learning practitioners lack a conceptual framework to facilitate the leader's experience of emotion. The primary outcomes of the study are deeper understandings of how emotion catalyzes or impedes the development journey, and identifying the conditions necessary to engage and stay in the journey. The study reveals a bias for explaining cognitive processes and leads to under theorized roles of emotions in deep learning processes in adulthood.

### Primary Presenter

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Feasibility of Developing Intercultural Competence via International Education Initiatives

Significant events during the years 2020-2021 have underscored the field of international education's need to confront its relationship with its traditional goals of peace, cooperation, and mutual understanding and community calls for social justice. Chronologically, a few of these events include De Wit calling for a more ethical approach to internationalization than the current emphasis on branding and competition; the pandemic underscoring the hyper-focus on mobility-based initiatives in international education and associated privileges required to participate; the murder of George Floyd sparking global protests against anti-blackness; and multiple violent incidents against Asian Americans highlighting the need for solidarity building between communities. This paper considers intercultural competence as a shared value between international education and social justice and provides an example for how international education can rethink its purposes and outcomes in a way that centers social justice. This paper reviews 38 articles from twenty-one peer-reviewed journals and two published books over a 30-year period in five countries, and presents mainstream and alternative definitions of intercultural competence; common assessment tools and critiques; examples of both mobility- and campus-based international education initiatives that can enhance students' intercultural competence; and evidence of the importance of faculty professional development and aligned attitudes for facilitating students' intercultural competence. The analysis found alternative definitions emphasize a fluid process and the inclusion of marginalized groups; assessment tools are deficient in assessing an etic perspective and require customization to improve accuracy; study abroad and internationalizing the curriculum (IoC) have potential as avenues for facilitating students' intercultural competence development, in which IoC is more widely accessible; professional development and aligned attitudes are essential for faculty intercultural competence development and facilitating students' intercultural competence; and caveats to success include international education initiatives as just the beginning of the process and the requisite institutional investment in human resources.

### Primary Presenter

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RESEARCH SHOWCASE

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Urban American Indian Students Negotiating Civic Identity

This critical participatory ethnographic study examines the negotiation of civic identity by urban Indigenous students in public high school social studies classes, a Native youth council, and the civic environment of a school in Washington State, where the Since Time Immemorial curriculum is mandated in social studies classes. Using Safety Zone and Tribal Critical Race theories to understand the experiences of students, stories from observations and participant interviews and focus groups are employed as data. This study found connections between students' land/s and Nation/s, participation in service and activism with other Nation/s, a caring teacher, family civic connections, curricula that centers American Indian history and current events, and school were vital to these negotiations. The study found these spaces were "zones of sovereignty" forwarding survivance and self-determination for students. Student understanding of Indigenous civic constructs of sovereignty, self-determination, dual citizenship and an understanding of federal Indian policy are explored as sites where they created and sustained their own civic identities inside and outside of school.

### Primary Presenter

Rachel Talbert

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Postdoc

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Brian Casemore

# EDUCATION

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Degrees of Relevance: A Basic Qualitative Study of How MBA Students Make Their Education Relevant as They Cross Boundaries Between School and Work

The purpose of the study was to explore how working professionals enrolled in MBA programs make their education relevant. This inquiry was guided by the following central research question: How do students enrolled in MBA programs make their education relevant as they cross boundaries between school and work? The central research question was supported by three subquestions: What are the objects crossing the boundary between the MBA program and students' workplaces? How do MBA students broker learning at the boundary? At what level are interactions occurring and to what end?

Grounded in social constructivist epistemology, a basic qualitative method was chosen for this study. Data were collected through 18 semi-structured interviews with 10 students and eight learning partners, 18 field notes that described the context of the interview and early insights from the data collected, and 28 documents such as course descriptions and work presentations. Study participants shared a total of 39 critical incidents of learning that crossed the boundary between school and work. Data were analyzed and synthesized to produce three overall themes, which were translated into a typology of four relevance-making types, which provided the basis for 10 participant profiles. Then, patterns of content, process, and outcomes for each type of relevance-making were analyzed and synthesized.

This study found that relevance-making differed by type and depended upon students' intentions for Innovative Climbing, Identity Switching, Introspective Exploring, or Fast Founding. In Innovative Climbing, students integrated new business concepts from school at work in order to earn promotions. In Identity Switching, students changed how they saw themselves and how others saw them in order to change where they work. In Introspective Exploring, students reflected upon their experiences in ways that informed their career goals. In Fast Founding, a student rapidly introduced business concepts from school into the workplace to sustain his business venture. It was through discovering or realizing these intentions that relevance was made.

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# EDUCATION

## SCHOOL OF NURSING

### Effectiveness of Community-Based Hemorrhage Control Education

Background: Trauma is the leading cause of death among people 1 to 44 years of age. Rural residents are 14% more likely to die from a traumatic injury than their urban counterparts due to untimely and ineffective emergency treatment in the prehospital setting, inequitable access to the most comprehensive trauma centers, and a lack of locally implemented injury prevention programs. Although bystanders with bleeding control (BCon) knowledge and skills are vital to the survivability of a traumatic medical emergency, only 0.5% of Idahoans have completed STOP THE BLEED®.

Objectives: Implement an evidence based BCon course that teaches participants how to identify life-threatening bleeding and control it with pressure, packing, and tourniquets. The aims were to increase participants' willingness and confidence to use lifesaving techniques, reduce their concerns about assisting trauma victims, and increase their knowledge of basic BCon.

Methodology: A pre-post same subject design was used. Thirty-three participants were recruited through convenience sampling, with the exclusion of children  $\leq 12$  years of age. A 22-item survey was administered prior to, immediately after, and within four months of training. Descriptive statistics were used to report all variables. Willingness, confidence, concerns, and BCon knowledge were analyzed using McNemar's test or a paired t-test, as appropriate.

Results: Our sample consisted primarily of white (97.0%) females (57.6%) between 60 and 79 years of age (36.4%). Immediately after training, participants were more likely to help a stranger (70% vs 96.7%;  $p = 0.021$ ) or render aid without a BCon kit (60% vs 86.7%;  $p = 0.008$ ). Confidence also improved significantly (63.3% vs 96.7%;  $p = 0.002$ ). The average number of concerns decreased from 2.17 in the pretest to 1.63 immediately after training ( $p = 0.047$ ) and to 1.54 within four months ( $p = 0.006$ ). BCon knowledge scores improved from 74.3% before training to 91% immediately after training ( $p < 0.001$ ) and remained 88.3% within four months ( $p < 0.001$ ).

Conclusions: The STOP THE BLEED® course increased willingness, confidence, and knowledge related to BCon, while reducing concerns.

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RESEARCH SHOWCASE

# EDUCATIONAL HEALTH SERVICES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Establishing a “Patient-Centered Medical Home” for Patients with Post-Acute Sequelae of SARS-Cov2 Infection (PASC): A Pilot Program in An Urban, Academic Setting

In November 2020, leaders in the George Washington University Medical Faculty Associates Divisions of General Internal Medicine (DGIM) and Infectious Diseases (ID) piloted a clinic based upon the Patient-Centered Medical Home Model for patients with the multisystem Post-Acute Sequelae of SARS-CoV-2 (PASC) who have ongoing symptoms beyond the acute phase of COVID-19. Similar models have been established at partner institutions to share experiences, practices, and knowledge and also develop unified clinical metrics: Washington University in St. Louis, UCLA, University of Chicago, and the Veterans Affairs Medical Center. Several GW internal medicine residents have volunteered to participate in the GW Recovery Clinic Pilot to better understand educational needs for management of an emerging condition.

The comprehensive care model includes: thorough symptom history acutely and chronically, focused physical exam, COVID-19 course, assessment of risk factors for severe disease, transmission mode, and any medical care sought and treatments received. This is paired with direct linkages as indicated, to neurocognitive testing, rehabilitation services, and specialist referrals (e.g. Pulmonology, Cardiology, Neurology, Physical Medicine & Rehabilitation, and Cognitive). As a clinical research learning experience for medical residents, patients who have documented positive SARS-CoV2 test are invited to participate in the GWU COVID-19 Specimen Bank for investigational purposes. Rehab therapists were positioned in the clinic to provide assessments and referrals, and have empirically noted improvement in some PACS symptoms such as postural hypotensive symptoms through therapy. Importantly, PASC clinic visits serve as an opportunity to provide reassurance and education as appropriate, which we view as critical to address patient's unease and uncertainty in the face of a global pandemic.

Anecdotal evidence from our experience in PASC clinic will likely be a powerful tool for hypothesis generation. It appears the vast majority of patients seen were never hospitalized, and the incidence of PASC as a function of severity of initial presentation remains to be determined. Furthermore pre-existing medical and psychiatric illness may constitute an independent risk for PASC and possibly influence treatment. Importantly, an initial cohort of patients accessing the clinic had higher health literacy levels allowing for easier access of resources. Broadening the reach of the clinic with strategies focused upon reaching communities of color and those who had severe COVID-19 are important next steps in model expansion. Given the high demand, primary care providers and residents are being trained to see PASC patients to ensure high value care with appropriate linkages within our medical home model.

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RESEARCH SHOWCASE

# EDUCATIONAL HEALTH SERVICES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Stuck at Home: The Impact of a COVID-19 Registry on Medical Education

#### Objective:

The COVID-19 pandemic compelled U.S. medical schools to suspend clinical rotations and transition to virtual curricula. Our institution sought to supplement students' education by creating a medical student-run COVID-19 patient registry. This registry research project was designed to provide an opportunity for medical students to contribute to a needed health service goal by documenting the clinical characteristics of COVID-19, while supporting experiential and collaborative learning about this patient population and research methodology. The purpose of this study was to develop and utilize a survey tool to characterize medical students' perceptions of their learning through participation in this team-based registry research project.

#### Methods:

Students were surveyed about their experience with this registry, assessing their perceptions regarding impact on clinical knowledge/skills, documentation/hospital operations, altruism, and research process, with select questions modeling principles of informal learning as it applies to the medical education context. Quantitative data and open-ended comments were analyzed in order to characterize the impact of registry work on informal learning.

#### Results:

Survey response rate was 62.7% (32/51). 87.5% of respondents affirmed that participation supplemented their medical education. 78% of participants felt they contributed to the COVID-19 response. 68.8% of students endorsed they gained a better understanding of research methodology, and 87.5% intend to pursue independent research from the registry data. Students commonly reported positive experiences with mentorship, improving their clinical knowledge, teamwork, and sense of altruism through work on the registry.

#### Conclusion:

This registry experience serves as a mechanism for informal learning that can be utilized to augment education during future surges when in-person clinical experiences are not feasible or are considered unsafe.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Safety Enhancement for Deep Reinforcement Learning in Autonomous Separation Assurance

Separation assurance is difficult for autonomous air traffic control systems due to the complex air traffic environment. Conventional separation assurance models often fail to keep safe with the uncertainty in offline execution. In this paper, we present a safety module for deep-reinforcement-learning-based air traffic control application to support autonomous separation assurance. The proposed module directly addresses both model uncertainty and state uncertainty to improve safety. Our safety module consists of two sub-modules namely state safety sub-module and model safety sub-module. The state safety sub-module is based on execution-time data augmentation method to introduce state disturbances in the model input. On the other hand, the model safety sub-module is a Monte-Carlo dropout extension that learns the posterior distribution of model policy. We demonstrate the efficacy of the two sub-modules in an open-source air traffic control simulator with challenging environment settings. The numerical experiment results show that the safety module helps the deep reinforcement learning agent significantly enhance its safety performance in autonomous separation assurance task.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Short-Range Order in SiSn Alloy

SiGeSn alloys have been long viewed as homogeneous random solid solutions. In contrast to this view, our very recent study has demonstrated GeSn alloys exhibit a short-range chemical order (SRO) where solute atoms are found to significantly repel each other in their 1st nearest neighbors. Employing a computational strategy that combines Density Functional Theory (DFT) calculation with Monte Carlo (MC) sampling, we found SiSn alloys also exhibit a strong SRO, but different from GeSn, such that SRO is reflected by a depletion of solute-solute 2nd nearest neighbors. This finding not only unveils the key role of SRO in group IV alloys but also substantially extends our general understanding of SRO in alloys.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### The Influence of Leg Shape on Thermoelectric Performance under Constant Temperature and Heat Flux Boundary Conditions

Today, an important portion of the energy produced goes unused in the form of waste heat, leading to serious loss of efficiency. To address this issue, thermoelectric generators offer the potential to convert waste heat into electricity, making them a promising option for thermal management. Comprised of a series of electrically conductive legs, thermoelectric generators can benefit from intricate leg shapes which are laborious to fabricate via conventional manufacturing methods. The advent of novel manufacturing techniques such as additive manufacturing, interchangeably termed as 3D Printing, enables such leg shapes with minimal material loss. However, there is little knowledge about what shapes are beneficial in applications with differing thermal conditions. This work determines the effect of different thermoelectric leg designs on thermoelectric device performance. Various leg geometries (rectangular prisms, prisms with interior hollows, trapezoids, hourglass, and Y-shape) were modeled numerically to determine their thermal and electrical performance under constant temperature and heat flux boundary conditions. Two well-established thermoelectric materials, bismuth telluride and silicon germanium, were modeled to capture both low and high temperature application cases, respectively. Per the analysis results, hourglass-shaped thermoelectric leg with a constant hot side temperature manifested the best thermal and electrical performance, since it yielded more than double the electrical potential and maximum power output compared to the conventional rectangular shape when the cold side is exposed to natural convection boundary condition. Under a constant hot side heat flux, the reverse trapezoid-shaped leg resulted in almost double the electrical potential and a 50% increase in the power output compared to the conventional leg shape. In particular, this research shows that considering leg shape alone is insufficient: varying boundary conditions (which reflect different device operating conditions) result in different performance values for the same leg shapes. These findings underscore the significant effect of leg geometry on electrical and thermal performance of a thermoelectric leg, as well as the importance of taking the device operating conditions into consideration when selecting the best leg shape.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Characterization of 3D-Printed GelMA Scaffolds for Tissue Engineering Applications

Gelatin methacrylate (GelMA) is a popular scaffold material in tissue engineering research because it is highly biocompatible, biodegradable, and 3D printable. The eventual goal is to use it for tissue replacements, avoiding the problems associated with allografts and autografts. Improved material characterization of GelMA is necessary to optimize preparation techniques, tune properties to match specific native tissues, and evaluate scaffold performance. Acoustic characterization is particularly desirable due to its non-destructive nature, making it a promising method for in vivo monitoring. In the present study, three concentrations of GelMA were 3D printed using stereolithography at varying ultraviolet light crosslinking times. Ultrasound pulse-echo techniques were employed to evaluate the physical properties of the scaffolds. Utilizing this non-destructive acoustic characterization procedure, parameters including speed of sound, acoustic impedance, and attenuation were measured. To further evaluate the material properties of the scaffolds, compression testing was also performed. Physical parameters of GelMA were found to be similar to those of native soft tissues, demonstrating that GelMA scaffolds are biomimetic. Furthermore, increased GelMA concentration resulted in faster sound speeds and higher Young's moduli. Acoustic characterization proves to be a promising technique in evaluating the structure and function of scaffolds non-destructively.

### Primary Presenter

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Harnessing the Power of Open Innovation to Design Complex Engineered Systems

Organizations are increasingly faced with complex socio-technical problems, and have looked to Systems Engineering's (SE) methodologies to solve them. However, SE's approaches and tools have not been able to solve these problems effectively—with delays, cost overruns, and underperforming systems as a result.

To address this gap, we are exploring how new approaches—open innovation (OI) in particular—could expand and bolster SE's toolbox. OI taps into a broad array of problem solvers for their input on a specified problem. With high-profile examples of success like the DARPA Grand Challenge, OI is a promising phenomenon to explore. As such, we are studying the theoretical underpinnings of open innovation and connecting those to existing SE theory. This will expand and strengthen SE theory, but also help us craft new, grounded approaches for practitioners to deploy.

For this work, we draw on data from multiple settings and employ diverse research approaches. First, we conducted two longitudinal observations of OI programs within NASA to gather real, in-depth data: Asteroid Grand Challenge program between 2013 and 2016, and the Centennial Challenges Program between 2016 and 2020. Second, we ran in silico experiments to abstract and model the dynamics we observed in the field—the interaction between problem architecture, problem solvers, on cost and solution performance. Lastly, we ran in vivo experiments to test the impacts of the interventions that our work suggested. We launched 17 robotic design challenges on the Freelancer platform, receiving 255 detailed design solutions from 139 participants. The strengths of each research approach reinforce our contributions across our research portfolio.

Our preliminary contributions address why and how to employ OI approaches for complex problems. Why: the (within discipline) crowd produces good, in-depth solutions which can outperform the organization's equivalent systems. Besides the solutions, these approaches also provide a rallying point for the relevant community and a catalyst for follow on technical development. How: solution performance depends on the problem solver(s) and the architecture of the problem. While internal experts might not be needed to solve (all parts of) the problem, its formulation is crucial to leverage the crowd. As such, the organization needs to carefully match the problem's decomposition to their solving capabilities.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Pairwise Interaction between Newtonian Drops in Viscoelastic Matrix

Suspension of drops in Non-Newtonian fluid is omnipresent in many natural and industrial phenomena such as, chemical and material processing, food processing, flow of slurries, paints etc. Macroscopic properties of these suspensions dependent on the microscopic behavior of drop deformation, orientation, inter-particle interactions and cross-stream migration. In the limit of dilute emulsions, the complex flow behavior can be understood by simply taking into account the interaction between two drops. In most of the applications, owing to the small size and velocity, the flow is dominated by inertia less Stokes flow which is linear and reversible. In Stokes flow, colliding particles follow their streamlines after collision due to the reversible nature of the flow. Drop deformation and viscoelasticity breaks the reversibility of flow and thus affects cross stream separation between two drops after collision. This study focuses on the hydrodynamic interaction between two equal sized Newtonian drops suspending in a shear flow of viscoelastic fluid. The viscoelastic fluid is modeled using FENE-CR constitutive equation and the flow equations are solved using front-tracking method. The main non-dimensional numbers, important in this study, are Capillary number ( $Ca$ ) which measures deformability of drop and Weissenberg number ( $Wi$ ) which measures viscoelasticity of fluid. The focus of this work is to understand the effect of viscoelasticity of surrounding fluid in the final cross-stream separation between two interacting drops. The study shows that, elasticity of surrounding fluid reduces cross-stream separation between drops after collision. At particular  $Ca$ , increase of  $Wi$  monotonically decreases both cross-stream separation and drop inclination angle. At lower  $Wi$ , increase of  $Ca$  decreases final cross-stream separation, whereas, at higher  $Wi$ , increase of  $Ca$  increases final cross-stream separation. Thus, it is possible to identify two regions where either of these two competing effects dominate. We are continuing our work to learn more about these observations.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### The Impact of Artificial Intelligence on Mental Health in Women of Color and Underrepresented Communities

With the rise of Artificial Intelligence and the forward movements towards the Fourth Industrial Revolution, it is no surprise that studies show the impact it has on everyday life. However, there are instances of people being impacted by these forward moving technologies in different ways. There seems to be an unjust and unbalanced experience as indicated by Women of Color and people in underrepresented communities. The impacts go as far as infringing upon the mental health of these individuals causing them to experience high levels of anxiety, elevated cortisol and stress levels, as well as an increase in harmful behavior which has been prevalent during this time of COVID. With the algorithms being created, there are unconscious biases that go into play that can cause advantages and disadvantages for people of different backgrounds and socio-economic backgrounds. With the incorrect usage of AI, there can be harmful effects on the quality of life. There are solutions that can be presented to ensure more responsible and ethical AI. In this study, I will show the effects and various uses within these communities.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Artificial Intelligence for Real-Time Topology Identification in Power Distribution Systems

With the increase in demand for electricity and the number of end-use consumers, the operation and control of power grids have become more and more complex and challenging. Ensuring acceptable reliability and quality of the electricity supply has become particularly important to every aspect of our electrified economy. Due to the growing deployment of Micro-Phasor Measurement Units ( $\mu$ PMUs) in power distribution grids, an abundance of high-resolution measurements is available that can be harnessed for smarter operation and fault analyses in power distribution networks. Traditional models have revealed limitations on the network topology identification which may occupy manpower and material resources with no guaranty to effectively restore power in a short time period when facing faults and other disruptions. This paper suggests and implements a machine learning framework that uses the  $\mu$ PMU measurements as inputs and provides a full observation of the network topology in real-time. Specifically, the proposed framework employs a Convolutional Neural Network (CNN) to identify the physical state of the power network at all times. We evaluated the framework on the IEEE 34-node test feeder, where the experiments show that the proposed CNN can achieve a promising performance with high accuracy even when the  $\mu$ PMU measurements contain noises and missing entries.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Site Selection Decision Support Tool Using Geographic Information Systems and Multi-Expert Analytic Hierarchy Process

Site selection, the process of locating alternatives for new facilities, is a complex and crucial decision faced by growing companies. Organizations often employ time consuming and informal market research techniques, which may fail to capture institutional knowledge or consider all feasible alternatives. Advancements in geographic information systems (GIS) have allowed for analytical methods to be adopted, but current GIS based methodologies may only be able to study a small area using expensive software, hardware, or data. The goal of this project is to create a decision support tool that can study a large area using open source GIS software and publicly available data, without the use of high-performance computing. The project client is a business that combines an urban winery, a multipurpose venue, and a restaurant into one facility. The company's site selection problem focuses on finding locations where there is a high demand for their products and services. Requirements elicitation was performed on several experts, and group aggregation techniques were applied to the traditional analytic hierarchy process (AHP) to generate weights for various decision criteria. Data for each criterion was standardized into a consistent scale and then loaded into GIS map layers. A weighted overlay technique was implemented to rank feasible alternatives in map form. Intermarket analysis was conducted using variables that capture an area's demand for weddings and corporate events, which are the company's key sources of revenue. Variables that capture demand for the organization's services include labor availability, existing event infrastructure, and wine consumption in the target region. Intra-market analysis is performed to provide granular recommendations by capturing factors such as crime statistics, accessibility, and proximity to complementary businesses. Recommendations were provided at a "census block group" level of granularity. Sensitivity analysis was performed to test model robustness, and model accuracy was validated through ex post analysis of the firm's existing locations. Opportunities exist to apply the underlying methodology presented in this project for other companies in various industries to address site selection problems.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Machine Learning-Based Integration of Numerical Simulations with Experimental Observations of Soil Liquefaction

Liquefaction of soils continues to be a major cause of soil failure during earthquakes. This project intends to assess and predict the liquefaction strength of Ottawa F65 sand through laboratory experiments and numerical simulations. The laboratory experiments include a series of stress-controlled monotonic and cyclic direct simple shear tests conducted at vertical stresses of 40 kPa and 100 kPa to investigate the stress-strain-strength response of Ottawa F65 sand under different monotonic and cyclic shear stress loading conditions. A fiber optic sensing approach to evaluate the horizontal stresses that develop during direct simple shear tests is implemented using 3D printed fiber-embedded soil confining rings. Parallel to the experimental campaign, a series of nonlinear finite element simulations are conducted to assess the suitability of direct simple shear tests to obtain the stress-strain-strength response of soils. These simulations specifically evaluate the effects of boundary conditions and system compliance. Observing the overall consistency of the numerical simulations with the experimentally obtained response of the soil, selected Machine Learning (ML) models are trained on a dataset collected from extensive laboratory experiments and numerical simulations for a specified set of normal stresses, cyclic stress ratios, initial shear stresses and relative densities. The ML models are then used to predict the stress-strain-strength response of Ottawa F65 sand under new normal stresses and new cyclic stress ratios.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Non-Idealities in Memristor Devices and their Impact on Training Algorithms

Resistive switching (memristor) devices are a promising emergent technology which can be programmed and can store synaptic weights in artificial neural networks thanks to its ionic-driven physics of operation. Large scale memristor matrices have potential for hardware implementations of energy-efficient and compact training in machine learning. However, this new device technology has non-idealities due to its manufacturing and inherent physical phenomena inside the device that prevent software-equivalent accuracies at the system level. Our results show that when Stochastic Gradient Descent (SGD) is used for training, the performance rapidly declines for highly non-ideal devices, even for a simple three-layer perceptron on MNIST. We have investigated the Mini-Batch Gradient Descent (MBGD) approach in the context of device non-idealities, asymmetry, and nonlinearity. Convergence curves for different batch sizes show a consistent increase in performance with the increased batch size, despite device non-idealities, but is highly sensitive to the learning rate. While very promising, MBGD is very memory-intensive. We are proposing the use of decomposition methods to alleviate this issue. The streaming batch principal component analysis (PCA) algorithm and non-negative matrix factorization (NMF) algorithm uses low-rank decomposition of the gradient during mini-batch training in order to benefit from improved accuracies and reduced memory overhead. This work shows results of this streaming batch PCA and NMF algorithms implemented for different ranks, batch sizes, and realistic memristor models and performing close to software-equivalent accuracies on a multi-layer perceptron network training on the MNIST dataset. These promising results open the way to efficient memristor-based machine learning accelerators.

### Primary Presenter

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Measuring Gender Bias in Word Embeddings of Gendered Languages Requires Removing the Grammatical Gender from the Vector Space

Numerous studies have shown that machine learning (ML) models can learn human-like biases and perpetuate them in society. For example, it was revealed that Amazon's recruiting engine discriminated against female candidates as males have traditionally dominated the tech industry. Word embeddings, which learn numeric vector representation for words based on word co-occurrence patterns and have applications in tasks such as automated resume screening are examples of biased ML models. It has been demonstrated that implicit human biases are replicated and quantifiable in English embeddings. However, in addition to learning semantic information such as gender bias, word embeddings learn syntactic information as well. This complicates measuring bias in word embeddings derived from grammatically gendered languages, as these languages assign gender to nouns and enforce accompanying words to agree with the gender. Word embeddings learn grammatical gender signals via the association between nouns and their gender, which outweigh social gender bias in magnitude. For example, although matemáticas (Spanish translation of mathematics) is a concept that is traditionally male-related, the feminine grammatical gender of matemáticas interferes with quantifying the stereotypical male-math association that is learned by the embeddings. As a result, bias quantification methods like the Word Embedding Association Test (WEAT) need to first remove grammatical gender information to measure bias in gendered languages. For the first time, this study generalizes WEAT from English to six grammatically gendered languages of French, German, Italian, Polish, Russian and Spanish which belong to different branches of the Indo-European language family. The study introduces methods to identify, evaluate and remove grammatical gender signals from word embeddings iteratively via linear discriminant analysis (LDA) and support vector classification (SVC). Analyses were performed on FastText embeddings, which are trained on text corpora consisting of more than 10 billion tokens for each of the languages. After removing grammatical gender, results demonstrate that the computed bias scores from the embeddings match the aggregate stereotype-congruent ground truth scores reported by millions of human subjects in social psychology who are native speakers of these languages. This research demonstrates that although grammatical gender and semantic gender bias signals are entangled, they are to a great degree independent of one another in word embeddings. Furthermore, the suggested method provides a tool to further investigate the relationship between language structure and semantics.

### Primary Presenter

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Rheological Study of Scaffold Degradation in Vascular Grafting Applications

Degradable polymeric materials have been used in ultrafast dissolving applications such as vascular grafting, drug delivery and 3D printing. Porous, polymeric scaffolds are designed for controlled delivery of nutrients that support osseous tissue growth and vascular formation. Premature degradation of the scaffold material may occur due to pulsatile nature of blood flow and mechanical loading. As a consequence, uncontrolled material release may impede tissue engraftment and neovascularization. Therefore, developing an understanding of the time-scales of polymeric prosthetic degradation is essential in designing predictable and tunable scaffolds for vascular grafting applications.

We experimentally observed the degradation of prefabricated scaffolds of hygroscopic materials such as polyvinyl alcohol (PVA) that undergo swelling, rupturing, and large-scale material release via structural degradation. We hypothesized that the scaffold material being released in the surrounding media will impart a change in the material properties of the media such as apparent viscosity and viscoelasticity and set out to investigate this phenomenon using a standard a strain rate controlled, rotational rheometer (DHR-2, TA Instruments Inc).

In our experiments, PVA scaffolds of known mass were placed in well plates in a medium that facilitates the growth of cells, such as human endothelial vein cells (HuVEC). At various time-instances the media was extracted from the well plates and tested using a strain-rate controlled, rotational rheometer with a cone and plate geometry at 37 degrees Celsius (human body temperature). The scaffolds were not inoculated in this study to avoid the additional material release components from cellular waste that may obfuscate the data due to the scaffold material release. Each measurement is recorded three times and averaged. The rheometer calibration and limitations due to low torque and secondary flow effects were carefully considered while estimating the zero and infinite viscosities. We characterized bulk-scale viscosity variation due to scaffold material degradation as function of time and over a range of shear rates that encapsulate in vivo conditions in the human vasculature.

We have achieved a preliminary understanding of scaffold degradation for PVA material in cell growth facilitating media. This study will facilitate development of biodegradable polymeric-scaffolds with predictable degradation characteristics for biomedical and clinical applications such as vascular grafting and osteochondral regeneration.

### Primary Presenter

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# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Green Coal Production Plant Modeling

As many institutions are moving towards decarbonization, the coal industry is slowly declining and exploring new markets. During the last three years, teams from The George Washington University and Mississippi State University have worked on a joint research program that aims to produce three new patented products derived from coal: absorbents for water remediation, soil fertilizer, and low-emission coal pellets. These new environmentally-friendly products could potentially revitalize the coal industry. However, there is currently no existing plant ready for production of these products and the design of a high-performance plant is paramount to achieving this new market.

The production line of the plant consists of processes that the coal will undergo, each product having its specific path to obtain the desired attributes. Therefore, the project goal is to create a plant design and a simulation model of the production line, as well as a user guide that presents a detailed summary of analyses performed to increase plant throughput and reduce risk. The creation of an accurate simulation model for the production plant will be accomplished in five steps. The first is obtaining data, which will occur through both research (including technical manuals and scholarly articles) as well as expert elicitation from the client. This step is necessary in designing a plant layout that satisfies the system constraints while meeting the client's demands. The second step will be a flow rate analysis in Microsoft Excel to explore the introduction of different optimization techniques using buffers within the production plant. In the next step, a simulation model will be created in Simio software. The fourth step will include the actual implementation of the Simio model to study efficiency and risk analysis of the production line. The fifth and final step will be devoted to the development of a user guide for the client to explain the usability of the Simio model and draw conclusions for the client to implement.

The anticipated benefits of this project are to illuminate issues that will affect the utilization of the production line and to provide the client with strategies to improve the flow of the overall production line. Furthermore, a simulation model will allow the client to have better control over how the production line operates. The user guide that accompanies the model will also provide useful insights into how and when certain controls can be implemented on the production line and their potential adaptation to future changes of the plant.

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RESEARCH SHOWCASE

# ENGINEERING

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Thermodynamic Analyses of an Ejector Refrigeration System for Disaster Relief Applications

Natural disaster-prone regions such as Puerto Rico are facing adverse effects of climate change during the Atlantic hurricane season. From June through November annually, challenges arise for the preservation of medicines, vaccinations, food, agricultural produce, and clean water. Hurricanes Dorian and Iota, in 2019 and 2020, respectively, were category-5 storms that caused damages worth billions of US dollars. The damages led to recurring long-term power outages and impending refrigeration requirements for essential food and medicines. For example, insulin was inadequately supplied due to the failures in cold supply chain networks.

To address this need, a low-cost, ejector-based refrigeration is being designed considering the use of environmentally friendly refrigerants and implementing sources of waste heat. The system incorporates a supersonic ejector that works on the mechanism of (i) entrainment between the primary (driving) flow and the entrained refrigerant (driven) flow and (ii) turbulent mixing to compress the refrigerant. The experimental data for ejector efficiency and entrainment ratios under self-entrainment mode were acquired for air as the working fluid in previous studies. In this study, (2-D axisymmetric) numerical simulations were performed with air using COMSOL Multiphysics software (version 5.5) to understand the supersonic flow patterns via velocity, pressure, and turbulent kinetic energy fields. This numerical solver is finite element-based and incorporates high Mach number flows with the k-epsilon turbulence model. Thermodynamic analyses of the ideal reverse Carnot refrigeration cycle were performed using an in-house Python program (EjecRef v 1.0) utilizing ASHRAE data to visualize ejector-based refrigeration cycles on pressure-enthalpy and temperature-entropy graphs. The conditions of entrainment ratios, total pressures, and total temperatures were parameterized and the state of the evaporator and ejector efficiency was initialized in the EjecRef program. The R134a (1,1,1,2-tetrafluoroethane) and R290 (propane) refrigerants were chosen for these systemic simulations considering their global warming potentials (GWP), ozone depletion potentials (ODP), and lower flammability limits (LFL). The combination of experimental data, simulations, and thermodynamic analyses utilizing the EjecRef program (v 1.0) provide realistic design constraints such as cooling capacity and coefficient of performance (COP).

The Atlantic hurricane season causes intermittency or loss of grid-based power systems, thus, creating an imminent need to preserve essential food and medicines. The insights gained from these analyses will help facilitate the development of the low-cost ejector-based refrigeration system for off-grid disaster applications.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Association between Increasing Agricultural Use of 2,4-D and Population Biomarkers of Exposure: Findings from the National Health and Nutrition Examination Survey, 2001-2012

To combat weeds resistant to commonly used herbicides, alternative methods of weed control have been adopted utilizing application of a secondary herbicide. The widespread use of combination herbicide products has driven up demand for 2,4-D, a phenoxyacetic acid herbicide widely used to control weeds on lawns, turf, and a variety of crops. The objective of this study was to examine trends in 2,4-D urinary biomarker concentrations to determine whether increases in agricultural application of 2,4-D in the US have resulted in an increase in population exposure.

NHANES data with available urine 2,4-D biomarker measurements from survey cycles between 2001 and 2012 were utilized. Participants with missing relevant data were excluded, resulting in a total of 12,059 (90.30%) participants. Urine 2,4-D values were dichotomized using the highest LOD level across all cycles (0.40 ug/L). Because use of 2,4-D has not increased linearly over time, the amount of 2,4-D used in crop applications was analyzed as a predictor of exposure. Amount of 2,4-D applied was estimated using a variety of pesticide use data sources published by the U.S. government.

Of the 12,059 participants included in the study, 3855 (31.25%) had urinary 2,4-D levels above the dichotomization threshold. The frequency of higher level of exposure significantly increased, from 17.0% to 39.8%, over the series of surveys ( $p < .0001$ ). The adjusted odds ratio for high 2,4-D exposure level associated with pounds of 2,4-D utilized in crop applications (per million pounds) was 1.065 (95% CI 1.043-1.087,  $p < .0001$ ). Several of the models demonstrated an increased odds ratio for higher level of exposure in specific age and sex groups. For children ages 6-11 ( $n=1887$ ), the adjusted odds ratio was 1.095 (95% CI 1.055-1.137,  $p < .0001$ ), while for participants age 60 and older ( $n=2529$ ), the adjusted odds ratio was 1.095 (95% CI 1.069-1.121,  $p < .0001$ ). For women of childbearing age (20-44) ( $n=2063$ ), the odds ratio was 1.081 (95% CI 1.049-1.115,  $p < .0001$ ).

This study demonstrates that as average annual use of 2,4-D increased, individuals had increased odds of having higher levels of 2,4-D detected in their urine. With the expectation of increasing agricultural use of 2,4-D, the strong association between crop application and human exposure is concerning, particularly with respect to certain vulnerable populations who appear to be more highly exposed than the general population.

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## RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Association between Decline in eGFR and Prior Dysuria among Nicaraguan Sugarcane Workers

**Background.** Nicaraguan sugarcane workers have an elevated prevalence of chronic kidney disease of unknown origin, referred to as Mesoamerican Nephropathy (MeN). Work in the sugarcane industry may involve exposure to climatic heat and strenuous physical labor, suspected contributors to the development of MeN. These same factors increase the risk of dysuria and crystalluria which may be a source of transient kidney injury, though it is unknown if dysuria leads to a decline in kidney function.

**Objective.** In a longitudinal study of sugarcane workers, we examined whether experiencing dysuria was associated with subsequent reduced kidney function.

**Methods.** Male workers at a sugarcane company in Nicaragua were sampled within job and year between July 1997 – June 2010. Months worked were abstracted from employment records and occurrence of dysuria and serum creatinine measurements were abstracted from medical records. Estimated glomerular filtration rate (eGFR) was estimated and categorized into two binary categories,  $\geq 90$  (at least mild loss of kidney function) and  $< 60$  (at least mild to moderate loss of kidney function) mL/min/1.73m<sup>2</sup>. To examine the relationship between prior dysuria diagnosis (ever/never) and eGFR outcome, logistic regression based on generalized estimating equations for repeated events was used. Based on the regression, we reported the odds ratio (OR) and the 95% confidence interval (CI), controlling for age, cumulative months worked, proportion time worked in cane cutting, and period of the harvest season.

**Results.** A total of 1,676 eGFR measurements were made across 190 workers. 134 workers had at least one dysuria diagnosis, and 72% of eGFR measurements were preceded by a dysuria diagnosis at an earlier time. Experiencing an eGFR  $\geq 90$  and  $< 60$  were both associated with ever having a dysuria diagnosis in adjusted models, with OR=2.26 (95% CI 1.40, 3.66) and OR=3.82 (95% CI 1.79, 8.15), respectively.

**Conclusion.** Dysuria diagnosis was associated with low eGFR measurements. These findings suggest that crystalluria may contribute to subsequent transient changes in kidney function, though more research is warranted.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Does Neighborhood Access to Green Space Influence the Prevalence of Childhood Obesity in Cities Globally? A Systematic Review

Background: Green space plays a vital role in promoting physical activity and hence has potential to contribute to reducing childhood obesity and improving health.

Objectives: This systematic review examines the association between access to green space and childhood obesity.

Methods: Following the Navigation Guide framework, literature searches were conducted in SCOPUS and PubMed. Of the 219 studies retrieved, eight studies met the inclusion criteria and were assessed for methodological quality and strength of the evidence.

Results: The majority (87.5%) of papers found some positive association between access to green space and childhood obesity, but the strength of association was inconsistent and mixed across studies. Several studies found that the relationship varied by factors such as age, level of physical activity, socioeconomic status, media use, and green space measures.

Discussion: Further studies are necessary to confirm the results and minimize the effect of confounders such as physical activity and diet. Additionally, using an effective and single approach to measure green space features can lead to more consistent findings.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Particulate Matter Exposure and Association with Atopic Dermatitis: A Systematic Review

Atopic dermatitis is a chronic inflammatory condition that can cause itchiness, rashes, cracked and dry skin, and sensitive skin, and is a growing concern in children. Two of the most common triggers of atopic dermatitis are genetics and environmental triggers, including air pollution. Particulate matter is an air pollutant that has become an increasing health concern all around the world. Many previous studies have shown an association between particulate matter and asthma exacerbation and development. However, the evidence for increased risk of atopic dermatitis and skin irritation is limited. The exact mechanism by which atopic dermatitis is exacerbated or developed also remains unclear. We conducted a systematic literature review to investigate the association between exposure to particulate matter and atopic dermatitis among children. A total of seven studies were identified and reviewed following the methods and principles of the Navigation Guide. The articles studied associations between particulate matter and atopic dermatitis symptoms in children aged 0 to 6 in two East Asian countries, and the main population of interest across all studies was infants, toddlers, and young children. The majority of studies reported a positive association between air pollution exposures and risk of atopic dermatitis, although there were differences in types of air pollutants studied. More research studies are needed to understand the long-term effects of prolonged exposure to particulate matter and how this may affect the skin barrier in children and as they grow up.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### The Mobilization of Contaminants from Superfund Sites to Adjacent Communities Due to Severe Water Events

**Introduction:** As climate change increases the severity of water events, toxicants can be mobilized from contaminated sites to adjacent communities. There are countless toxic sites across the United States, and the EPA has 1344 “Superfund” sites currently on their national priorities list to be remediated.

**Methods:** In this review, I utilize The Navigation Guide methodology to assess the literature regarding the relationship between Superfund sites and the migration of hazardous substances due to severe water events. A comprehensive literature search of Pubmed, Proquest Environmental Sciences, and Scopus yielded five studies that fit my inclusion criteria.

**Results:** These studies examined a variety of outcomes, including changes in trace elements in tap water, toxicants in soil, and surface water contamination. All studies found at least one positive relationship between a water event and contamination in an adjacent environmental media, but I determined the overall strength of the research to be limited.

**Discussion:** The body of literature was weakened by confounding and the lack of adequate baseline measurements for contamination levels in proximal communities, despite the Superfund sites being designated national priorities before the occurrence of each severe water event. This is an urgent environmental justice issue. The communities that neighbor Superfund sites are disproportionately minority, educationally disadvantaged, below the poverty level, and linguistically isolated. Both the results of the studies and the limitations within the literature highlight the need for thorough monitoring and expedited remediation.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### **Rainfall and Diarrheal Disease: A Systematic Review Assessing Effect Modification by Improved Drinking Water, Sanitation, and Hygiene**

**Background:** Despite global efforts, diarrheal disease continues to be a leading cause of death globally. Climate change is expected to increase the global burden of diarrheal diseases through changes in the global water cycle, including changes in frequency and intensity of hydrometeorological events, and threats to water, sanitation, and hygiene (WASH) infrastructure. Rainfall and WASH are important factors in the spread of diarrheal disease; however, little is known about how rainfall and WASH interact to impact diarrheal disease. The objective of this review was to assess the evidence for the interaction between rainfall and WASH on the outcome of diarrheal disease.

**Methods:** We conducted a systematic literature review using the Navigation Guide approach. We searched PubMed and Scopus for studies that assessed an effect modification relationship between rainfall and water, sanitation, or hygiene and the outcome of diarrheal disease. We conducted a qualitative assessment of the quality and strength of the evidence.

**Results:** Of the 441 unique search results, 4 studies met the inclusion criteria and were included in the final review. Based on the limited number of studies, low quality of the body of evidence, and inconsistency in results, we determined that there is insufficient evidence that improved WASH modifies the effect of rainfall on diarrheal disease.

**Discussion:** Given that climate change is expected to increase the already large global burden of diarrheal disease, it is crucial that we understand how WASH interventions and rainfall interact to impact diarrheal disease. More large-scale studies and flexible research funding are needed to investigate this question.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Wildfires and Children's Mental Health: A Systematic Review

**Background:** As climate change leads to more frequent and intense natural disasters, the need for comprehensive research-based recovery strategies are vital for future generations.

**Objective:** The Navigation Guide methodology was applied to determine whether there was an association between wildfire exposure and adverse mental health outcomes in children.

**Methods:** The Navigation Guide methodology was utilized to a) specify the study question, b) select the evidence, and c) rate the quality and strength of the evidence. Previous literature dictated the protocol for conducting a comprehensive search of the literature, and relevant studies were identified using prespecified criteria. Each study was evaluated for risk of bias and then the body of literature was rated for the quality and strength of the evidence provided.

**Results:** There were ten included studies in this review based on the inclusion and exclusion criteria. Through narrative analysis it was shown that wildfire exposure could lead to an increase in adverse mental health symptoms in children across all studies. However, the risk of bias was determined to be generally high across studies and the body of evidence was deemed low quality.

**Conclusion:** Based on the Navigation Guide, there was inadequate evidence that wildfire exposure was associated with adverse mental health outcomes. However, future research and investment in mental health and disaster recovery is needed to fully address this issue.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Pesticide Exposure and Polycystic Ovary Syndrome (PCOS): A Systematic Review

**Background:** Polycystic ovary syndrome (PCOS) is one of the leading causes of infertility globally, but little is understood about the environmental exposures that contribute to its development. Environmental pesticide exposure is common, and many pesticides are considered endocrine disrupting chemicals.

**Objective:** This paper applied The Navigation Guide systematic review methodology to examine the association between pesticide exposure and PCOS in humans.

**Methods:** The literature published prior to December 9, 2020 was searched for studies with original, population-based data that matched pre-established inclusion criteria. The risk of bias was assessed for included studies and the body of evidence was graded for overall quality and strength.

**Results:** Six studies were identified that met the established inclusion criteria. The risk of bias across the six studies was generally “low” or “probably low”, and the overall body of evidence was graded “low”. A meta-analysis was not conducted due to heterogeneity of study data.

**Discussion:** The body of evidence included for review suggested some positive association between pesticide exposure and PCOS, but inconsistency and imprecision were observed across the studies. Heterogeneity was observed in the variety of pesticide exposures measured. A majority of the studies used small sample sizes and wide confidence intervals were observed.

**Conclusions:** This review found that there is “inadequate” human evidence that exposure to pesticides is associated with PCOS in females. Further population-based study of a variety of populations is needed to understand more about the potential association between pesticide exposure and PCOS.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### A Systematic Review: Global Wildfire Events and GHG Emissions

In the past two decades, the number of wildfire events that have occurred globally has significantly increased, leading to a significant amount of greenhouse gases emitted into the atmosphere. With climate change further exacerbating boreal forest conditions, there is a need for the global community to quantify the emissions of greenhouse gases that result from wildfire events. Although GHG emissions estimates from wildfire events do exist, there have been no such reviews that have attempted to collect and compare wildfire GHG emissions to anthropogenic sources. Therefore, this review sought to identify greenhouse gas emissions estimates from global wildfire events and determine if the emissions quantified would be comparable to anthropogenic sources.

A literature review of studies published between 1990 – 2020 that attempted to quantify greenhouse gas emissions from various global wildfire events was conducted. Of the 3,372 studies identified for this review, only 11 articles that met the inclusion criteria were ultimately selected and included in this review. The studies included represented research conducted in a variety of countries including Argentina, the United States, Canada, China, Russia, and South Korea. All studies measured at least one of the major greenhouse gases (i.e. carbon dioxide, methane, nitrous oxide, and ozone) via either Mg (mega-gram) or Tg (tera-gram), respectively. Of the studies included, fire emission equations, modeling of trace gases, and spatial modeling techniques were the primary methods of determining greenhouse gas emissions from wildfire events.

Based on the analysis and interpretation of the emission estimates provided, as well as, the methods utilized in each of the studies, it was concluded that the strength of evidence is low. We were unable to assess a significant association between the exposure and outcome of interest due to a variety of factors including variations in study design and emissions estimation techniques, the accuracy of the information, and the potential for risk of bias. Therefore, although GHG emissions estimates were reported, it was difficult to conduct a comparison, nor was there a comparison of wildfire emissions to anthropogenic sources present in the included studies.

However, as the problem of climate change grows, it is imperative that further funding and research on GHG emissions from wildfire events continue in order to accurately quantify the amounts of these harmful gases that are entering our atmosphere.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Mental Health Outcomes following Hydrological Extreme Weather Events among Pacific Islanders: A Systematic Literature Review

**Background:** There is growing literature surrounding the relationship between climate change and mental health. The Pacific Islands are among the most vulnerable to health risks related to climate related disasters. Understanding the implications to mental health is imperative for determining the most effective interventions and policies for this region.

**Objective:** I conducted a systematic review of the existing body of literature exploring the association between hydrological extreme weather events (HEWEs) and adverse mental health outcomes among populations in Pacific Island countries.

**Methods:** I utilized the Navigation Guide methodology to identify relevant literature through four databases and selected studies based on prespecified inclusion and exclusion criteria. Each study was evaluated for the risk of bias, the quality of the evidence, and strength of the evidence.

**Results:** Six studies met the inclusion criteria and assessed mental health outcomes within a Pacific Island population following a HEWE. Although a positive association is observed between HEWEs and adverse mental health outcomes, chance, bias, and confounding could not be ruled out as an explanation for the association with reasonable confidence. Risk of bias was high as majority of the studies adopted a cross-sectional design and relied on qualitative methods for data collection and analysis. Quality of the evidence was determined to be “low.” Factors such as the number, size, and quality of studies as well as an underutilization of quantifiable measurements constrain confidence in the association.

**Discussion:** In accordance to the Navigation Guide methodology, I concluded that there was “limited” evidence for the association between HEWEs and adverse mental health outcomes among Pacific Islanders. Findings from this review make it critical to highlight the mental health implications associated with natural disasters, and more broadly climate change, within the Pacific Islands where mental health services are underutilized, mental health needs remain unmet, and mental health is still stigmatized.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### The Effect of Occupational Exposure to E-waste on DNA: A Systematic Review

Over the past few decades, global consumption of electrical and electronic goods has continued to skyrocket while the lifespan of these products has become greatly diminished. Currently, the accumulation of electronic waste has led to the development of a burgeoning environmental crisis responsible for an increase of associated health problems. Specifically, exposure to elevated levels of e-waste pollutants (heavy metals, radioactive metals, lead, PCB, PAH, PCDD, PBDF, PBDE and DL-PCB) may serve as a risk factor for a plethora of negative health outcomes including DNA damage. Those who are occupationally exposed to informal sector e-waste recycling operations may be at greater risk for DNA damage. We conducted a systematic review of the literature, utilizing the methods and principles of the Navigation Guide, to assess the association between occupational exposure to informal sector e-waste recycling operations and DNA damage and oxidative stress. We identified 9 papers for inclusion in this review. All studies reported an association between occupational exposure to e-waste or a chemical component of e-waste and DNA damage or oxidative stress. Findings from most studies indicated that those who were involved in informal recycling of e-waste had higher rates of DNA damage than both those employed in other waste management sectors and those residentially exposed to e-waste. Although the current evidence is suggestive of an association, more high-quality epidemiological studies with greater statistical power are needed to confirm these associations.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Systematic Review: The Relationship between Hurricanes and Emergency Department Use in the Elderly Population

This systematic review aimed to identify the relationship between emergency department visits and the elderly population after exposure to a hurricane. Relevant articles were identified through PubMed, Scopus, and ProQuest. Studies were analyzed in Covidence and selected based on inclusion and exclusion criteria. The inclusion criteria were defined as follows: the study was in the United States, the exposure occurred on the east or gulf coast, the study was published after 2010, the study population included adults ages 65+. Studies were excluded if they occurred outside of the United States, published before 2010, the exposures did not happen on the east or gulf coast of the United States, or the exposure was not a hurricane. In each of the seven studies analyzed, there was a positive relationship between emergency department visits and the elderly population after exposure to a hurricane. These studies accounted for different storms, various locations, and different time periods and all found similar results for each population studied. It is concluded from this review that there is an increase in emergency department use from the elderly population after a hurricane occurs. This information will be useful in developing disaster preparedness response plans in the future.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Examining the Association Between Climate Change Factor Events and Conflict, a Systematic Review

Climate change continues to be a dominating force increasing the frequency of extreme weather events around the globe. Continual exposure to the acute events cripples the economies and health of low- and middle-income countries and regions ill-equipped to deal with the changing environment. There are not many events more immediately damaging to the health of a region than conflict, armed or civil. Emerging research is examining the association between regional exposure to climate-change events, such as extreme drought, water scarcity, monsoons, and others, and a conflictual outcome in various forms. To better understand the impact these extreme weather events have on the health of an exposed population, a systematic review of the literature was carried out examining the relationship between climate change factor events and conflict development in applicable Middle Eastern North African (MENA) countries.

The process for this review follows the Navigation Guide criteria. A systematic search of epidemiological, environmental, and meteorological literature was performed to determine the extent of included studies. Each study was rated for risk of bias and examined for quality and strength of evidence before coming to a determination of the overall quality and strength of evidence.

9 retrospective or cross-sectional studies published in peer-reviewed public health and epidemiology journals were identified. 5 of the 9 studies included focus on drought, water scarcity, or desertification, with the other 4 representing exposures to weather systems such as cyclonic or flooding events. The current body of evidence was rated as moderate.

All studies individually demonstrate a positive association between exposure to climate factor events and conflict outcome, however, the difference in scale and methodology of analysis between studies, as well as the lack of a robust body of evidence, is not enough to assume generalizability. More research needs to be done to standardize measurement of both exposure and outcome so future studies may better approximate the association and allow prediction of when and where future conflicts may emerge.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### **A Systematic Evaluation of the Human Health Effects from Exposure to Cobalt and Compounds: Reproductive and Developmental Outcomes**

**Background:** In 2020, the U.S. Environmental Protection Agency (EPA) identified exposure to cobalt as a chemical of potential public health concern under the Safe Drinking Water Act. EPA identified the need for an updated evaluation of “developmental studies” to regulate cobalt in U.S. drinking water.

**Objective:** Conduct a systematic review evaluating the epidemiological evidence of environmental cobalt exposure on human reproduction and development.

**Methods:** Systematic review methods developed by EPA’s Office of Research and Development Staff Standard Operating Procedures for Developing IRIS Assessments were used to search, screen, and evaluate studies included in this analysis.

**Results:** A targeted literature search identified over 5,000 unique references. Utilizing manual screening processes, including the utilization of specialized software (e.g., SWIFTActive), 21 epidemiological studies were considered to be PECO-relevant following full-text review. Majority of the identified studies implemented case-control and pregnancy/birth cohort study designs. Studies included in this analysis were considered to be adequate or good across a majority of the study evaluation domains (e.g., exposure measurement, outcome ascertainment, participant selection, confounding, analysis). Strongest evidence adjusted for exposure to multiple metals.

**Conclusion:** In this systematic review, nearly all the studies identified found either null or positive associations from exposure to environmental cobalt on pregnant women and their offspring. Determining any causal effect from environmental cobalt exposure on reproductive and developmental outcomes is limited by the number of studies per endpoint and the lack of influential studies. Additional evidence is required to better understand the effects of cobalt exposure on pregnant women and their offspring.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Systematic Review: 17-alpha Ethinylestradiol Effects on Male Fathead Minnow's Vitellogenin Plasma Levels in 21 days

Researchers and government officials have highlighted the presence of xenoestrogens in wastewater treatment plant (WWTP) effluent. Xenoestrogens, specifically 17 alpha-ethinylestradiol (EE2) are major concern as they are typically in WWTP effluent due to their limited ability to degrade throughout the WWTP process and are flushed into streams. EE2 is a synthetic estrogen commonly found in oral contraceptives and hormone replacement therapy. There have been many studies conducted ranging from studying the acute and chronic effects of EE2 on *Pimephales promelas* or fathead minnows. This systematic review used the Navigation methodology to evaluate the effects 17-alpha ethinylestradiol has on male fathead minnow's vitellogenin plasma levels after a 21-day exposure of EE2. After screening studies, eight studies were included for final evaluation. There was a dose-response relationship as vitellogenin plasma levels were higher in EE2 treated concentrations compared to controls of water alone. In addition, within the different treatments of EE2, there was a significant difference of vitellogenin plasma levels in male fathead minnows. These two findings conclude that EE2 is a chemical of concern for male fathead minnows and ultimately reproduction for exposed fish.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### The Role of Di(2-ethylhexyl) Phthalate (DEHP) during Early Development on Autism Spectrum Disorder: A Systematic Review

**Background:** The exact etiology of autism spectrum disorder (ASD) is still unknown. This systematic review looks at the evidence published since 2016 of the associations between prenatal and/or exposure to DEHP and ASD.

**Methods:** Studies that were published between 2014 and December 2020 were included in the review. Databases searched were PubMed, Scopus, and ProQuest Environmental Science Collection. Included studies assessed the effect of DEHP during pregnancy or early childhood on ASD occurrence. The search resulted in 167 studies returned for eligibility screening and 4 studies were included. Due to the different statistics used for summarizing results and a lack of heterogeneity between studies a meta-analysis could not be performed.

**Results:** There were a limited number of studies that assessed the risk of DEHP exposure on ASD diagnosis. Across included studies three were cohort studies and one was a case-control pilot study. In all the included studies DEHP was measured using biomarkers in biological samples. Autism and autism characteristics were assessed using different methods; two of the studies used the gold standard Autism Diagnostic Observation Schedule, one study used a doctor confirmed ASD diagnosis but did not establish what validation tool was used, and the one study used the Social Responsiveness scale 2 (SRS-2) diagnostic tool. The SRS-2 test is well validated and highly correlated with ASD diagnosis. One study reported that there was not an increased risk for ASD with higher exposure to DEHP. Another found that there was no observed association between gestational DEHP exposure and higher SRS scores. The third evaluated study found that infants with high phthalate levels, including DEHP, were at moderate risk for an adverse neurological outcome but that the risk was substantially elevated if infants had a high gene score for oxidative stress and high phthalate exposure.

**Conclusions:** This review shows potential evidence of DEHP exposure influencing ASD. However, there was low quality of evidence found across studies was primarily due to poor exposure assessments; most studies used an insufficient number of urine samples to assess exposure which are likely only reflective of the last 6-12 hours of exposure to DEHP. Future cohort studies need to account for the potential variability in exposure across pregnancy and early childhood by taking many urine samples and pooling.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Neighborhood Walkability and Cardiovascular Risk: A Systematic Review

As the incidence of cardiometabolic diseases continues to rise and cardiovascular disease remains the leading cause of death in the United States, the influence of the built environment on behavioral risk factors has become a primary area of research aimed to inform public health interventions and initiatives. This systematic review evaluated the current body of evidence assessing the relationship between neighborhood walkability and risk of cardiovascular disease, considering physical inactivity as having a potential mediating role. In searching four databases for peer-reviewed articles published in the English language between January 2016 and December 2020, this review identified 11 articles that qualified for inclusion. In order to assess the quality of the evidence, the included studies were first systematically evaluated using a risk of bias analysis. The “low” quality rating resulting from this analysis was then incorporated into a strength of evidence analysis, from which I determined that there was insufficient evidence to support a negative association between neighborhood walkability and risk of cardiovascular disease. The results of this review reinforced the need for representative longitudinal studies that explore this complex relationship and effectively address confounding biases related to preexisting health-seeking behaviors and the self-selection of physically active individuals into highly walkable areas.

### Primary Presenter

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Systematic review of CAFO Air Emissions Exposure and Community Respiratory Outcomes

Intensive industrial farming of livestock has increased dramatically over the last few decades, both in the US and globally. The rise of concentrated animal farming operations (or CAFOs) has also led to an increase in biological aerosolized emissions, (or bioaerosols), also contributing to air pollution via gases such as ammonia and hydrogen sulfide, particulate matter, and volatile organic compounds.

Occupational studies and systematic reviews have identified a linkage between exposure to livestock-related air pollution and adverse respiratory symptoms and outcomes, but there is less research and consensus on the respiratory effects to residents of CAFO-adjacent communities. This systematic review aims to determine if there is an association between exposure to industrial farming air emissions and respiratory outcomes in nearby communities, along with the nature and magnitude of this potential association.

The development of this systematic review was informed by the Navigation Guide. A search of the scientific literature across 3 databases was conducted to identify studies meeting the predetermined inclusion criteria. The 19 qualifying studies were scored on risk of bias and subsequently evaluated on quality and strength of evidence.

4 of the 19 studies used direct measures of industrial farming air emissions while 15 used distance to farm or other proxy methods of exposure. Most studies of community exposure pointed to an association with adverse respiratory symptoms and outcomes, but certain study limitations prevent a generalization of the results. Respiratory outcomes in CAFO-adjacent residential communities may vary by farm location, animal type, exposure duration, and emission composition, among other factors. Future studies should seek to directly measure, monitor, qualify and quantify exposure to the various components of CAFO emissions, and investigate longitudinal effects to further understand the effects of chronic and acute exposure.

### Primary Presenter

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Smart Health Mask

The Smart Health Mask™ is an IoMT device that can intermittently or continuously monitor a person's vital signs. The lightweight, breathable face mask uses Bluetooth technology to transmit the vital signs to the cloud and a mobile app. Alerts to seek medical attention and call EMS to make the Smart Health Mask™ different from other products on the market. To assist those who have developed COVID-19, the Smart Health Mask can monitor vital signs, provide education, and alert emergency contacts and EMS.

When one of the selected vital signs falls out of specification, the device alert will buzz an alarm. The Red-Alert is activated when medical assistance is in need. The mask, app, and cloud icon display a green light when activated. All vital signs are OK, and no need for filter replacement.

The user will ensure the device is fully charging. Receive a short education on proper use, cleaning, and fit; enter his demographic information into the app if he wishes; fit the mask to the face; establish vital sign baselines; answer a short questioner.

Ongoing use includes continuous/intermittent monitoring of vital signs; notifications, alerts-low battery, filter change, seek medical treatment; location tagging; push notification to tag new location; update COVID-19 status.

The innovative mask technology includes LED biosensors of pulse oximetry, respiration, heart rate, and a thermistor that measures body temperature. Bluetooth and mobile wireless technology for app/device interface, and AWS for web hosting and analytics.

Detecting the onset of covid-related symptoms is a binary classification problem using a supervised learning model. Conclusion: The Smart Health Mask utilizing an OEM PCB measures temperature, heart and respiratory rates, and oxygen saturation. The medical data transmuted by a BT to a phone app and secure Cloud storage.

### Primary Presenter

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### **A Systematic Review: Mold and Moisture Exposure and Respiratory Symptoms in Schoolchildren**

Background: Moisture and dampness in school buildings can lead to mold and indoor air pollutants exposing the developing bodies of children. Consistent associations have been found between moisture and mold exposure and respiratory symptoms. Symptoms can include wheezing, cough, fatigue, and asthma. Many studies have been conducted to explore exposure to moisture in homes but few have looked at exposure in schools.

Methods: This systematic review used the Navigation Guide methodology to evaluate the impact of moisture and mold exposure on respiratory symptoms in schoolchildren. Seven studies were included in the final evaluation.

Results: Exposure to moisture and mold damage in schools seems to be associated with respiratory symptoms in schoolchildren. The most common respiratory symptoms reported were wheeze, prolonged cough, and nasal symptoms. Cultural and geographical associations also seemed to play a role in moisture and mold damage and respiratory symptoms.

Conclusion: Moisture and mold damage needs to be regarded as a serious public health issue, especially in terms of childhood exposure. Avoidance and/or remediation in schools will benefit the health of children and environmental management should be heavily considered in schools.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Systematic Review: Wildfire Smoke Exposure and the Long-Term Health Outcomes of Wildland Firefighters

**Objectives:** Wildland firefighters are repeatedly exposed to wildfire smoke which contains air pollutants that can affect human health outcomes. This systematic review sought to determine the state of long-term health outcome research regarding wildland firefighters and wildfire smoke exposure. The goal was to evaluate the current literature and explain the gaps that currently exist.

**Methods:** Literature searches were conducted on PubMed, Scopus, Cochrane Central, and NIOSHTIC-2. Across all sites, 320 studies were found, 21 duplicates were removed, and 299 studies were screened. After initial screening, 191 studies were deemed irrelevant and 108 were moved forward to full-text eligibility screening. After the full-text evaluation, 103 studies were excluded and 5 were included in the final systematic review.

**Results:** The majority of current research describes acute health measures relating to respiratory outcomes. Existing literature focuses heavily on lung function by utilizing measurements such as spirometry, exhaled carbon monoxide, and questionnaires discussing lung function. The most notable gap found was the lack of long-term health outcome research. Of the five studies included, only one study looked at long-term health outcomes.

**Discussion:** Understanding the long-term health outcomes of wildfire smoke exposure is necessary to improve occupational health protocol for wildland firefighters, and to help discover health-related biomarkers of exposure to track long-term effects. Prospective cohort studies should be conducted to determine health-relevant biomarkers, and results from these studies can ultimately be used to inform occupational health policy.

### Primary Presenter

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### **A Systematic Review: Wildfire Smoke Exposure and Emergency Room Visits for Cardiovascular Health Outcomes in the Western United States**

**Objectives:** In order to understand the relationship between wildfire smoke exposure and cardiovascular heart outcomes amongst adults 18 years of age and older-- a comprehensive and integrative systematic review on the subject matter was conducted. To measure cardiovascular outcomes, the studies examined looked at emergency room visits during wildfire events.

**Methods:** The selection process for the papers began by formulating a series of search terms in alignment with the PECO statement, the search terms were applied in PubMed, Scopus, and ProQuest Environmental Science Collection. There were a total of 135 papers found across the databases using the formulated search terms. After screening the papers against the inclusion and exclusion criteria there were a total of 6 papers which met the criteria and were subsequently used for this systematic review.

**Discussion:** Cardiovascular health outcomes due to wildfire smoke exposure more pronounced in adults 65 years or older. Cardiovascular health outcomes are harder to track during wildfire periods and some studies suggested that there could be higher rates of cardiovascular events after fire periods.

**Conclusion:** More research on the long-term exposure and effects of wildfire smoke exposure is needed to understand the effects on cardiovascular health outcomes. In future studies, there should be a focus on smoke density, duration of exposure, and follow-up across a longer study period.

### **Primary Presenter**

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### The Urban Heat Island Effect and Increased Risk of Heat-Related Morbidity

**Objective:** The urban heat island effect occurs in metropolitan areas when the area is significantly warmer than surrounding rural and suburban areas, usually due to anthropogenic activities. Urban heat islands result in a variety of negative environmental and human health impacts. This review focuses on the urban heat island effect and the increased risk of human mortality and morbidity, as compared to risk of heat related mortality in non urban areas. This review evaluates current literature that addresses this topic and underscores any remaining gaps.

**Methods:** This review was conducted by searching for relevant literature across scholarly sources including PubMed, Himmelfarb Library, and ScienceDirect. Across all sites, 2,169 studies were found. 556 studies were deemed relevant and the abstracts of those studies were screened. After this screening, 242 studies were selected based on evidence linking the urban heat island effect to increase heat-related mortality as well as other heat related illnesses. Following full-text screening, 9 studies were included in the final systematic review.

**Results:** The studies included in this review displayed a low risk of bias. Overall, the majority of literature concludes that the urban heat island effect is associated with increased risk for heat related illnesses. All the studies included in this review show a positive correlation between urban heat stress and increased risk of heat related morbidity.

**Discussion:** The results of this review support further research on heat related illness in urban populations as well as provide evidence for the need for more heat emergency protection measures. Areas that were more sensitive to heat related illness were low income areas and marginalized communities. Further research can focus on the built environment rather than focusing specifically on higher temperatures. Further, air pollution should be assessed as a potential confounder. More research may be beneficial to further explain the UHI effect, but the data is sufficient to show that it exists in comparison to rural and suburban populations

### Primary Presenter

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Phthalate and Novel Plasticizer Concentrations in Food Items from U.S. Fast Food Chains

Purpose of research: Certain ortho-phthalates (i.e., di-n-butyl phthalate (DnBP) and di(2-ethylhexyl) phthalate (DEHP)) have been phased out due to their reproductive toxicity and replaced with other plasticizers (e.g., dioctyl terephthalate (DEHT)). Since consumption of processed and packaged foods may increase human exposure, we aimed to characterize ortho-phthalates and replacement plasticizers in food items and food handling gloves from fast food restaurants.

Principal results: We detected ortho-phthalates or replacement plasticizers in all food samples (n=64). Among the 11 chemicals examined, DEHT was found at the highest concentrations in foods (n=19; median =2,510 µg/kg; max =12,380 µg/kg) and gloves (n=3; range: 1240000-1880000 µg /glove). DnBP and DEHP were detected in 81% and 70% of food samples, respectively. Chemical concentrations differed by food type. Median DEHT concentrations were significantly higher in burritos than hamburgers (6,000 µg/kg vs. 2,200 µg/kg; p <0.0001); DEHT was not detected in fries. Cheese pizza had the lowest levels of most chemicals.

Major conclusions: To our knowledge, these are the first measurements of DEHT in food. Despite the limited toxicity data available on DEHT, our preliminary findings suggest it may be abundant in food handling materials and the food supply. Furthermore, ortho-phthalates of public health concern remain ubiquitous. These results, if confirmed, may inform individual and regulatory exposure reduction strategies.

### Primary Presenter

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Urban Green Space and Environmental Health Equity: The Impact of Green Space Exposure on All-Cause Mortality Rates across Washington, DC

Urban green space can provide the dual benefits of climate mitigation and public health improvements. Epidemiological meta-analyses demonstrate that greater exposure to green space results in reduced mortality and morbidity rates by increasing access to physical activity, improving mental health, and reducing ambient air pollution and the Urban Heat Island effect. With the proven association between urban green space and mortality, it follows that exposure to green space may contribute to health disparities in cities, including in Washington, DC, where green space density is highly variable and life expectancy by neighborhood ranges from 68.2 to 89.3 years. Neighborhoods with the lowest life expectancy are located in Wards 7 and 8, where 91.74% and 91.84% of residents identify as Black, respectively.

The objective of this study was to estimate attributable death rates related to lack of accessibility to green space across Washington, DC. We utilized green space databases and mortality data from local governmental agencies to estimate green space density and all-cause mortality across DC. We estimated associated health impacts using exposure-response relationships derived from epidemiological meta-analyses.

Our results demonstrate that the attributable death rate per 100,000 people associated with low green space density varies substantially across Washington, DC, with lack of green space having the strongest effect on mortality rates in Southeast DC. The attributable death rate per 100,000 people ranges from 0 in Georgetown to 206 in Fort Dupont. Every neighborhood with an attributable death rate per 100,000 people greater than 90 is located within Wards 7, 8, and 5, with the exception of Chevy Chase in Northwest DC. Our results are consistent with existing findings from epidemiological meta-analyses that there is a strong protective relationship between exposure to green space and all-cause mortality: assuming that the relationship between green space and premature mortality is causal, exposure to green space may reduce mortality in DC by approximately 306 to 403 deaths annually.

Our findings suggest that inequitable access to green space in Washington, DC exacerbates racial and environmental health disparities, particularly in Southeast DC. We hope that the results of our study help improve understanding of the health benefits of green space at the intra-urban scale and urge urban policymakers — including in Washington, DC through Sustainable DC and the DC Office of Health Equity, as well as in C40 Cities — to integrate green space into their Climate Action Plans.

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RESEARCH SHOWCASE

# ENVIRONMENTAL AND OCCUPATIONAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Developing Prevalence of Emergent Resistant *Aspergillus Fumigatus* through Anti-Fungal Susceptibility Testing

Invasive *Aspergillus fumigatus* isolates have displayed emergent resistance to multiple triazole antifungal medications in rural California. We hypothesize that the prevalence of multi-azole resistant *Aspergillus* species will increase with increasing use of triazole long term antifungal treatment in pesticides and prescriptions. Clinical azole-resistant aspergillosis has been associated with resistant *Aspergillus* strains in soil and agricultural niches. Multi-azole resistance in *Aspergillus* exacerbates the length and severity of opportunistic infections in humans, and drug-resistant *Aspergillus fumigatus* makes up 1-6% of cases per year since 1999. In this study, clinical *A. fumigatus* and other *Aspergillus* species were collected and screened for susceptibility to three triazoles: Voriconazole, Posaconazole and Itraconazole. Of the *Aspergillus* isolated July 20th through September 9th 2020, approximately 9 % were found resistant to Itraconazole, 2 % were found resistant to Voriconazole and 0 % were found resistant to Posaconazole. These results suggest that prevalence of triazole resistance in clinical *Aspergillus* infections in rural CA may have increased in recent years as hypothesized. Sample collection, testing, and statistical analysis is ongoing. Future results will include genotyping for *cyp51A* gene in resistant strains of *Aspergillus* that has been correlated with *Aspergillus fumigatus* resistance. We will use whole genome sequencing to associate common patterns in resistant genome sequences compared to susceptible genome sequences.

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RESEARCH SHOWCASE

# EPIDEMIOLOGY AND BIostatISTICS

## INSTITUTE FOR BIOMEDICAL SCIENCES

### Reaching into the Regions: Gene-Level Analysis of Molecular Epidemiology and Phylodynamics of SARS-CoV-2

SARS-CoV-2 (CoV) is the biological agent that causes COVID-19, a respiratory disease that has become a global pandemic. Because the virus will evolve molecular-level solutions to maintain its fitness (as already seen in the B.1.1.7 variant from the United Kingdom), it is essential to characterize evolutionary patterns in a high-resolution manner and develop statistical tests for variant associations to phenotypes of interest (e.g., disease severity, geographic location, epidemiological timeframe). Here, we divided the CoV genome into 29 constituent regions and identified nonstructural protein 3 (nsp3) and Spike protein (S) as proteins with the highest variation and greatest correlation with the viral whole-genome variation. We demonstrate that geography and time best explain differences between gene regions of samples. We extend this analysis to different related CoV viruses, including MERS, SARS, and bat coronaviruses. Here too, S and nsp3 explain most of the variation; these two regions also show a high number of sites under selection. Our results provide a direction to prioritize genes associated with health outcomes and inform improved DNA tests to predict disease status and severity.

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RESEARCH SHOWCASE

# EPIDEMIOLOGY AND BIostatISTICS

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Evaluating Temporal Dynamics using Gaussian Processes in Longitudinal Metabolomics Data

One crucial step in understanding a system includes evaluating the relationship between features and changes over time. This is especially pertinent in complex systems, such as human biological processes. The use of high-throughput technologies has allowed researchers to measure more features at a finer granularity more often. Unfortunately, a large amount of noise also resides in the data, either resulting from the biological system itself or induced by the machines producing the data. The temporal dynamics that govern these biological processes can thus be masked, even if multiple observations are observed over time. Therefore, the research community needs tools to analyze, condense, and ultimately extract meaning from noisy high-dimensional longitudinal omics data.

In this work, we applied Gaussian processes to longitudinal metabolomics data from the NIH Integrated Human Microbiome Project (iHMP), studying the onset of Inflammatory Bowel Disease (IBD). Our interest was in understanding the temporal patterns, as well as variance decomposition, for a given set of metabolites measured in this study. This was done by specifying covariance kernels that represented particular relationships between features. Inference was carried out on the hyperparameters specified in the kernels selected.

Preliminary results show promise in the ability to interpret meaning within, as well as differentiate between, the temporal behavior of metabolites studied. Computational considerations are important as there is a tradeoff between approximating the posterior distributions of interest and run time. Multiple inference methods are currently being evaluated. The results can be used to categorize omics features under investigation better. This categorization can include exploratory analysis, quality control, dimension reduction, and network analysis. The open-source code and documentation will be available at <https://github.com/omicsEye/waveome>.

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RESEARCH SHOWCASE

# EPIDEMIOLOGY AND BIostatISTICS

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Comparative Analysis of Salmonella Infantis Cases in Pennsylvania to Non- Infantis Salmonella Cases

Salmonella Infantis is one of the 10 most common serotypes causing human illnesses in both Europe and North America. In the US, the number of cases of human illness resulting from this strain has grown rapidly in the past decade. This strain presents challenges to public health due to its antimicrobial resistance and its association with higher rates of hospitalization and more severe illness. The objective of this study is to compare S. Infantis trends to overall trends of non-Infantis Salmonella cases in Pennsylvania in 2015-2019 to determine key risk factors and clinical features of the infection. Data from case investigations of laboratory-confirmed Salmonella infection from 2015-2019 in Pennsylvania, sourced from PA-NEDSS, Pennsylvania's electronic disease surveillance system, will be analyzed. Logistic regression will be used to compare key risk factors, clinical features, and severity of disease of S. Infantis cases compared to non-Infantis cases and odds ratios, adjusted odds ratios and 95% confidence intervals will be reported. This research will add beneficial information regarding risk factors and clinical features of the Salmonella Infantis strain. This information could impact future surveillance and prevention activities and will be useful for future outbreak investigations.

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RESEARCH SHOWCASE

# EPIDEMIOLOGY AND BIostatISTICS

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Industry Research Payments Made to Physicians across Surgical Subspecialties: A Cross-Sectional Analysis of The 2018 CMS Open Payments Database

Background: The Centers for Medicare and Medicaid Services (CMS) Open Payments Database allows the public to view payments made to physicians by the pharmaceutical industry. These payments may be an indication of financial biases that exist within the medical field, particularly within the surgical specialty. Understanding the financial relationships between pharmaceutical manufacturers and surgical subspecialties will help the public make more educated decisions regarding their health and lead to better regulations managing surgeon-pharmaceutical relationships. The goal of this paper is to identify potential biases across surgical subspecialties by examining the differences in research payments made to vascular, plastics, thoracic, orthopedic, and neurological surgery subspecialties, as well as how the category of the transactions, including drug, medical device, and biologic payments, may influence these relationships.

Methods: Using the 2018 CMS Open Payments Database, we conducted a cross-sectional secondary analysis of research payments made to surgeons stratified by surgical subspecialty and transaction category.

Results: Preliminary analysis indicates a variance in pharmaceutical research payments made to physicians across surgical subspecialties. For example, of the \$97.16 million in research payments made to physicians in 2018, orthopedic surgeons received the highest median payments, while making up less than 3% of physicians. Transaction category was also found to vary significantly across surgical subspecialties. Further analysis is being conducted to examine the extent to which research payments vary by surgical subspecialty and transaction category.

### Primary Presenter

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RESEARCH SHOWCASE

# EPIDEMIOLOGY AND BIOSTATISTICS

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Deep Learning of Epidemiological and Omics Data of COVID-19 Using N3C Data Enclave

The COVID-19 pandemic emerged a need for a centralized health data repository for epidemiological data. As a result, the National Institute of Health initiated the NCATS National COVID Cohort Collaborative (N3C) to create one of the largest centralized clinical and omics data repositories. Access to an enclave with high enormity can heighten the potential of Machine Learning algorithms as data from various populations can be used to uncover trends and make predictions. In this study, we propose to develop deep learning models to explore the convoluted relationship between COVID-19 and various epidemiological and omics features. Neural networks (NN) have the ability to find the complex relationship present in the data by the process of traversing through the data points and optimizing the underlying function that remains obscure to many other machine learning techniques. By leveraging the plethora of omics data in N3C the NN model achieves better weight optimization and thus can assist in the discovery of biological pathways affected by COVID-19. In a clinical setting, this model can serve as a robust predictive tool capable of supporting the decision process.

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## RESEARCH SHOWCASE

# EPIDEMIOLOGY AND BIOSTATISTICS

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Burden of Gonorrhea among HIV+ Department of Defense Beneficiaries

**Background:** The likelihood of HIV-Gonorrhea (GC) coinfection is substantial, given that they share both routes of exposure and sexual risk taking behaviors. Sexually transmitted infections (STI) such as gonorrhea may facilitate the transmission of HIV through inflammatory processes. Unlike a strictly heterosexual population, men who have sex with men (MSM) are at a disproportionately greater risk of coinfection and may harbor infections in both genital and extragenital sites.

**Objectives:** In this investigation, we examined the burden of genital and extragenital HIV-GC coinfection among MSM in the United States Armed Forces following the repeal of Don't Ask Don't Tell (DADT) policy in 2011. The purpose of this study was to determine which potential predictors, including demographic/health, behavioral, and sexual behaviors, significantly predicted gonorrhea among service members.

**Methods:** Data for this retrospective secondary analysis was obtained from the Infectious Disease Clinical Research Program's (IDCRP) HIV Natural History Study (NHS) and included data points from DoD beneficiaries, including active duty, retirees, and dependents. Descriptive statistics along with a binary logistic regression analyses were performed.

**Results:** In total 1,117 HIV positive men were evaluated. Of the sociodemographic variables examined in the regression models, age and race were the only significant factors that contributed to the positive diagnosis. DoD beneficiaries in their early 30s were more likely to test positive for all three forms GC evaluated in this study. African American participants, compared to other races, showed higher likelihood of a positive genital GC diagnosis. Regarding behavioral determinants, those who drank alcohol more frequently but not daily (i.e., had more than six drinks in one drinking session in the past week and month) were less likely to be tested positive compared to those who drank heavily (i.e., had more than six drinks in one drinking session daily) and those who did not drink (or claimed not to drink). Comparing the CD4 counts between a participant's first HIV positive diagnosis and the time of the GC positive diagnosis, the viral load (determined by the NHS participant's CD4 count) was higher at the time of GC diagnosis compared to the initial CD4 count at baseline.

**Discussion:** This study contributes to existing knowledge focusing on the sexual health of military service members and their beneficiaries.

### Primary Presenter

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RESEARCH SHOWCASE

# EPIDEMIOLOGY AND BIOSTATISTICS

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### The Association between Epidemiological Determinants and Carpal Tunnel Syndrome in Albania

Carpal tunnel syndrome (CTS) is a debilitating condition that if left untreated may result in loss of hand function due to the compression of the median nerve. This study aims to investigate the epidemiological aspects of this syndrome, with a focus on examining the association between occupation and CTS in Albania. 100 patients diagnosed with CTS completed a questionnaire and were classified into categories based on their occupation. Construction and agriculture occupations were reported to have the highest number of cases with CTS, 17% and 16%, respectively, compared to other occupations. Housewife patients with CTS consisted 12% of the patient population, followed by instrument sterilization technicians with 8%. Economists, policemen, babysitters, teachers, engineers and other occupations consisted a minor proportion of the patient population with CTS. Gender stratification was performed to determine the proportion of women and men with CTS in each occupation. 75% of the cases with CTS in agriculture consisted of women, while 66% of the cases with CTS in construction consisted of men.

The mean age of men with CTS in construction was 55.7 years old, with a median of 60 years old. The mean age of women with CTS in construction was 51.9 years old, with a median of 52 years old. The mean age of men with CTS in agriculture was 56.3 years old, with a median of 60.5 years old. The mean age of women with CTS in agriculture was 52.8 years old, with a median of 54.5 years old. The mean age of housewives with CTS was 49.3 years old, with a median of 45 years old. The mean and median age of CTS was slightly lower in women compared to men. Housewives with CTS were reported to have the lowest mean and median age out of the occupations examined.

Previous studies have indicated a higher prevalence of CTS among women compared to men which may be explained by certain risk factors such as hand anatomical characteristics, metabolic factors, and hormonal changes during pregnancy and menopause that women share. It is important to note that most women in Albania are involved in occupations that require frequent hand manipulation and repetitive hand movements that may be responsible for the development of CTS. The information regarding the association between occupation, age, gender, and CTS might be beneficial in implementing effective screening interventions that may result in a better prognosis and outcome of CTS.

### Primary Presenter

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RESEARCH SHOWCASE

# EPIDEMIOLOGY AND BIostatISTICS

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Functional Epidemiology of Proteins and Metabolites in COVID-19

Proteins are a direct product of the genome and metabolites are functional products of interactions between the host and other factors such as the environment. Omics data about proteins and metabolites are useful in characterizing biological processes underlying COVID-19. Using an integrated approach combining proteomics and metabolomics data, we investigated the changes in metabolites and proteins in relation to individuals' characteristics (e.g., age, gender, and health outcome) and clinical information (e.g., metabolic panel test results). We have used this information in conjunction with machine learning algorithms to create a prediction system to prognosticate the health status of patients presenting symptoms of COVID-19. Furthermore, we used the model developed to discover biologically relevant metabolite and protein biomarkers for further investigation. We found significant enrichment of metabolic indicators of lung, liver, and gastrointestinal dysfunction associated with disease severity. Additional analyses identified similarly enriched proteins derived from these anatomical sites that normally play a role in responses to injury or infection, but may contribute to excessive systemic inflammation within the context of COVID-19. This work provides a roadmap for understanding the molecular mechanisms that drive disease severity and highlights potential avenues for the treatment of COVID-19.

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RESEARCH SHOWCASE

# EPIDEMIOLOGY AND BIostatISTICS

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Policies for Safer States: COVID-19 Disease Risk

In the past year it has become obvious many flaws and vulnerabilities exist in attempting to handle pandemics. The United States has responded to the coronavirus disease 19 (COVID-19) pandemic with variability at the State level. Not surprisingly, there has been significant differences in the incidence of COVID-19 across certain States.

In this two-part study, both State issued COVID-19 related policies and cofounders related to higher incidence are analyzed. The policy analysis was done on the five States with the highest incidence of COVID-19 (North Dakota, South Dakota, Rhode Island, Utah, and Tennessee) and the five States with the lowest incidence (Vermont, Hawaii, Maine, Oregon, and Washington). The possible confounding variables included in the study were: population density, population 65+ years of age, socioeconomic/behavioral variables (income per capita, poverty rate, smoking), ethnicity (African American/Black, Hispanic/Latino, and Indigenous), number of COVID tests performed, and air quality.

A multivariate regression was completed to analyze the relationship between incidence rates and the confounders before relating it back to policy. The analysis revealed that 7.5% of the variation in incidence rates can be explained by all the confounders studied. The p-values for all the confounders, except for air quality, were greater than the alpha level of .05 which means these variables do have a statistically significant relationship to incidence rate. All the states with low COVID-19 incidence rates had strict policies and almost all states (except for Rhode Island) with high incidence states did not have strict policies. Many elements go into analyzing risk factors for COVID-19, but it is evident the State-based policy play a role.

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## RESEARCH SHOWCASE

# EXERCISE AND NUTRITION SCIENCES

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Perceived Food Security and Dietary Quality Among Urban Youth during the COVID-19 Pandemic

The COVID-19 pandemic has caused widespread increases in food insecurity and disruptions to school meal programs, raising concerns about potential adverse effects on the dietary quality of already at-risk youth in the U.S. This study therefore sought to examine the association between youth-perceived food security and consumption of key food groups of concern among lower-income middle school youth during the pandemic.

The COACHES Study utilizes mentors trained in trauma-informed coaching strategies to improve the health of youth from underserved communities. As part of this ongoing study, demographics, body mass index, and dietary intake were assessed among 6th and 7th grade students (n=67) from five schools in New Orleans, LA, pre-pandemic (early 2020) and again in the fall of 2020, along with the CoRonavirus Health Impact Survey for Youth. Binary outcome variables were created for changes since prior to the COVID-19 pandemic for daily consumption of and servings of: 1) sugar-sweetened beverages (SSBs), and 2) fruit and vegetables. Logistic regression analyses were used to examine the relationship between youth-reported food security and perceived changes in dietary intake from pre-pandemic to fall 2020 while adjusting for sex and weight status.

Among youth (n=67, 11.7 +/- 0.8 years, 53% female, 42% overweight/obese, 100% African-American), 31% reported that they had worried about the amount or type of food available to them at home due to lack of money or availability during the pandemic. Nearly 70% of students consumed two or more SSBs daily and only 35% ate four or more servings of fruits and vegetables a day; while pre-pandemic, already 60% of youth reported consuming SSBs daily and 37% and 50% reported not consuming fruit and vegetables, respectively, at least daily. Although not significant, students reporting food insecurity had 63.0% [CI: 0.41—6.40] higher odds of consuming two or more SSBs daily and a 26.6% [CI: 0.21—2.52] lower odds of having eaten four or more servings of fruits and vegetables daily. Changes in SSB, and fruit and vegetable consumption between food insecure and food secure did not reach statistical significance.

The high percentage of students reporting food insecurity, ongoing high SSB intake, and the low proportion meeting fruit and vegetable serving recommendations provide important insights into the nutrition status of at-risk youth during the pandemic. Larger ongoing studies are needed to more fully evaluate the link between food insecurity and dietary quality and to inform nutrition interventions targeting this population.

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# GLOBAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Quantifying Health Conditions in Kachin State, Myanmar: Results from a Population-Based Survey during a Ceasefire

Background: Kachin State, Myanmar (formerly Burma) is home to tens of thousands of internally displaced persons (IDPs) uprooted by decades of armed conflict. A population-based survey was conducted in 2007 to assess maternal and child health and mortality and HIV knowledge during a ceasefire period to assist prioritization of humanitarian programming.

Methods: Ethnic community health workers conducted a multi-stage cluster survey to assess key indicators of women and child health (WCH) including crude and child mortality, malnutrition (assessed by middle upper arm circumference, MUAC), water and sanitation (WASH), antenatal care and family planning, and HIV knowledge. Multiple logistic regression was used to assess associations of demographic factors and household exposures with household death and HIV knowledge. Analyses accounted for the complex survey design.

Results: Data from 1,720 households in 59 village clusters was available for analysis, representing 9,693 IDPs. Contraception use (11% for any method) and facility-based birth (29.5%) were uncommon, and 13.4% of children aged 3 months to 5 years were malnourished or at risk for malnutrition. Estimated child, infant and neonatal mortality rates were 145.1, 71.2, and 36.9, respectively. Child malnutrition was associated with recent diarrheal episode, and with the death of another child in the household (POR: 2.64, 95% CI: 1.08-6.45). Household deaths also were associated with possession of insecticide-treated nets (POR: 0.46, 95% CI: 0.25-0.84), presence of a skilled attendant at birth (POR: 0.67, 95% CI: 0.46-0.97) and use of contraceptives (POR: 0.45, 95% CI: 0.20-0.99). Whereas most respondents (90.3%) were aware of HIV/AIDS, only half (50.2%) demonstrated knowledge of at least 6 of 7 domains.

Conclusions: Child mortality in Kachin State during a ceasefire period in 2007 exceeded national estimates and was associated with plausible risk factors including household undernutrition. Results can be used to inform program priorities and to compare WCH and HIV indicators among IDPs during subsequent periods of peace and conflict in Kachin State.

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RESEARCH SHOWCASE

# GLOBAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Advancing Sovereign Obligation as a Mainstream Topic in Global Health: A Case Study Analysis of International Health Agreements

The 20th century was characterized by rapid development and globalization. As a result, the well-being of all nations and the health of their populations is inextricably interconnected; the COVID-19 pandemic serves as timely proof. Effective international cooperation is therefore critical to mitigate threats to global health. The United Nations (UN) system provides a venue for countries to collaborate on international priorities, but was designed to respect sovereignty above all else. While UN agencies can negotiate international regulations, they typically do not have an enforcement mechanism to compel states to meet their obligations. This project will explore how the concept of “sovereign obligation” could be used to strengthen global governance institutions in order to ensure they are fit-for-purpose in the 21st century. Sovereign obligation evolves the idea of sovereignty to acknowledge that nations are responsible for the impacts of their actions that extend beyond their borders. Despite its relevance to global governance reform conversations, the concept is notably absent from global health policy literature. This project aims to fill this gap by building a case for sovereign obligation to become a mainstream concept in global health. This paper utilizes the ‘preliminary illustration of a theory’ case study methodology to analyze two health-related agreements negotiated within the UN system. The analysis includes a background on the negotiation process, an outline of concepts related to sovereign obligation already in the text, and a discussion of how the sovereign obligation framework could be used to strengthen the agreement. The first case study explores compliance with the International Health Regulations (2005), which establishes core competencies related to pandemic preparedness. Sovereign obligation could strengthen the disease outbreak notification requirements and help enforce the duty to collaborate to strengthen pandemic response capacity globally. The second case study will focus on the Codex Alimentarius, a set of international regulations for the global food market. Sovereign obligation could compel all nations to meet the minimum standards for food safety and establish trade practices which help cultivate food systems in low- and middle-income countries. Together, these case studies will illustrate how sovereign obligation provides a framework for more effective international cooperation that will be persuasive to national leaders. Global health practitioners involved in global governance reform should adopt the concept to help advocate for stronger international commitment to multilateralism.

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RESEARCH SHOWCASE

# GLOBAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Assessing the Determinants of Contraceptive Awareness among 10-17 Year Old Adolescents in Chittagong, Sylhet, and Dhaka

Adolescence is a defining period of life during the ages of 10 to 19 years, characterized by rapid social, physical, and emotional changes, promoting an individual's development as well as establishing gender and social norms. In Bangladesh, previous research regarding sexual and reproductive health (SRH) practices primarily focused exclusively on married adolescents. As early adolescence is the age when gender and sexual norms, values, and attitudes start forming, and many become sexually active, it is important to involve unmarried adolescents in SRH programs.

This research aims to reduce the knowledge gap that currently exists in creating effective sexual and reproductive health programs targeted towards unmarried adolescents in Bangladesh. Linear probability models are used to conduct a secondary data analysis of the Gender and Adolescence: Global Evidence Bangladesh survey data to assess the factors associated with contraceptive awareness and attitudes within two cohorts of adolescents (younger cohort; age $\leq$ 14 years, older cohort; age $>$ 14 years) in Chittagong, Sylhet, and Dhaka. No significant associations were found for gender across both cohorts, though education and adolescents' maternal characteristics were found to contribute significantly to awareness and attitudes of unmarried adolescents towards sexual and reproductive health practices. Further investigation of these factors is necessary for the development of comprehensive SRH programs, helping both unmarried and married adolescents establish positive and responsible SRH attitudes and behaviors.

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RESEARCH SHOWCASE

# GLOBAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Lessons Learned from MERS in South Korea: Test, Trace, and Communicate

In the early phases of the COVID-19 pandemic, South Korea emerged as a leader for curtailing the spread of the virus while keeping its borders open to travelers, avoiding mass lockdowns, and holding a general election with the highest voter turnout rate in almost 30 years. South Korea's ability to respond to the pandemic early on has left experts wondering how these outcomes could be replicated in the United States during future pandemics. South Korea's relative success has largely been attributed to its mass testing, contact tracing, and information dissemination systems. The pandemic preparedness and response policies currently being employed by South Korea are the result of lessons learned from a previous coronavirus disaster: the outbreak of MERS in 2015. This project examines the public health significance of testing, tracing, and risk communication, how South Korea strengthened these systems after MERS, and how they have influenced COVID-19 response. By drawing an analogy between the South Korean MERS outbreak of 2015 and the management of COVID-19 in the United States, I address the following question. How did South Korean pandemic preparedness policy come to be, and is it replicable in the United States? I will then conclude a series of recommendations for the United States based on South Korean policy.

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# GLOBAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Using Meta-Research Methods to Examine the Inclusion of Women, Pregnant Women, and Women-Specific Health Outcomes in Studies that Contributed to the Dietary Reference Intakes for One-Carbon Metabolism Micronutrients

**Purpose:** Maternal micronutrient deficiencies occurring during periconceptional, pregnancy, and postpartum periods are a leading cause of adverse pregnancy outcomes globally. The Dietary Reference Intakes (DRIs) are a set of reference values used to assess and guide nutrient intakes of healthy individuals. However, the current DRIs for pregnancy and lactation may be limited in their methods and included populations. The present study analyzed the current DRIs for their inclusion of pregnant women and geographic representativeness. **Methods:** Meta-research methods were applied to the DRI report for vitamins B6, B12, folate, and choline in four steps: search, screening, full-text data extraction, and data analysis. For each target micronutrient, sections that contributed data to setting the average requirement were focused on, "Selection of Indicators for Estimating the Requirement," "Findings by Life Stage and Gender Group," and "Tolerable Upper Intake Limit" for adults, pregnancy, and lactation sub-sections. Screening involved reviewing the reference list to determine whether a reference directly contributed to setting the DRI. Full-text data extraction of primary data was conducted in areas of: 1) administrative information; 2) study methods; 3) human population characteristics; and 4) non-human subjects. Descriptive analyses were performed to describe the inclusion of women, pregnant women, geographic patterns, and demographic diversity. **Results:** For Vitamin B12, 100% of indicator studies and 71% of life stages studies included women, with a total of 3,246 women participants. However, none of the indicator studies and 15% of life stages studies included pregnant women, with a total of 556 pregnant women participants. None of the indicator studies and 8% of life stages studies reported health measurements specific to women, pregnancy, or lactation. Geographically, 54% of studies were conducted in the United States, and 18% took place in low-and middle-income countries. Data analysis is ongoing for the remaining micronutrients. **Conclusions:** Preliminary findings indicate that the body of evidence informing the current DRIs are limited in their inclusion of women and pregnant women. Numerous adverse pregnancy and birth outcomes are preventable through optimal maternal nutrition. Therefore it is critical to ensure that the DRIs are suitable for their intended population. Despite their original intent for use in North America, the DRIs are widely adopted globally. Thus, geographic representation of the studies underlying the DRIs have implications for generalizability.

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RESEARCH SHOWCASE

# HEALTH POLICY AND MANAGEMENT

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Social Mission in Health Professions Accreditation

Accreditation is the process of ensuring institutional compliance with established standards to ensure high quality health professions education that meets the needs of patients and society. Currently, there are nine main accrediting bodies for schools in dentistry, medicine, nursing, pharmacy, and physician assistant programs that define “gold standards” of education and assess institutional compliance with these established standards. Some standards are in areas that fall under social mission, or “the contribution of the school in its mission, programs, and the performance of its graduates, faculty, and leadership in advancing health equity and addressing the health disparities of the society in which it exists.” The concept of social mission has been further defined through a framework of six domains and eighteen measurable subdomains (termed “areas”) developed by the Social Mission Metrics Initiative (SMMI).

This study analyzed the extent to which social mission is present in the accreditation standards of major U.S. and Canadian health professions accrediting bodies to allow accrediting bodies to make improvements and hold health professions schools to the standard of training and practicing with health equity and social mission lenses. The 18 SMMI areas and their subsequent indicators were translated into themes and subthemes. Social mission in curriculum was the most well represented theme across all accreditors. Of the nine accreditors, the Committee on Accreditation of Canadian Medical Schools (CACMS) included more social mission themes within its standards than any other accreditor included in the study. The three nursing accreditors included standards explicitly related to community collaborations, but lacked standards requiring student diversity. While curriculum and student training were present across all accreditors, a key-word search of the standards found that “racism” or “anti-racism” were not mentioned in any of the studied health professions standards.

The findings from this study demonstrate wide variability of social mission content in accrediting standards. Accrediting bodies have the potential to take a more active role in promoting health equity in the health education community by holding schools accountable for practicing social mission.

\*The final results from this study have been submitted for publication. The presentation will only include a sample of preliminary results.

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RESEARCH SHOWCASE

# HEALTH POLICY AND MANAGEMENT

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Addressing Barriers Faced by Underrepresented Minority Students during the COVID-19 Medical School Admissions Cycle

**Problem:** Physician patient interactions are perhaps one of the strongest predictors of healthcare quality and treatment outcomes. Literature shows that race concordant physician-patient relationships result in higher levels of patient trust and physician attention, which can lead to increased care quality and better health outcomes. Considering the high levels of medical mistrust in historically marginalized communities, increasing workforce diversity is one avenue by which racial and ethnic disparities can be addressed. Unfortunately, the current health workforce is far from diverse-Health Resources and Service Administration data show that the United States health workforce is approximately 64% White, 16% Hispanic, and 11% Black. A similar distribution exists within the medical school applicant pool. Approximately 50% of all medical school applicants in the past four medical school cycles identify as White, whereas only 12-14% of applicants identify as an underrepresented minority (i.e. Black, Hispanic, Native American).

**Gaps:** Previous research has shown the lack of diversity in our health workforce can be linked to medical school admissions. However, there has been no extensive investigation into the barriers faced by underrepresented minority (URM) students particularly during the COVID-19 pandemic.

**Purpose:** Although the COVID-19 pandemic has imposed a number of barriers on all medical school applicants in the 2020-2021 application cycle, it has disproportionately impacted URM students. This research assesses these barriers faced by URM applicants in the 2020-2021 application cycle.

**Proposal:** In this research, key informant interviews of experts familiar with medical school applicants and the admissions process were used to identify barriers related to cost, technology access, and the Medical College Admissions Test (MCAT). Based on the data collected, policy recommendations were also made to address these barriers.

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RESEARCH SHOWCASE

# HEALTH POLICY AND MANAGEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Shifting Attention to an Undervalued Asset; the Emergency Department Technician

A longstanding nursing shortage in the United States coupled with increasing emergency department (ED) patient volume have led to a need for both additional hospital personnel and more efficient management of ED patient flow. In most hospitals, the Emergency Department Technician (EDT) has become an indispensable member of the treatment team, performing a variety of important roles to actively support other healthcare providers.

However, there is no literature or data that addresses statewide regulations of the ED technician position and scope of practice. To better understand the regulatory environment, an email requesting information about a state's ED technician regulatory structure was sent to both the Nursing and EMS Boards of all fifty states and the District of Columbia. Majority of responses noted that their boards do not have specific rules governing the ED tech's scope of practice. Additionally, we found that many regulatory bodies, including Centers of Medicare/Medicaid Services (CMS), The Joint Commission, and DC Department of Health, do not have standards for ED technicians. This paper further examines the current regulatory landscape for EDT practice and the training required of the EDT in US emergency departments throughout all fifty states and DC.

With these findings, we believe a standardized process of training EDTs can relieve the burden of reduced availability of registered nurses. If properly trained, ED technicians can perform time-consuming procedures, allowing clinicians and nurses to concentrate on higher level diagnostic and therapeutic operations. By emphasizing the role of the EDT with appropriate training and oversight, the industry can significantly improve the delivery of acute care in the ED setting.

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# HEALTH SCIENCES

## COLLEGE OF PROFESSIONAL STUDIES

### Attachment Style and quantitative Electroencephalography (qEEG) Abstract

**Aim:** Most research on attachment in the brain has been about EEG asymmetry. Previous research found that individuals with anxious and avoidant attachment styles have greater right frontal activation during tasks when exposed to emotional stimuli (Dawson, 2004; Rognoni et al., 2008). More can be learned from quantitative electroencephalography (qEEG), which involves comparing several minutes of resting-state EEG to a normative database. The aim of this study is to provide preliminary evidence between attachment style and the brain in a resting state using qEEG data. We hypothesize that participants with greater attachment anxiety and avoidance will show an alpha asymmetry with less prefrontal alpha activity in the right hemisphere on their qEEG brain map.

**Method:** The participants of this study are twenty-three adults that completed a qEEG within the past 5 years. Ten minutes of resting-state, eyes open, EEG data was recorded, edited, and compared to a normative database to produce qEEG brain maps. Participants completed a survey with demographic information as well as trauma measures and the Experience in Close Relationship (ECR-S, Brennan, Clark, & Shaver, 1998) attachment measure. Participants' qEEG data was then analyzed in relation to their survey responses.

**Results:** A preliminary finding of our data reveals that attachment anxiety is positively correlated with interhemispheric and intrahemispheric alpha coherence. In the left hemisphere, there were five significant correlations between attachment anxiety and alpha coherence and in the right hemisphere there were four significant correlations. There were also two significant correlations between attachment anxiety and interhemispheric alpha coherence. There was only one negative correlation found between alpha coherence and attachment avoidance.

**Discussion:** Contrary to our hypothesis, we did not find any significant interhemispheric alpha asymmetry. In contrast to previous task-based EEG studies, we used qEEG data acquired during a resting state. Therefore, our results provide preliminary evidence that attachment style is reflected differently in the brain when it is in a resting state. They also suggest that alpha hypercoherence is related to anxious attachment. Our findings lend support to research indicating that anxious rumination is associated with alpha hypercoherence (Andersen et al, 2008). They raise the possibility that the brain being stuck in a pattern of over-processing emotional information is one way in which attachment anxiety could be understood. Further research is needed to support these findings since they could have important treatment implications.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Online Group Psychotherapy During COVID-19: The Group Member Perspective

In response to the COVID-19 pandemic, an increasing number of mental healthcare professionals adopted Telehealth methods to prevent disruptions in therapeutic services. Although there is scarce scientific findings on the outcome or impact of online group therapy, group leaders conformed to the social-distancing guideline and transmitted their service to online platforms (Weinberg, 2020). Extant research on this transmission and experience of online group therapy has a narrow perspective with data solely collected from group leaders and without theory driven hypotheses. The present research was developed to examine group members' perspectives on tele-group treatment, specifically, the challenges throughout the process, the advantages of online groups, and the perceived difference between in-person group and tele-group sessions. Survey questions include items that assess group cohesion, group alliance, therapeutic engagement, working through conflict, and effectiveness of tele-groups. The study also examines cross-sectional factors: racial identity, ethnicity, age, gender identity, sexual orientation, religion, and ability, of whether these topics have been raised up in tele-groups. Moreover, the research aims at apply attachment theory to predict who may have more challenges to online groups. We will be studying the relationship between individuals with different types of attachment styles (secure/insecure) and their experience in tele-group therapy.

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# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Neutrophil Capture with CD15+ Dynabeads`

**INTRODUCTION:** Although RNA biomarkers have been discovered for appendicitis biofilm infections and other inflammatory diseases, no point-of-care diagnostic tests have been established to provide a simpler, quicker, and more reliable method than standard sequencing.

**OBJECTIVES:** The overall objective is to create a blood test using only a drop from a finger prick and quantitative RT-PCR technology (providing results in about one hour) to be able to diagnose these diseases without the need for more invasive, costly and time-consuming lab cultures, imaging and arteriography (requiring interventional radiology). Thus, the primary objective of this study was to optimize neutrophil isolation so that we can improve the signal-to-noise ratio in RT-PCR, and prove that the biomarker signals are indeed from neutrophils.

**METHODS:** This was a multi-experiment study of various steps in a standard CD15+ Dynabead positive isolation protocol. CD15+ Dynabeads were used to specifically capture neutrophils. Fresh whole blood samples were collected for each experiment and conducted on either small-scale (1.5 mL Eppendorf tubes & small magnet) or large-scale (15 mL conical tubes & large magnet. Experiments were conducted, while keeping all other variables constant, on the following steps of the protocol: pre-positive-isolation centrifugation wash, pre-positive-isolation incubation time with Dynabeads, amount of washes with the magnet, and ratios of whole blood to isolation buffer or whole blood to Dynabeads. To measure success rates of neutrophil capture, hemocytometer counts were conducted. Unwashed whole blood was used to obtain total amounts of white blood cells and red blood cells in each sample used.

**RESULTS:** The best procedure for capturing neutrophils using the CD15+ Dynabeads involves freshly washing the beads, and removing the plasma. Both steps help to remove soluble inhibitors. Without washing the beads, they can include free antibodies that would bind the cells and prevent the beads from binding. Out of one, two, or three washes with the magnet, two washes in the magnet produced the highest yield of captured neutrophils (109.7%). 1:1 ratio of whole blood to isolation buffer produced the best yields (72.0% with 1:1 vs. 57.4% yield with 2:1). 50 uL of Dynabeads per mL of whole blood was found to be the best standard.

**CONCLUSION:** A standard operating procedure was produced for sample analysis of patient samples. The procedure warrants further studies to ensure reliable, reproducible results, as well as to eventually produce a smaller-scale version to use in a point-of-care diagnostic test.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Cold Plasma-Based Control of the Activation of Pancreatic Adenocarcinoma Cells

Cold atmospheric plasma (CAP) has shown strong anti-cancer capability in vitro and in vivo. The interaction between CAP and cancer cells build the foundation to understand the anti-cancer effect of a direct CAP treatment. The CAP-based activation phenomenon is a key factor to understand the CAP cancer treatment. The CAP-treated pancreatic adenocarcinoma cells instantaneously entered a specific activation state, in which these cancer cells become very sensitive to the cytotoxicity of both reactive oxygen species and reactive nitrogen species. Here, we present a roadmap of control the basic operational parameters of the CAP jet (the helium flow rate, the discharge voltage, and the discharge frequency) on the activation. Among three parameters, the discharge voltage shows the largest impact on the activation phenomenon. The maximum activation effect occurred when the discharge voltage reached a medium level. A 0D chemical simulation revealed that such maximum activation effect may be due to the maximum densities of several short-lived reactive species in CAP jet at a certain level of discharge voltage.

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# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Biological effect of dual PI3K/HDAC Inhibitor in Cutaneous T-Cell Lymphoma

T-cell lymphoma, a type of NHL that occurs in T lymphocytes, play an important role in immune responses. TCL is a heterogenous group categorized into several subtypes, including CTCL. Cutaneous T-cell lymphoma (CTCL) presents skin symptoms, which are often mistaken for skin conditions. Current treatment plans can take patients several months and even up to a year to respond. Therefore, new treatment options/targets are needed to decrease response time and improve effectiveness. In this regard, PI3K signaling has been shown to have potential significance as a treatment target for various cancers. PI3K is upstream activator of the AKT activation, which leads to uncontrolled protein synthesis and ultimately cancer growth. PI3K inhibitors are in clinical trial with modest activity, therefore this study sought to determine the effect of PI3K inhibition along with histone deacetylase inhibition using a dual tool compound CUDC-907 in CTCL in-vitro.

This study examined the in-vitro biological effect of the CUDC-907 several CTCL cell lines such as HH, H9, HuT 78, and SeAx. The CTCL cells were grown and maintained in RPMI media supplemented with 10% fetal bovine serum and 1% antibiotic mixture. 70-80% confluent cells were plated in a 96-well plate overnight, then treated with CUDC-907. CTCL cells were treated with various concentrations of the drug (10nM, 100nM, 500nM, and 1 uM) for 72 hours in the humidified 37°C CO<sub>2</sub> chamber. MTT 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium was added, followed by incubation at 37°C for 4 hours. After the addition of isopropanol, absorbance readings were taken at a wavelength of 570nm using a spectrophotometer. MTT assay results showed a dose-dependent decrease in the cell proliferation in all four CTCL cell lines tested, suggesting an anti-proliferative role of CUDC-907 inhibitor in CTCL cells. Western Blotting experiments followed by treatment with inhibitor were conducted to confirm that CUDC-907 was targeting PI3K signaling. 100nM and 500nM concentrations were used to treat the cell lines for a 24-hour incubation period and then the cells were lysed to extract proteins. Through Gel electrophoresis the proteins and AKT levels were compared with a control group, which received no drug treatment. Results showed a dose-dependent reduction in AKT, and increase in the histone acetylation (hall mark of HDAC inhibitors) confirming the inhibitors targeting PI3K and HDAC pathway.

In conclusion, combined PI3K and HDAC inhibition through CUDC-907 has anti-lymphoma activity in CTCL. This study provides a scientific rationale for clinical study of CUDC-907 in patients with CTCL.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Comparing Evaluations of Social Situations in Adults who Do and Do Not Stutter

Social anxiety disorder (SAD) is a common anxiety disorder that is distinguished by a fear of being humiliated, embarrassed, and evaluated negatively in social situations (Iverach et al., 2009). Social anxiety disorder (SAD) is a risk factor for adults who stutter (AWS; Craig & Tran, 2014; Tran, Blumgart, & Craig, 2011). Persons with SAD fear negative evaluation and evaluate social situations differently from persons without social anxiety. Four information processing biases are thought to contribute to SAD (Heinrichs & Hofmann, 2001). Persons with SAD exhibit attention bias toward threatening stimuli and they tend to exhibit memory biases that involve remembering negative and socially threatening stimuli more readily than nonthreatening stimuli (Amir & Bomyea, 2010; Amir, Foa, & Coles, 2000). Judgment bias occurs when persons overestimate the probability that a negative event will occur, and overestimate the negative consequences associated with it (Voncken, Bögels, & Peeters, 2007). Finally, interpretation bias occurs when persons react in ways that are out of proportion with the actual threat in the situation; for example, persons with SAD might interpret a mildly negative situation as profoundly negative (Alden, Taylor, Mellings, & Lapsa, 2008). These information processing biases have received some attention in stuttering adults (Hennessey, Dourado, & Beilby, 2014; Lowe et al., 2016 (Brundage, Winters, & Beilby, 2017). The current study aimed to discover if AWS and AWNS evaluate different types of social situations in similar ways.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Role Of *Ndnf* in Alveolar Progenitor Cells during Lung Adenocarcinoma Initiation

Lung alveoli consist of squamous alveolar type I cells (AT1) responsible for gas exchange and cuboidal alveolar type II cells (AT2) responsible for producing surfactant. Under normal conditions in the adult lung there is a subset, approximately 1%, of AT2 cells known as progenitor AT2 cells which are also responsible for stem cell-like functions. Progenitor AT2 cells can self-renew and can differentiate into AT1 cells. In normal conditions, the progenitor AT2 cells divide intermittently, approximately 40 day doubling time, in peripheral lung tissue, typically near blood vessels. The progenitor AT2 cells are activated by AT1 injury and are controlled by the EGFR/KRAS pathway. Most AT2 cells show a limited proliferative response following expression of oncogenic KRAS, the most common cause of lung adenocarcinoma, while a rare subset of AT2 cells continue to proliferate indefinitely and form deadly tumors. It is known that AT2 cells are the source of adenocarcinoma, but the specific causes and modifications that lead to tumor initiation are currently unknown. It is unclear if the subset of AT2 cells that proliferate into tumors are progenitor AT2 cells or not, which we will seek to determine in this study.

Previous studies from our lab and other labs have found that the presence of Neuron-Derived Neurotrophic Factor (NDNF) exhibited tumor suppressive features in lung cancer and kidney cancer (Zhang et al., 2019; Xia et al., 2019). We recently found that *Ndnf* has restricted expression in a subset of AT2 cells in the mouse lung. Interestingly, we found that oncogenic *Kras*-induced lung adenocarcinoma originated from these *Ndnf*-expressing AT2 cells in the mouse lung. It is thus conceivable that the *Ndnf*-expressing cells contain those tumor-initiating progenitor AT2 cells, and that *Ndnf* plays a protective role in the progenitor AT2 cells to prevent tumor formation. To test this hypothesis, we will: 1) determine whether the progenitor AT2 cells express *Ndnf*; 2) determine whether oncogenic *Kras*-induced lung adenocarcinoma preferentially originate from the subset of AT2 cells that normally express *Ndnf*; 3) determine the role of *Ndnf* in the AT2 cells during oncogenic *Kras*-induced lung adenocarcinoma initiation.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Macrophage Heterogeneity within the Developing Prostate and Prostate Tumor Tissue

Prostate cancer has the second-highest mortality rate and the greatest incidence among all cancers in men, and new approaches to treatment are needed. While immunotherapy has become a potent treatment for a variety of cancer types, T-cells only amount to a small minority of cells in the tumor microenvironment in prostate cancers. Instead, tumor-associated macrophages are the most prominent non-cancerous cell population and are highly involved in prostate tumors constituting up to 70% of tumor immune subsets. Although macrophages are known to exist in the prostate and have an impact on prostate tumorigenesis, the character and function of these cells throughout prostate development is unknown. Here we find that two distinct subpopulations of macrophages exist in the prostate throughout development, characterized by the differential expression of Cd74 and Lyve1. Notably, these two subpopulations differed in their cell turnover during early prostate development and were impacted by the presence of male androgens. Additionally, CD74+ macrophages were localized within the prostate epithelium during prostate regression and tumorigenesis. Our results demonstrate the presence of two distinct subpopulations of macrophages in both the normal prostate and in prostate tumors and provide evidence for functional differences of these populations throughout prostate development and regression. We anticipate our work to highlight macrophage diversity in the prostate and the need to further understand how these populations may influence the efficacy of cancer treatments.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Use of Integrative Medicine in AYA Cancer Survivors: A Meta-Analysis

Childhood cancer is well studied within the medical community; increased research, medical interventions, and subsequent survival rates of childhood cancers has resulted in a growing population number of individuals who enter adulthood having survived a traumatic event.

While Western medicine leads to cure of the biological disease, adolescent and young adult (AYA) cancer survivors are often left to live with psychological trauma and long-term treatment adverse effects. The increasing population of AYA cancer survivors has prompted questions into the psychological health of AYA patients post-completion of therapy. Published studies investigating methods of trauma treatment in AYA cancer survivors, however, is limited.

This meta-analysis investigates the national prevalence of integrative / complementary alternative medicine (CAM) services, such as aromatherapy, yoga, and meditation, offered to AYA cancer survivors, as well as outcomes of these various treatment modalities.

This investigation shows the prevalence of Eastern, or integrative medicine, in the treatment of the adverse symptoms during cancer treatment, as well as during remission, has been published among adult cancer patients and survivors; however, institutions and success rates within the AYA cancer survivor population has yet to be studied. There are limited studies published about the success of CAM among the AYA cancer survivor population; however, CAM and integrative therapies are widely researched among adult populations currently receiving cancer treatment, as well as for those in remission. Among these studies, CAM use was documented among breast cancer patients and survivors. Integrative therapies such as yoga, aromatherapy, and Tai Chi were found to be beneficial in the treatment of both physiological and psychological pain associated with Western medical interventions.

The literature review identified limited published studies about the success of CAM among survivors of AYA cancer. The prevalence of integrative therapies has increased in clinics, both nationally and internationally, among adult cancer patients and survivors suggesting that Eastern therapies are being successfully used to treat both physiological and psychological pain during cancer treatment and remission. The limited number of publications surrounding the use of CAM among AYA cancer survivors may be a result of the progressive nature of these therapies within the medical community.

These findings demonstrate the need for more research regarding integrative and CAM therapies among the AYA cancer population, as well as the potential benefit of Eastern medicines to address the psychological impact of cancer survival during remission. Furthermore, the success of integrative and CAM therapies among the adult cancer survivor population suggests the benefits of these therapies for AYA cancer survivors.

### Primary Presenter

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# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Self-Rated Executive Function Impairments Among Young Adults with Autism Are Associated with Sensory Processing Experiences

Background: Executive functioning (EF) challenges in real world settings are well-documented among children with autism spectrum disorder (ASD). Emerging evidence suggests adults with ASD experience similar difficulties; however, many existing studies have relied upon primarily parent/caregiver report. Therefore, this study examined self-ratings of real-world EF problems among young adults with ASD without intellectual disability and age-matched neurotypical adults. EF challenges, like inflexibility, have been correlated with sensory sensitivity in children with ASD in prior studies, yet these associations have not been evaluated in adults. Thus, we also examined correlations between self-report of both EF difficulties and sensory experiences among adults with ASD. Our objective was to characterize self-rated real-world EF difficulties experienced by young adults with ASD and their associations with sensory processing.

Methods: Participants consisted of young adults with ASD ( $n=41$ ;  $M$  age= $25.60\pm 10.28$ ;  $M$  IQ= $113.49\pm 13.86$ ; 32 males) and young neurotypical adults ( $n=73$ ;  $M$  age= $24.27\pm 7.06$ ;  $M$  IQ= $117.04\pm 11.11$ ; 61 males) who completed psychometrically sound and well-established questionnaires assessing EF (Behavior Rating Inventory of Executive Function-Adult (BRIEF-A) and sensory processing (the Adolescent/Adult Sensory Profile).

Results: Adults with ASD rated themselves as experiencing more EF problems overall than did neurotypical adults ( $F=58.32$ ,  $p<.001$ ). When examining the profile of EF difficulties, there was an interaction between BRIEF-A scale and diagnostic group. More specifically, the adults with ASD rated themselves as experiencing particular challenges in shifting/flexibility ( $M=61.59\pm 14.64$ ) and working memory ( $M=62.93\pm 11.88$ ;  $F=3.78$ ,  $p=.001$ ). Based on correlational analyses, only two of the BRIEF-A scales were associated with sensory processing in ASD. Follow-up linear regressions demonstrated that after accounting for the effects of age, sex, and IQ, shifting/flexibility challenges were predictive of sensory sensitivity ( $R^2$  change=.28;  $t=3.25$ ,  $p=.003$ ) and self-monitoring difficulties were associated with low registration of sensory information ( $R^2$  change=.15;  $t=2.08$ ,  $p<.05$ ).

Conclusions: Utilizing self-ratings of EF challenges, we demonstrate comparable EF profiles to those previously documented in autistic adults using parent report. People with ASD rated themselves as having particular difficulties with shifting/flexibility and working memory. Additionally, flexibility problems were correlated with sensory sensitivity while self-monitoring difficulties were associated with low registration of sensory information. These findings strongly support utilizing self-ratings of EF to provide insight into the lived experiences of people with ASD and, for the first time, establishes links between EF and sensory processing in ASD.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Developmental Effects of Six1 Mutations on the Otic Expression of Putative Target Genes in *Xenopus* Embryos

Point mutations in the SIX1 gene play a major role in Branchio-oto-renal spectrum disorders (BORSD), a birth defect that leads to mixed hearing loss. Permanent malfunction of the middle and inner ear can be attributed to the malformation of the ear's ossicles and middle ear space, and hypoplasia in inner ear structures. As the Six1 gene is heavily involved in the regulation of cranial placode development into the ear, the morphological presentation of BORSD can be explained by the interaction between Six1 mutants and their target genes. Using affected tissues, including the cranial neural crest and otic placode, one can trace the involvement of the mutant Six1 gene to its interactions with neural crest cells and branchial arch progenitor cells. Within these cellular regions, there are proposed candidate genes that are targets of Six1: *prdm1*, *eya2*, *TSPAN13*, *zbtb16*, and *spry1*. The four BOR mutations were engineered in the *Xenopus* Six1 gene (V17E, Y129C, R110W, and W122R), which is 100% identical to the human SIX1 gene in the two mutated regions of the protein. The mutants were expressed in a wild-type background in *Xenopus laevis* embryos in order to find any alteration in the expression of the target genes. We found that Six1 mutants were transcriptionally deficient and had deleterious effects on otic development. The interactions between specific mutants and target genes varied, resulting in variable phenotypic expression in the otocyst. With only two confirmed genes that are causative of BORSD, Six1 and Eya1, investigation of potential target genes is imperative for comprehensive genetic screening of at-risk newborns to allow timely implementation of interventions such as cochlear implants and otologic surgery.

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# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Loss of Vestibular Ganglion Neurons in Congenital Vestibular Disorders

In congenital vestibular disorders (CVDs), children form an abnormal inner ear before birth which can result in severe challenges in maintaining posture, balance, walking, eye-hand coordination, eye tracking, reading, and language acquisition. The most common inner ear pathology found in these children is an inner ear in a sac-like configuration with the three semicircular canals absent or truncated. It is not known how this inner ear defect affects the development of the vestibular neural circuitry due to lack of a suitable animal model. Accordingly, this lab designed and implemented a new animal model, the “ARO/s chick”. Briefly, the developing inner ear or “otocyst” is surgically rotated on one side in two-day old chick embryos (E2). The Anterior-posterior axis Rotation of the Otocyst 180° results in a sac-like inner ear that resembles that found in CVD children. On hatching, ARO/s chicks experience balance and walking problems.

Children with CVDs have been reported to have a reduced number of vestibular ganglion neurons (VGs), the first vestibular neurons transmitting vestibular signals from hair cell mechanoreceptors in the inner ear to the brain. This study investigates whether ARO/s chicks contain a reduced number of VGs. Photographic images were taken on a Leica inverted microscope of Nissl-stained, 20  $\mu\text{m}$ , transverse serial sections of VGs on the intact and rotated sides of E13 ARO/s chicks. VG neuron counts and overall ganglion volume were obtained from images of every third section using QuPath computer program and corrected to estimate total ganglion values. In ARO/s chicks ( $n=3$ ), VGs on the intact side contained  $5,559 \pm 270$  neurons, while VGs on the rotated side had  $3,734 \pm 151$  (SEM), a 32% loss. VGs on the rotated side showed a 27% loss in volume compared to the intact side. Thus, VG neuron number is reduced significantly on the rotated side of ARO/s chicks. Reduced VG number was expected because a subset of vestibular nucleus neurons in E13 ARO/s chicks showed a 66% loss of neurons on the rotated side compared to the intact nucleus. Thus, the formation of a sac-like inner ear during early development produces significant losses of peripheral and central vestibular neurons so that the vestibular neural network becomes dysfunctional postnatally. As more information on ARO/s chicks is collected from specific sites in the vestibular neural circuitry, we may revise our thinking on how to treat these disorders.

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# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Use of Duchenne Muscular Dystrophy Models to Identify Biological Pathways that Contribute to the Severity of Cardiac Disease

Duchenne muscular dystrophy (DMD) is an X-linked chronic muscle disease caused by mutations in the dystrophin gene that blocks dystrophin protein expression. Loss of dystrophin causes increased contraction-induced damage of cardiac and skeletal muscle cells, leading to chronic inflammation and progressive degeneration of these muscles. DMD patients suffer progressive muscle weakness, replacement of skeletal and cardiac muscle with extracellular matrix, respiratory distress and cardiomyopathy. With genetic therapies becoming available to treat skeletal muscle deficits, the life expectancy of DMD patients is steadily increasing. These surviving patients develop severe cardiomyopathy in early adulthood, as is common among female DMD carriers. Here we compare a severe DMD mouse model (D2-mdx), that manifests cardiac fibrosis and cardiomyopathy in early adulthood, to a milder DMD mouse model (B10-mdx) with mild, late-onset cardiomyopathy despite carrying the same mutant allele of dystrophin. To understand the disease-related changes that contribute to cardiac disease progression in DMD we carried out RNA sequencing to monitor differential gene expression (DGE) at disease onset in these models. We used multiple functional annotation databases including Gene Ontology, KEGG, gProfiler, and Panther to perform a comprehensive functional annotation of the significant differentially expressed gene list to tap into the strengths of these algorithms. While Gene Ontology and Panther only annotate the gene list using Gene Ontology database, KEGG and gProfiler use multiple biological pathways, drug, and disease databases to understand the functional characteristics of the genes better. Our analysis identified multiple pathways and biological processes that may contribute to greater cardiac pathology in the heart of the severe (D2-mdx) model. These changes include biological processes such as immune response, cadherin signaling, and extracellular matrix structure. As membrane instability contributes to repeated bouts of myofiber injury in DMD, dysregulation of the inflammatory immune response is expected, which activates fibrotic pathways leading to stiffened extracellular matrix and tissue damage and degeneration. Thus, our findings here point to specific early deficits that initiate greater severity of cardiac pathology in D2-mdx compared to genetically comparable milder DMD model B10-mdx. We will present the implication of these findings on the therapeutic avenues to inhibit or slow the progression of cardiomyopathy in DMD.

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# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Motivational Drive for High-Fat Food is Predicted by Initial Preferences in Mice

Chronic obesity can lead to the development of a myriad of conditions such as type 2 diabetes, cardiovascular disease, and stroke. The widespread availability and overconsumption of highly palatable foods, such as those high in fats, are thought to be significant contributors to the epidemic. Diets high in fat are suggested to entail addiction-like behaviors, yet the individual variability underlying these behaviors has yet to be described in basic research settings. This is in part because rodents are typically not provided with multiple diet choices. Here, we attempted to fill this gap by employing Feeding Experimentation Devices (FEDs), which allowed for preprogrammed feeding regimens of food pellets. FEDs are equipped with sensors that can detect nose pokes and food consumption from mice. We first demonstrated that mice with free access to multiple food choices supplied by FEDs showed a varying degree of preference toward food enriched in high-fat (HFD; 50% vegetable fat) over standard chow diet (SD). The individual variability observed in the initial exposure phase was further exemplified using operant tasks aimed at testing an individual's motivational drive to consume the two diets. To measure motivation for HFD and SD, we used fixed ratio feeding schedules, in which the SD FED required only one nose poke for one pellet (FR1), and the HFD FED required either three (FR3) or five (FR5) nose pokes for one pellet. We found that on this feeding regimen, mice with previously defined preferences toward HFD (HFD-pref) exerted more than five times the effort to eat HFD over normal chow that was sustained throughout the dark cycle. In contrast, mice that did not show an initial preference for HFD (SD-pref) did not sustain FR5 operant schedules. Last, we investigated whether these initial preferences were predictive of higher levels of motivation in a progressive ratio operant task, in which the number of nose pokes required for HFD retrieval was progressively increased whereas chow pellet retrieval was maintained on an FR1 schedule. In this assay, breakpoints were higher in HFD-pref mice, further exemplifying the role of individual variability in motivated output guided for food enriched in fat. Prospective implications for this research suggest obtaining a better understanding of the neural mechanisms underlying food addiction.

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# HEALTH SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Mapping Outcomes for Recovery of Consciousness in severe Traumatic Brain Injury

Common Data Elements (CDEs) are standardized and precisely defined items and responses to facilitate consistent data collection across intervention studies. CDEs for recovery of consciousness were introduced in 2010. Yet, lack of uniformity in measures across trials continues to be a major limitation of clinical trials involving patients with severe traumatic brain injury (sTBI). This scoping review examines the type and frequency of primary outcome measures (POs) used in intervention studies of recovery of consciousness for adults in states of disordered consciousness following sTBI and categorizes them within the four main sections of the World Health Organization International Classification of Functioning (WHO ICF) framework. Additionally, the impact of TBI CDEs were evaluated on use and type of POs for 10 years pre- and post- implementation.

Studies from 1987-2019 were identified in PubMed, Scopus, EMBASE, PsycINFO, and the Cochrane Library. A research librarian created a search strategy for each database using three primary concepts: severe TBI, recovery of consciousness, and outcomes. The team reviewed 10,962 titles, abstracts, and full texts to identify studies meeting inclusion criteria. 292 included studies had data extracted and were rated to evaluate study quality using the Scottish Intercollegiate Guideline Network. Data were extracted and analyzed using Stata 16.0. POs were categorized into one of the four WHO ICF domains and also by CDE status for pre- (2000-2009) and post- (2010-2019) CDE implementation.

A total of 74 POs were identified and categorized in the following domains: Body Function (n=50), Body Structure (n=10), Activities and Participation (n=7), and Environmental Factors (n=4). Two POs crossed domains and 1 did not align with any category. Across all studies POs in Body Function domain were commonly used (88%, n=257); the Glasgow Outcome Scale was the highest utilized outcome. Of the 74 POs, 1 was identified as a CDE for recovery of consciousness: Coma Recovery Scale. The CDE PO increased by 15% when comparing pre- and post-CDE implementation studies.

The results demonstrate the great heterogeneity in POs utilized in intervention studies for recovery of consciousness in patients with sTBI. It is clear there is an urgent need to map and classify POs for sTBI clinical trials in order to harmonize and standardize across studies, ultimately resulting in increased data quality, data sharing, and better- informed clinical decision making.

### Primary Presenter

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# HEALTH SCIENCES

## DUAL PA/MPH PROGRAM

### Communication between Adolescents/Young Adults and Health Care Providers during Routine T1D Care

Background: Adolescents and young adults (AYAs) with type 1 diabetes (T1D) are at higher risk for diabetes self-care challenges and elevated A1c. Understanding AYA/health care provider (HCP) communication may provide insight to better support T1D management. The current study examined content and quality of AYA/HCP communication during routine T1D care.

Methods: Thirty-two AYAs (M age=20.5 + 9.1 yrs; 53.1% male; 43.8% non-Hispanic Black; M A1c=8.1+ 1.4%) and 9 HCPs (100% female) participating in an RCT promoting AYA health communication had a routine T1D visit audio-recorded and transcribed. A coding framework was developed to assess communication content and quality, including: AYA initiation, self-disclosure, preparation, and future planning; HCP goal setting, supportive language, problem-solving, education/information sharing, and warnings/threats. Coders double and triple-coded transcripts until 90% agreement was reached. Chi square analyses evaluated associations among codes.

Results: Routine T1D visits were primarily attended by AYAs alone (78.1%), ranging from 8-45 min (M=30.3 +9.3). AYAs and HCPs spoke 27.0% and 69.1% of the visit, respectively. T1D adherence, lifestyle adherence, and developmental issues were discussed in all visits (100%); insurance, mental health, and T1D support systems were each discussed in 53.1% of visits. AYA preparation (e.g. bringing glucose values, regimen knowledge) was positively associated with HCP supportive language ( $\chi^2(1, N=32)=5.7, p=.02$ ) and HCP education ( $\chi^2(1, N=32)=8.3, p<.01$ ). HCP warnings/threats were identified in 25% of visits; 75% of AYAs in these visits had A1c levels  $\geq 7.0\%$ .

Conclusion: Results highlight reciprocal AYA-HCP communication. Improving AYA preparation for T1D care visits may facilitate more efficient and informative AYA-HCP interactions, potentially leading to improved T1D outcomes. Future studies will evaluate associations among communication and T1D outcomes over time, including A1c and transition to adult care.

### Primary Presenter

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### **An Ever-Changing Support System: The Impact of Diet and Habitat on Diversity in Termite Microbiomes**

The gut microbiome refers to the unique network of microscopic organisms living in or passing through the gut. Many factors influence the diversity of a host's microbiome such as diet, environment, and evolutionary history. Termite guts serve as an excellent system to study the microbiome, and are capable of offering great insight into factors that influence microbial diversity within and between species. This is because termite species and populations exhibit variations in factors like habitat and diet. The latter is of particular interest because termites are known to rely on gut microbes to aid in digestion of substances like wood and grass. There is likely differences in gut microbial diversity, then, between species of termites with different diets, and similar microbes between termite species from the same feeding group. The question is, how significant are these dietary differences relative to environmental factors, in shaping microbial diversity in termites? To test this, we surveyed four species of termites *Amitermes laurensis* (AL), *Nasutitermes magnus* (NM), *Coptotermes acinaciformis* (CA), and *Microcerotermes serratus* (MS) from different habitat types in Northern Queensland, Australia. This area is especially unique because it spans an ecotone with habitats that shift from tropical rainforest to savannah. We collected AL, NM, and CA from two different savannah habitats—one dry and one wet, and we sampled MS from both these savannah habitats, an intermediate site, and two rainforest habitats. AL and NM feed on grass, and CA and MS feed on wood. Sampling termites from different feeding groups in different habitats allows for the assessment of the impact of both varying diet and varying habitat on the gut microbiomes of these termites. We extracted DNA from the guts of the sampled termites and sequenced the DNA using 16S amplicon sequencing. We used DADA2 to read quality profiles, filter and trim reads, merge paired reads, remove chimeras, and assign taxonomy. Now, we are further analyzing and exploring the data using Phyloseq. Our findings show that both food source and habitat influence termite microbiome diversity. As we continue to assess which species and groups display the greatest microbial similarity or differences, this will aid in determining which factors most significantly impact microbial diversity in these termite guts.

### **Primary Presenter**

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Meaning in the Midst of Crisis: A Qualitative Study of Family Sensemaking of Terminal Illness

A diagnosis of terminal disease creates an interruption to the routine of life and marks the beginning of an illness journey for patients and their families. Due to advancements in medicine over the past few decades, terminally ill patients and their families experience longer periods of anticipatory grief. Promising treatments intended to extend life and minimize symptoms lengthen the illness journey. While research in this area has provided useful insight on the challenges that family caregivers face, it does not examine the collective experience of the larger family unit. This study explored the cross-disciplinary topics of terminal illness and sensemaking from the perspective of the collective family experience. The central research question was: How do patients diagnosed with terminal illness and their families construct a shared meaning of the terminal illness experience?

For this interpretivist study, an invitation to participate was sent through a GW doctoral program listserve. For selection, families needed to either currently be experiencing terminal illness or had experienced it within 12 months of the interview. Three families participated in two semi-structured interviews – one group interview as a family and one individual follow-up interview 7-10 days later. A total of 15 interviews were conducted. Structural narrative was used to identify stories within the interviews; thematic narrative analysis was used to identify themes within the stories.

Three themes emerged from the data: (1) needing to ease burden for family members; (2) establishing communication within the family; and (3) sensing loss in different ways. The family stories provide insight into the paradoxical journey of terminal illness. They shared stories about their challenges with caregiving and their constant search for answers. The interviews themselves offered opportunities for families to make sense of the illness experience. One family member described the process as healing after the loss of her father while another expressed her appreciation to share their experience. Findings from this study can help other families experiencing terminal illness. It offers insight on how they might create meaning and organize themselves in response to a terminal diagnosis. In addition, the healthcare industry can benefit from these findings. Doctors, nurses and other healthcare professionals can help facilitate sensemaking for their patients and their families.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Participatory Action Research Case Study for Anti-Racist Organizational Change

The double pandemic of Covid-19 and systemic racism has exposed the built-in prejudices of America's medical infrastructure. These prejudices are a manifestation of America's colonial and racist foundation that strategically centers "whiteness" at the expense of Black, Indigenous, people of color (BIPOC) lives. The white-dominant culture is especially pervasive throughout academic medical centers (AMCs), where learnings tend to exclude issues of racism and racial inequity, leading to biased treatment of BIPOC patients by AMC-trained providers and exacerbated racial disparities. Recently, the American Medical Association declared racism a public health crisis, calling upon AMCs to treat race as a social construct.

Recognizing the role medical entities play in America's vast racial disparities, the Anti-Racism Coalition (ARC) was launched (July, 2020), a collaborative effort between George Washington University (GW) medical entities (GW University School of Medicine and Health Sciences, GW Hospital, Children's National Hospital, and GW Medical Faculty Associates). ARC is committed to the "implementation of an anti-racist academic community to identify and eradicate all forms of racism and ethnic oppression." This goal necessitates the development of an organizational change model that attends to power imbalances, historical inequities, and community partnerships in ways that have been unexplored.

Under the guidance of ARC-member and researcher, Dr. Maranda Ward, a literature review of 48 articles (1999-2021) pertaining to AMCs, organizational change models, Critical Race Theory (CRT), Participatory Action Research (PAR), and racial equity was conducted. Case studies (2 organizational change, 2 PAR, and 1 organizational change for racial equity) were critiqued using a CRT lens for omission of achieving sustainable racial equity. In doing so, key terms came up: intersectionality, white privilege, storytelling, and shared power. Synthesized readings were culminated in a proposed model to decolonize the way organizational change is characterized and enacted.

The model's feasibility will be tested as an IRB-approved mixed methods PAR case study in GW's Physical Therapy (PT) Department. It will begin with an assessment that gauges the interest and capacity amongst the PT department's faculty, staff, students, and partners (stakeholders) in building an anti-racist program. Follow-up interviews will be conducted to understand stakeholders' interests, needs, strengths, challenges in addressing racism, racial/health equity and calls for diversity and inclusion. Results will be translated into anti-racist policy and training recommendations that engages stakeholders. Depending on study results, the model will be utilized across all GW medical departments, thus helping to achieve ARC's goal of building an anti-racist GW.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Assessing the Health Equity Knowledge, Attitude, and Capacity of Students in the Health Professions: A Baseline Survey

Significant health disparities remain in the United States due in part to uneven access to quality food, jobs, housing, schools, healthcare, and safe neighborhoods. The pervasive nature of structural racism, stigma, and discrimination maintains these gaps. Health professionals are poised to play a pivotal role in mitigating health disparities as they work to improve the health of the community, conduct research, and interact directly with patient populations. Thus, students in the health professions must be adequately prepared through incumbent educational training programs to recognize the social determinants of health, including racial and wealth inequalities to ultimately appreciate, explore, and address health equity challenges. The objective of this two-phased mixed methods study is to assess the health equity knowledge and capacity of newly enrolled health professional students from The George Washington University School of Medicine and Health Sciences and School of Nursing.

The first phase of this research includes validating a 36-item survey instrument. Validation of the survey instrument includes the following steps: A) an expert panel review consisting of faculty, staff, and potential employers (n=11) for construct validity; B) cognitive focus groups consisting of currently enrolled students (n=22) for content validity; C) psychometric testing to transform the coded Likert scale data into weighted scales using a Rausch analysis; D) piloting the tool among existing students across the participating programs (n=48) to determine that the items capture the true range of knowledge and attitudes of students. After validating the survey, we will begin the second phase of the research, where we will administer the electronic survey using Qualtrics to newly enrolled students across all participating programs at the beginning of each semester for 3 years. Research is ongoing with phase one to validate the survey tool before it is implemented into main practice.

Validating this instrument will contribute valuable information on how to empirically measure health equity knowledge. In conclusion, our data will inform research, curriculum, clinical training, and service-learning projects to address the knowledge and attitude gaps present within the student population and establish a measurable health equity competency for the health professions.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Hospital-Based Health Care Worker Perceptions of Personal Risk Related to COVID-19

**Background:** Health care workers treating Coronavirus disease 2019 (COVID-19) patients face significant stressors such as caring for critically ill and dying patients, physically demanding care requiring new degrees of personal protective equipment use, risk of contracting the disease, and putting loved ones at risk. This study investigates the stress impact from COVID-19 exposure and how nurses and medical providers (eg, physicians, nurse practitioners, physician assistants) experience these challenges differently.

**Methods:** An electronic, self-administered questionnaire was sent to all hospital staff over 6 weeks surveying exposure to COVID-19 patients and degree of stress caused by this exposure. Responses from medical providers and nurses were analyzed for significant contributors to stress levels, as well as comparing responses from medical providers versus nurses.

**Results:** Stress levels from increased risk of disease contraction while on the job, fear of transmitting it to family or friends, and the resulting social stigma were highest in medical staff during the COVID-19 pandemic. Compared with medical providers, nurses had nearly 4 times the odds of considering job resignation due to COVID-19. However, most health care workers (77.4% of medical providers and 52.9% of nurses) strongly agreed or agreed with the statements indicating high levels of altruism in their desire to treat COVID-19 patients.

**Conclusion:** The significant stress burden placed on nurses likely contributes to increased thoughts of job resignation. However, health care providers displayed high levels of altruism during this time of extreme crisis, despite their personal risks of caring for COVID-19 patients.

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# HEALTH SCIENCES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Age is the Only Factor that Affects Survival to Hospital Admission in Video- Reviewed Out-of-Hospital Cardiac Arrest Resuscitations

#### Study Objectives

Out-of-hospital cardiac arrest (OHCA) affects more than 350,000 people in the United States each year with a survival rate of approximately 12%. Many factors have been implicated for their role in determining survival. For example, the American Heart Association recommends limiting pulse check time to less than 10 seconds and maintaining chest compression fraction (CCF)  $\geq 80\%$ . We utilized data from video-reviewed OHCA resuscitations at an urban academic emergency department (ED) to investigate factors associated with survival to hospital admission.

#### Methods

Data was gathered on 96 OHCA resuscitations between July 2, 2017 – December 9, 2019. Each resuscitation was recorded in real-time in critical care bays within the ED. Videos were reviewed independently by two emergency medicine residents. The data compiled represents that from video review and retrospective review of the patients' charts. Descriptive statistics (T-Wilcoxon-Mann-Whitney and Chi-squared/Fishers exact tests) and logistic regression were used to identify the factors associated with the survival to hospital admission.

#### Results

Overall rate of survival to hospital admission was 29%. Pre-hospital variables including witnessed arrest, bystander CPR and defibrillator use, and length of pre-hospital code had no significant effect on survival to hospital admission (all  $p > 0.05$ ). Notably, in-hospital variables including length of code, time to monitor placement, time to definitive airway placement, length of pulse checks, and CCF were also not associated with a significant effect on survival (all  $p > 0.05$ ). Of the factors investigated, only age was statistically significant ( $p = 0.035$ ) with the data suggesting that as age increases, rate of survival to hospital admission decreases ( $\beta = -0.041$ ).

#### Conclusion

In our population, variables that have previously been reported to affect outcomes (bystander CPR and defibrillation, length of code, CCF etc.) along with variables unique to video-review cases (time to monitor, time to IV access, length of pulse checks, etc.) had no significant effect on survival to hospital admission.

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# HEALTH SCIENCES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### CPR Duration and Temporal Characteristics of the Resuscitation

#### Introduction:

Prior studies have demonstrated an inverse relationship between the duration of cardiopulmonary resuscitation (CPR) and favorable outcomes. This literature suggests that prolonged CPR is futile. Providers often base the decision to suspend CPR on a qualitative judgment. These decisions are individualized according to each patient and his/her comorbidities. However, resuscitations are resource and time intensive, which could influence provider decision-making. Furthermore, emergency department (ED) volumes and available resources fluctuate with time of day and day of the week. We examine the relationship between the temporal characteristics of a resuscitation and CPR duration.

#### Methods:

This study was a prospective observational study utilizing video-capable resuscitation bays to capture cases of CPR in the ED. Investigators reviewed videos and recorded characteristics of the resuscitation. Medical records were reviewed for outcomes. Data on 96 cardiac out-of-hospital arrest patients between December 22, 2017 and February 3, 2020 were analyzed. One-way analysis of variance (ANOVA) was used to test whether the day of the week correlates with the duration of CPR. T-tests were performed to examine the correlation between weekends/weekdays and the duration of CPR. Ordinary least squared (OLS) regression was run to examine the effects of time of day and day of the week on CPR duration, adjusting for covariates. The primary outcome was total minutes of CPR.

#### Results:

There was significant variation in the duration of CPR, ranging from 2 to 54 minutes, with a median duration of 12 minutes. ANOVA analysis indicated there is no difference in CPR duration depending on the day of the week. When patients were analyzed in a sub-group analysis of patients who had return of spontaneous circulation (ROSC), there were significant differences in mean CPR duration depending on the day of the week. Among patients with ROSC, CPR duration was significantly shorter over the weekend (mean duration was 8 min ( $p=0.02$ )), which was confirmed with the T test. Time of day (AM vs PM) did not have any correlation with duration of CPR.

#### Conclusion:

CPR duration did not vary with days of the week nor times of day. Given Monday ED visit volumes are the highest, we had hypothesized that the balance between available resources and resuscitation needs would result in a shorter duration of CPR, especially among patients who did not have ROSC. This analysis demonstrated that this was not the case, which likely reflects the resource-rich setting in which we practice as a tertiary academic hospital.

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# HEALTH SCIENCES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Evaluating IBD Patient-Initiated E-Messaging and Telemedicine Visits during the COVID Pandemic: A Single-Center Study

#### BACKGROUND

During the COVID-19 pandemic, electronic messaging and telemedicine visits between patients and physicians have emerged as vital platforms through which chronic disease management is conducted. While an increased number of clinicians have engaged in virtual healthcare, there is limited research on the use of e-communication and telemedicine visits in inflammatory bowel disease (IBD) patients. This study evaluates the use of electronic communication, messaging content, and telemedicine visits across IBD patient demographics.

#### METHODS

A retrospective chart review was conducted of all IBD patients seen during the past 3 years in a university gastroenterology clinic. There were no exclusion criteria. Patient gender, age, ethnicity, IBD subtype, medications were obtained. E-messaging and content via FollowMyHealth portal application during March – August 2020 of the COVID pandemic were evaluated. A confidential database was created using Microsoft Excel with statistical analysis set at  $\alpha=0.05$ . This study was IRB approved.

#### RESULTS

295 medical records of IBD patients were evaluated. 53 (18.0%) IBD patients used secure e-communication. There was a significant difference in the rate of e-messaging based on gender (56.6% males vs 43.4% females;  $p=0.0478$ ), race (Whites 71.7% vs AA 17.0%;  $p=0.0109$ ) and medication regimen (biologic 54.7% vs non-biologic 45.3%;  $p<0.001$ ). There was no difference in the use of e-messaging based on age (66% in patients  $\leq 50$  years vs 34% in patients  $> 50$ ;  $p=1.00$ ) or IBD subtype (79.3% in UC vs 15.1% in CD;  $p=0.0774$ ). The most common messages included concerns regarding SARS-CoV-2 risk with immunosuppressive medications (18.9%), home infusion arrangements (15.1%), and refill requests (18.9%). 56 patients (19.0%) had a telemedicine visit during the pandemic. There was no significant difference in the rate of telemedicine visits based upon gender (53.6% males vs 46.4% females;  $p=0.1349$ ), race (50.0% W vs 35.7% AA;  $p=0.3099$ ), age (64.3%  $\leq 50$  y vs 35.7%  $> 50$  y;  $p=0.8765$ ), IBD subtype (67.9% UC vs 28.6% CD;  $p=0.6106$ ), or medication regimen (41.1% on biologic therapy vs 58.9% on non-biologic therapy;  $p=0.0512$ ).

#### DISCUSSION

Although virtual platforms have been increasingly used for IBD management during the COVID pandemic, this study reveals disparities in the utilization of electronic communication. Males, whites, and those on biologic medications more frequently used portal messaging. While this study revealed differences in e-messaging use, disparities in telemedicine encounters based upon gender, age and medication regimen were not apparent. Further research is warranted to evaluate the clinical outcomes of virtual engagement during this vulnerable time in healthcare.

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# HEALTH SCIENCES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Does Intubation of COVID-19 Patients Save Lives? A Descriptive Analysis of A Prospective Registry

**INTRODUCTION:** As the COVID-19 pandemic continues, respiratory management strategies emerged as a primary concern. The mortality rate for patients with COVID19 who require intubation, and the predictors of mortality for this specific population are poorly characterized with only a few case series and retrospective studies. Published mortality rates of patients requiring intubation have ranged from as low as 35% to as high as 80%. Given the overall high mortality rate associate with intubation, growing literature calls for further efforts to characterize this critical population.

**METHODS:** Analysis of a single urban academic center prospective database of intubated patients with COVID-19, including transferred patients. Descriptive statistics were used to characterize the intubated patients. Logistic regression was performed to account for age, gender, BMI, race, history of diabetes, COPD, and asthma.

**RESULTS:** From March 2020 to July 2020, 369 COVID-19 patients were included in the registry 93 of whom were intubated. Of those intubated, mean age was 57.3 years, with an average BMI of 32.5. 63.7% of the intubated patients were males, with 62.6% Black, 24.2% Hispanic, and 13.2% Caucasian. We report an overall mortality of 80%, with a crude odds ratio of 28.5 (95% CI: 14.5 - 55.8) for death associated with intubation. Logistic modeling revealed that age and gender are significantly associated with mortality, with mortality odds increasing approximately 9% for each year of age, and 2.8 times higher for males. BMI, race, and history of diabetes, COPD, and asthma did not meet statistical significance for association with mortality, nor were there any significant interaction effects. Holding age and gender constant, the odds ratio for death associated with intubation increases to 105.3 (95% CI: 38.5-287.8).

**CONCLUSIONS:** We report a high mortality rate of intubated patients, which may be multifactorial from being a referral center accepts critically ill patients, including evaluation for ECMO. Furthermore, our institution was an early adopter of noninvasive ventilation methods in an attempt to avoid intubation whenever possible. Ultimately, further studies are needed to better characterize those COVID-19 patients that require intubation and what variables are more closely associated with morbidity and mortality.

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# HEALTH SCIENCES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Clarifying Mistreatment in the Clinical Learning Environment

**Background:** Student mistreatment continues to be a pervasive and ongoing issue within medical schools. Students have different perceptions regarding what constitutes mistreatment. Mistreated students have increased rates of burnout, anxiety, and depression. Data from the AAMC Graduation Questionnaire has shown that the ombudspersons are one of, if not the least likely option students choose when reporting mistreatment. Current literature indicates that using an educational intervention designed to clarify mistreatment improves the ability of students to identify and report mistreatment episodes in the clinical setting.

**Intervention:** Our innovative approach seeks to deliver an ombudsperson-led lecture to third-year medical students that will increase their fund of knowledge on what constitutes mistreatment through examples, an explanation of the advisory role of the ombudspersons, the absolute maintenance of student confidentiality in their interactions with the ombudsperson, and the procedural venues that are open to the students in the mistreatment reporting process. The lecture will be given in the transition course for students prior to embarking on clinical rotations.

**Evaluation:** We will assess the effectiveness of our intervention by comparing students' responses to the AAMC Graduation Questionnaire at our institute in the years before and after the lecture was implemented. This questionnaire is sent annually by the AAMC to graduating medical students across the different schools and includes questions about mistreatment. We will also track mistreatment reports to the ombudspersons at GW in the years before and after the lecture-based intervention. Finally, we will administer an IRB-approved survey before the lecture to obtain baseline data on knowledge regarding mistreatment, immediately following the lecture to determine what was learned in the short-term, and finally at both six months and one year intervals after the lecture to assess long-term retention. This survey will, amongst other things, ask about student comfort-levels in reporting, trust in the school's ability to ensure confidentiality, and overall understanding of what constitutes mistreatment. We expect that our lecture will improve students' understanding of what constitutes mistreatment. We also expect that our intervention will increase mistreatment reporting and reports specifically to the ombudspersons.

**Discussion:** Some medical schools have a stand-alone lecture and discussions on mistreatment, while others do not. In the spirit of the well-regarded slogan "nothing about us without us," students' inclusion in the conversation is critical as they are ultimately the ones experiencing the mistreatment.

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# HEALTH SCIENCES

## SCHOOL OF NURSING

### Implementation of Diabetic Foot Care Education Improvement Project

**Background:** A diabetic foot ulcer (DFU) is a major complication in diabetes mellitus that results in increased mortality, morbidity, costs, and reduced quality of life. In 2015, an estimated 9.1 million to 26.1 million people with diabetes had DFUs worldwide. In 2019, 288 diabetic patients with diabetic complications such as DFU were treated at the project site.

**Aims & Objectives:** The project involved implementing diabetic foot care education among diabetes patients in the clinic towards improving their diabetic foot care knowledge and skills. The project aimed to empower the patients to adopt proper foot care practices and reduce diabetic foot complications incidences.

**Methods:** The project used a quantitative quasi-experimental design and was implemented among 31 diabetic patients aged 65-years and older at risk of developing diabetic foot ulcers. Data were analyzed through a paired t-test and McNemar test via SPSS.

**Results:** The patients' diabetic patient foot care knowledge improved from pre-intervention ( $M = 12.69$ ,  $SD = 3.118$ ) to post-intervention ( $M = 14.69$ ,  $SD = 1.365$ ). There was a significant improvement of diabetic patient foot care skills from pre-intervention ( $M = 52.13$ ,  $SD = 9.142$ ) to post-intervention ( $M = 64.35$ ,  $SD = 6.290$ ). A significant decrease of diabetic foot complications from pre-intervention ( $M = 1.97$ ,  $SD = 1.048$ ) to post-intervention ( $M = 1.06$ ,  $SD = 1.063$ ) was noted.

**Conclusions:** Foot care education improves foot care knowledge and practices and reduces DFU incidences. Healthcare practitioners should educate diabetic patients on appropriate foot care practices to reduce incidences of DFU.

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# HEALTH SCIENCES

## SCHOOL OF NURSING

### Just in Time Orientation of Non-Critical Care Nurses to the Critical Care Environment

#### Background

During the ongoing COVID-19 pandemic, many organizations have redeployed non-critical care nurses to Intensive Care Units to help provide care to the influx of critically ill patients. There is consistent evidence that provision of orientation programs have a positive effect on nurses who care for critically ill patients. Training is needed for these nurses to effectively assist in the care of these patients.

#### Objectives

This project developed, implemented and evaluated a Just in Time Critical Care Orientation training program. The project's three objectives were to increase participants' knowledge, improve their self-rated competence and confidence, and for participants to be satisfied with the program.

#### Methods

A 12-hour educational program based on national critical care resources was developed, implemented and evaluated. Thirty-two medical-surgical and step-down nurses were recruited to attend the program. The class delivered critical care information to participants through classroom learning, simulation, and hands-on experience in a critical care unit. Using a pre- and post-test design, participant knowledge and self-rated confidence and competence were measured using the Basic Knowledge Assessment Tool (BKAT) and the Perception to Care in Acute Situations (PCAS) tool. Participant skill demonstration and satisfaction with the program was also evaluated using the Student Satisfaction with Learning Survey tool.

#### Results

After completing this program, participants had an increase in knowledge as measured by significantly increased overall BKAT scores (Pre-test mean score 77.19 (SD = 15.08), post-test mean score 92.19 (SD = 7.51), as well as significant increase in answers to questions related to ventilators. The PCAS scores showed significant improvement in participants' rating of their abilities with regards to acute situations and care of critically ill patients in the post-test, as compared to the pre-test. Questions that asked specifically about the participants' self-rated ability to care for critical care patients, on ventilators, requiring intubation and critical care medications, saw significant increase in the post-test. Participants were overall highly satisfied with many aspects of the program, such as the content, teaching styles and modalities, and their ability to apply the information learned.

#### Conclusions

Implementation of a one-day critical care nursing program is an effective method of providing non-critical care nurses with basic levels of critical care knowledge and competency during a crisis that requires them to assist with providing care to critically ill patients.

#### Primary Presenter

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# HEALTH SCIENCES

## SCHOOL OF NURSING

### **A Quality Improvement Initiative to Engage Older Adults in the Discharge Process Using the IDEAL Discharge Protocol**

**Background.** Readmissions are costly and adversely affect patient outcomes. Readmissions significantly impact older adult's ability to manage post-discharge. Older adults are more likely to have challenges with understanding newly prescribed medications after discharge and therefore are less compliant with medications. Older adults are also less likely to follow-up with their primary care physician after discharge. Engaging patients and families in a collaborative discharge process is a key foundational element needed to improve patient outcomes and reduce avoidable readmission rates.

**Purpose.** This quality improvement initiative engaged patients and families in an evidence-based discharge protocol to reduce avoidable readmission over three months.

**Methods.** The Define, Measure, Analyze, Design, and Verify (DMADV) improvement process was used to implement the initiative. The IDEAL Discharge Protocol was piloted on one medical-surgical unit targeting adults 65 years or older with no cognitive deficits and discharged home. The IDEAL Discharge Protocol focused on implementing a structured process to include patients and their families in a collaborative care process focused on discussion, education, and post-discharge follow-up.

**Results.** Forty-four participants engaged in the study. A 4 percent decrease in the pilot unit readmission rate was observed. Before implementation, the readmission rate was 17 percent. After implementation, the readmission rate was 13 percent. Post-discharge follow-up resulted in the completion of 52.2 percent follow-up calls and 45.5 percent follow-up appointments scheduled. Of the 44 participants engaged in the intervention, two were readmitted, resulting in a 4.5 readmission rate for the study participants. Medication compliance was assessed and found to be 93.3 percent, and 100 percent of participants received education while engaged in the study.

**Conclusion.** The IDEAL Discharge Protocol aided in improving the discharge process to better equip patients with the tools to successfully transition home after discharge and return to their preadmission state. The IDEAL Discharge Protocol's implementation showed a trend toward reducing the pilot unit's readmission rate over the study period.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## SCHOOL OF NURSING

### Increasing Mental Health Competency in School Nurses

**Background:** Mental health concerns in the pediatric school population have significantly increased in prevalence over recent years, with an estimated 30% of the school age and adolescent population having a mental health disorder. Unfortunately, the time from onset of symptoms to treatment on average is over eight years, leaving less than 25% receiving appropriate care for their mental health conditions. Access is poor in Virginia, with the state ranking 47th out of 50 for pediatric mental health care. Spending the majority of their waking hours in the school setting, children and adolescents are familiar and comfortable with the school nurse, providing the ideal site to access mental health services. School nurses spend one third of their workload on mental health issues, yet more than half of all school nurses state feeling undertrained.

**Aims:** Implement a two-month pilot evidence-based protocol for school nurses designed to increase school RN competency of identification, management, and referrals for students with mental health concerns, ultimately increasing the access and quality of mental health care in the school system. Outcomes measured domains of knowledge, attitude, and competency related to aforementioned goals.

**Methods:** The quality improvement pilot program was administered virtually to school nurses practicing in Northern Virginia in the Fall of 2020. Interventions consisted of online Mental Health Training Intervention for Providers in Schools (MH-TIPS) modules, a process algorithm for interdisciplinary management of mental health issues in the school system, and weekly education designed to increase mental health competency. Data collection occurred via REDCap pre-, mid-, and post-surveys.

**Results:** 26 full-time Virginia school nurses completed the pilot project. Results demonstrated a statistically significant increase in all outcome domains: knowledge of signs, symptoms, and screening tools, increased positive attitude of screening and counseling in schools, and increased competency of identifying mental health concerns, screening tool administration, and referring for concerns.

**Conclusion:** School nurses are on the frontlines of pediatric mental health care. Increasing competency to identify and manage care for children/adolescents with mental health concerns is a priority to improve access and care for Virginia students. This pilot program is a cost-free program that can significantly increase mental health care competency for school nurses, not only in Virginia, but across the country.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## SCHOOL OF NURSING

### Implementation of Capnography Monitoring to Improve Outcomes among Intensive Care Units Patients on Patient-Controlled Analgesia or Opioids

**Background:** Patient-controlled analgesia (PCA) administration of opioids is associated with risk for respiratory depression. Capnography is a non-invasive way to identify early respiratory depression and prevent adverse patient events.

**Purpose:** This project evaluated the effectiveness of capnography versus standard monitoring in reducing adverse events among patients admitted to an intensive care unit (ICU) who were prescribed PCA opioids and evaluated patients at high-risk for respiratory depression according to age, gender, diagnosis, co-morbidities, and type of opioid prescribed.

**Methods:** This project used a pre- and post-intervention design to compare differences in the number of adverse events among 20 adult patients admitted to an ICU during a six-month period who were prescribed PCA opioids and received either capnography monitoring or standard monitoring. A chi-square test was conducted to evaluate group differences.

**Results:** The number of adverse events was not significantly different between patients who received standard monitoring versus those who received capnography ( $\chi^2=0.00$ ,  $df=1$ ,  $N=20$ ,  $p>0.05$ ). Adverse events were not significantly associated with age, gender, number of co-morbidities, type of opioid, and diagnosis ( $p>0.05$ ).

**Conclusions:** Implementation of capnography among ICU patients on PCAs did not prevent adverse events. However, there were favorable trends noted with regards to sedation level and a decrease in the occurrence of bradypnea in patients receiving capnography. Results from this project will guide the implementation of capnography throughout the institution.

### Primary Presenter

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# HEALTH SCIENCES

## SCHOOL OF NURSING

### Implementing TeamSTEPPS® Training for an Interdisciplinary Healthcare Team to Improve Teamwork

**Background:** The ambulatory surgery center's interdisciplinary team was experiencing poor teamwork and communication. Ineffective teamwork and communication increase the risk of adverse patient outcomes. An evidence-based teamwork training intervention was needed to improve teamwork and communication.

**Aims /Objectives:** The entire team participated in a TeamSTEPPS® training program. The aims and objectives were to improve the staff's attitudes and perceptions of teamwork and communication; pre, post and sustained at 30-days, reduce the number of documented near misses and measure for daily use of the newly acquired skills.

**Methods:** This is a quality improvement project with a one group, pretest and posttest design. The TeamSTEPPS® intervention was presented to the healthcare team. Participants' teamwork attitudes and perceptions were measured pre, post and 30-days post-intervention using the TeamSTEPPS® Attitude (T-TAQ) and Perception (T-TPQ) Questionnaires. A repeated measures ANOVA compared data at three time points. A post-hoc pairwise comparison determined effect size. Documented near misses were collected pre-and post-intervention. Two process questions were utilized to examine the team's use of new communication skills.

**Results:** The ANOVA showed that teamwork attitudes and perceptions improved when compared from M1 to M3 for each of the team constructs measured. A moderate effect was achieved. The near-miss outcome was inconclusive. All participants indicated daily use of new communication skills.

**Conclusions:** The TeamSTEPPS® training intervention improved the attitudes and perceptions of teamwork post-intervention and was sustained at 30-days. Providing teamwork training to interdisciplinary healthcare teams may decrease risks associated with adverse patient events.

### Primary Presenter

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# HEALTH SCIENCES

## SCHOOL OF NURSING

### Mindfulness Training in Mitigating Implicit Bias: Improving Cultural Competency for Nurses Caring for LGBT Individuals

Background: Equitable care remains a goal of the United States healthcare system, with cultural competency training used as one intervention to mitigate disparities. Cultural competency education is primarily based on racial and ethnic differences, often omitting other marginalized groups. Implicit bias consequences are not addressed in such training programs despite the association in health outcome disparities. Research related to implicit bias has demonstrated the ability to promote malleability in implicit associations, which may influence the development of openness, acceptance, and insight into the nature of marginalized groups.

Objectives: This project assessed a mindfulness meditation exercise intervention on nursing awareness in interacting with lesbian, gay, bisexual, and transgender (LGBT) patients. Additionally, an LGBT health education module that integrates affirmative practice and implicit bias concepts was introduced. This project served to improve awareness of implicit bias against LGBT individuals in order to begin mitigating the associations with poorer health outcomes.

Methods: Using a pre-post intervention design, participant acceptance and comfort in working with LGBT individuals was measured using the Sexuality Implicit Association Test (IAT). Participants were instructed on the use of a mindfulness meditation exercise and completed a self-paced LGBT health education module. Content included LGBT terminology, health disparities, effective communication, and an overview of implicit bias awareness.

Results: A total of 81 participants completed the pre-intervention IAT, and 51 completed the post-intervention IAT. In comparing pre- and post-intervention IAT scores, there was an overall increase in neutrality of bias between heterosexual and homosexual individuals.

Conclusions: Mindfulness provides a promising opportunity to decrease bias in healthcare workers interacting with marginalized groups. This project provides a basis for organizational change for implicit bias awareness education. The research provides further inquiry into the paucity of available literature of LGBT-specific healthcare, implicit bias, and cultural competence.

### Primary Presenter

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## SCHOOL OF NURSING

### Improving Nurse Manager Job Satisfaction: An Urban Academic Quality Improvement Project

#### Background

It is important that the nurse managers are able to contribute to organizational vision, mission, and goals by influencing others, sharing the vision, and implementing it (Boyce, 2018). They are pivotal to the successful accomplishments of the hospital mission. There was a paucity of literature about job satisfaction and job retention of nurse managers at urban academic medical centers.

#### Objective

The purpose of this project was to examine the effectiveness of educational interventions for nurse manager role development, job satisfaction and intent to remain in the role.

#### Methods

This was a quasi-experimental pre-posttest design project. The sample size consisted of 16 nurse managers from various nursing areas at an urban academic hospital. Demographics, competency self-assessments, as well as job satisfaction and the intent to remain in the role were measured and reviewed. The interventions were presented in four educational sessions.

#### Results

The managers had a mean age of 53.3 years, 73.3% were female and Black. Sixty percent were Masters' prepared. Collectively they had 27.9 years in the profession. There was no difference in most of the measured variables except about job satisfaction and retention. There was a one- point drop in thinking about leaving the organization, the job, and the profession.

#### Conclusion/Implications

This was a very small study. This data should be considered preliminary. To confirm some of the indications found, this study should be implemented in larger settings for a longer period of time for generalizability.

#### Primary Presenter

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# HEALTH SCIENCES

## SCHOOL OF NURSING

### Insights from Healthcare Worker Parents on Parenting Stress during the Covid 19 Pandemic: A Qualitative Approach

#### Purpose:

Frontline healthcare workers have experienced significant stressors related to the global pandemic known as Coronavirus 2019 (COVID-19). The impact of COVID-19 on frontline healthcare workers (HCWs) who are also parents (HCWs-Ps) is multifaceted. To prevent further spread of infection, stay-at-home orders were enacted throughout the country. Parents of children, infants to age 18, found themselves facing a demanding work schedule with little to no childcare or supervision during standard school hours. Thus, because of social distancing measures, HCWs-Ps face the unique challenge of having to care for children at home during work hours. HCWs-Ps also face daily fears of exposing themselves and their family to the virus while having to serve on the frontlines of the pandemic. As the pandemic has increased, recent limited evidence suggests that both parents and children worldwide face exceptional circumstances, such as parenting stress, disrupted work-balance, and challenged overall family well-being, due to COVID-19. Disruptions of family life because of imposed social distancing rules may have long-term consequences on parents and children. To our knowledge, no previous studies have investigated parenting stress among HCWs-Ps during the COVID-19 pandemic.

#### Methods:

This qualitative case study seeks to explore and describe the personal experiences of HCWs-Ps on the parenting stressors encountered during COVID-19 in the United States. A collective case study design employing semi structured interviews was used to collect cases' study data. Utilizing cross-case analysis, we compare and report on the distinctive stressors among HCWs-Ps through case descriptions.

#### Results:

The themes and codes derived from our analysis will report feelings, situations, and stressors from real-life events as reported by HCWs-Ps. Such themes will include parenting and work stressors as described in the semi structured interview guide.

#### Conclusion:

Study results will inform future studies and provide insights to management leaders in healthcare organizations and to law- and policymakers on how their policies and decisions impact the frontline workers. It will also potentially identify the dynamic needs of HCWs-Ps and their families should other public health emergencies arise that require social distancing.

### Primary Presenter

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# HEALTH SCIENCES

## SCHOOL OF NURSING

### Lung Cancer in Older Adults: Using Medicare Claims Data to Identify Symptoms and Co-Morbidities

**Introduction:** In patients with lung cancer, co-morbid conditions and symptoms complicate treatment, diminish quality of life and shorten survival. We aimed to describe the burden of symptoms, treatment effects, and comorbidities as characterized by the use of diagnostic and administrative codes in older adults with lung cancer receiving Medicare-related healthcare for lung cancer and preliminarily appraised moderation by age and gender. Based on literature review, we anticipated increased rates of pain-related symptoms and mental health diagnoses in older adults with lung cancer.

**Methods:** The study population included all adults >65 years of age from the 2017 5% standard random national sample of Medicare carrier file data. A total of 18073 patients with lung cancer were identified among 1,478,670 beneficiaries. We compared all ICD-10 coded diagnoses for patients with and without lung cancer (comparison group) using relative risk ratios.

**Results:** We identified 651 frequently coded ICD-10 diagnoses among patients with lung cancer, including 38 symptoms and 18 major co-morbidities. Compared to patients without lung cancer, those with a lung cancer history had increased risk (RR; 95% CI) of general pain (2.78; 2.71-3.13), depression (1.46; 1.41- 1.60), and anxiety (1.75; 1.71-.2.10). Emphysema (9.15; 8.89-9.85), COPD (4.60; 4.41-4.76), and heart failure (2.01; 1.95-2.18) were also notably increased in lung cancer patients. Within the lung cancer group, men had an almost two-fold risk of anxiety (1.96; 1.90-2.74).

**Conclusions:** Patients with a lung cancer history have a higher relative risk of pain, mental health disorders, and other comorbid conditions that may affect long-term outcomes. Future analysis of Medicare D and SEER-Medicare data may discern the impact of lung cancer features (pathology, stage, adjuvant treatment) combined with comorbidity prevalence (pain, anxiety/depression, cardiovascular disease) on long-term outcomes such as recurrence rates and mortality.

### Primary Presenter

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# HEALTH SCIENCES

## SCHOOL OF NURSING

### Limited Pediatric Mental Health Exposures Amount FNP Clinical Rotations

#### Background

Nurse practitioners are one of the fastest-growing professions in the country, with approximately 290,000 licensed in the United States and most holding the family nurse practitioner (FNP) degree. FNP are most commonly employed in primary care settings and see patients across the lifespan, including children and adolescents. Approximately 5% of outpatient pediatric office visits focus on psychiatric or behavioral problems, and 35% of these children sought care in a primary care office. Assuring that FNPs are prepared to provide this care is essential for quality outcomes.

#### Aim

This study aimed to evaluate FNP student preparedness in pediatric mental health assessment by examining student clinical experiences from a national survey of FNP students.

#### Methods

A secondary analysis was performed on a data set of FNP students (N=3946) from the National Study of Clinical Education in Family Nurse Practitioner Programs from 2016 to 2018. Pediatric, adult, and gerontology mental health assessment clinical experiences and securement of clinical sites were analyzed with descriptive statistics and chi-square analysis.

#### Results

Nearly 30% (n=1118) of FNP students reported experiencing fewer than two pediatric mental health assessments during their clinical rotations. Compared to their experiences with adults, there was a statistically significant difference,  $\chi^2(16, n = 1154) = 331.014, p < 0.001$ . Additionally, more than half (53%) of these students were required to set up their own preceptors and clinical sites.

#### Conclusion

The alarmingly low number of mental health experiences reported are concerning as frequency and experience are needed for skill acquisition (Benner, 1982), and new FNPs would be lacking an essential practice competency. Additionally, students who had few pediatric experiences were more likely to have set up their own clinical rotations. Study findings can guide educators to strategically direct clinical experiences to include this aspect of practice with this population. Facilitating student placement in clinical sites where pediatric care includes mental health assessment is crucial. If programs do not provide direct placement, rigorous evaluation of student-selected clinical sites and preceptors is needed to ensure adequate exposure to such experiences.

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RESEARCH SHOWCASE

# HEALTH SCIENCES

## SCHOOL OF NURSING

### Quality improvement initiative: Implementing Nurse Peer Mentorship Program

Introduction: Formal mentoring programs are valuable experiences for the mentor and the mentee. They provide nurses with the ability to develop professional networks while refining their competency. Nurses should be properly mentored focusing skills in addition to addressing their emotional needs. The purpose of this quality improvement project was to promote and evaluate the effectiveness of an existing mentoring program on intent to stay, perceived competency, and job satisfaction.

Methods: International Review Board approval was obtained. A convenience sample of new nurses with less than 2 years' experience in an academic medical center were recruited to assess their intent to participate in the mentoring program. The Caine Quality of Mentoring Tool (Caine, 1989), the McCloskey & Mueller Satisfaction Scale (1990), and a demographic questionnaire was administered to potential participants pre- and post- the tailored intervention. A pre-notice letter highlighting the advantages of participating in the mentoring program was distributed. The Doctor of Nursing Practice student used Zoom, and in person meetings with potential mentees, local leadership and mentors to socialize them to the program.

Results: De Identified data collected in Qualtrics and transferred to SPSS for analysis. Percentage were reported for interval data, whereas, standard deviation or mean will be reported for interval data. Of the 44 nurses surveyed, 22% completed the survey. Preliminary data revealed that 60% of the participants were not aware of the organization-based nurse mentor program.

Discussion: This improvement project can benefit organizations by identifying strategies and potential barriers that would improve participation in peer mentor programs.

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# HEALTH SCIENCES

## SCHOOL OF NURSING

### The Effects of Diabetes Self-Management Education among African Americans

**Background:** Type II diabetes continues to be a pervasive issue among African American adults. Significant challenges in effective management have resulted in poor health outcomes that have disproportionately threatened the quality of life among this group and increased the risk of mortality. Diabetes Self-Management Education (DSME) has demonstrated success in improved patient management and its capacity to mitigate risks for complications. Although researchers and health institutions generally accept DSME as an effective tool for managing diabetes, limited studies exist on its efficacy for African Americans.

**Purpose:** This study aimed to examine the effects of DSME intervention on diabetes management among adult African American patients. Aims included improving HbA1c control, improving self-management through patient education, and decreasing modifiable risk factors of cardiovascular disease by improving blood pressure control, lowering lipid levels, and accomplishing weight reduction.

**Methods:** Guided by the Iowa Model, this project was conducted using a pre/post-intervention design over the course of three months. DSME offered during practice appointments to adult African American patients in primary care practice. Thirty-Four participants were included in this study. Outcomes of interest included Hemoglobin A1c (HbA1c), Low-density Lipoprotein (LDL), weight, Blood Pressure (BP), patient knowledge, and patient management confidence. A paired t test was conducted for continuous variables, and a chi square test was for categorical variables.

**Results:** Following DSME intervention, significant improvement was observed in SKILLD assessment results a 16.9% increase in score (Pretest 6.26 +/- 2.12; Posttest 7.92 +/- 1.28, p<0.001). Mixed results were discovered for HbA1c improvement; 64.7 % of participants met HbA1c <8 post DSME intervention compared to 47% pre-intervention, however, HbA1c did not meet statistical significance in aggregate (p=0.142). Improvement in LDL control was observed 29.0% pre-intervention vs. 52.9% post-intervention (p=0.049). Results, however, did not meet the goal of 60% of participants with controlled LDL. No significant reductions were observed with BMI (Pre intervention 35.6 kg/m<sup>2</sup> (9.1) vs post intervention 35.4 kg/m<sup>2</sup> (8.9)) and blood pressure SBP/DBP (pre intervention SBP/DBP 138.2mmHg (18.5)/81.5mmHg (8.6) vs post intervention 134.4mmHg (11.8), p=0.11; 79.9mmHg (7.5), p=0.18).

**Conclusions:** DSME intervention is beneficial in improving patient knowledge, glycemic control, and cholesterol. DSME may not be sufficient in improving weight and blood pressure control; however, further studies may demonstrate higher efficacy amongst these variables. DSME may be an effective tool in decreasing specific risk factors for diabetic complications among African Americans. Further studies will need to be completed to conclude

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**INSTITUTE FOR BIOMEDICAL SCIENCES****Specific Targeting of the Latent HIV Reservoir Using Allogeneic  $\gamma\delta$  T cells**

$\gamma\delta$  T cells are an innate-like subset of lymphocytes that are an integral component of the immune response against cancer and infectious disease. They recognize both host and microbial derived non-peptidic antigens outside of classical major histocompatibility complex (MHC) presentation. Despite being severely depleted and directly infected by Human Immunodeficiency Virus (HIV), recent work by our group demonstrated the therapeutic potential of  $\gamma\delta$  T cells by showing that in vitro expanded autologous  $\gamma\delta$  T cells were able to specifically target and kill reactivated latently infected CD4 T cells. However, the likelihood that a portion of  $\gamma\delta$  T cells harbor latent virus precludes autologous expansion for HIV cure. Therefore, we hypothesized that expanded, allogeneic  $\gamma\delta$  T cells will be able to specifically target and kill reactivated latently infected CD4 T cells.

PBMCs from uninfected donors were used to generate a primary cell model of latent HIV infection and in parallel both autologous and allogeneic  $\gamma\delta$  T cells were expanded with 2.5  $\mu\text{g}/\text{mL}$  of pamidronate (specific  $\gamma\delta$  T cell activator) and 500 U/mL IL-2 for 3 weeks. Latently infected CD4 T cells and uninfected controls were treated with 100 nM Ingenol 3,20 dibenzoate (a PKC agonist) in the presence of ART for 36 hours. Reactivated cells were then co-cultured with or without either autologous or allogeneic expanded  $\gamma\delta$  T cells for 18 hours. The reduction in the latent HIV reservoir was determined by intracellular staining for the p24 viral capsid protein by flow cytometry and intact HIV DNA quantified by droplet digital PCR (ddPCR).

Co-cultures with either autologous or allogeneic expanded  $\gamma\delta$  T cells showed a comparable near 50% reduction in intracellular HIV p24 indicating a lower rate of cells actively producing virus. A corresponding decrease in intact HIV DNA detected by ddPCR further demonstrates elimination of CD4 T cells capable of harboring replication competent provirus. In addition, viability was consistently comparable between cultures with uninfected CD4 T cells alone versus CD4 T cells co-cultured with  $\gamma\delta$  T cells. This data indicates that allogeneic  $\gamma\delta$  T cells are able to recognize and kill latently infected cells upon viral reactivation while off-target cell killing remained undetectable. Our findings provide the critical first step in the development of a novel cell-based therapy for eliminating latent HIV.

**Primary Presenter**

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**MILKEN INSTITUTE SCHOOL OF  
PUBLIC HEALTH****The Association Between Progestin-  
based Contraceptive Usage and  
Inflammatory Immune Biomarkers for HIV  
Acquisition in Adolescent Females in  
Washington, DC**

Background: Unintended pregnancy in adolescents, which was reported to be about 50% of all adolescent pregnancies, can be prevented by variety of types of contraceptives. Previous research showed that the progestin-based contraceptive, Depot medroxyprogesterone acetate (DMPA), has been associated with enhanced HIV acquisition in adult women. However, the impact have not been assessed in adolescent girls, a population bearing a disproportionate burden of both the HIV epidemic and often-unintended pregnancies. Currently, the data on immunological consequences of continued usage of progestin-based contraceptives on genital tract of adolescent girls in the United States is insufficient. Therefore, the objective of this study was to examine the inflammatory immune biomarkers associated with HIV acquisition following usage of three types of progestin-based contraceptives, levonorgestrel intrauterine device (LNG-IUD), subdermal etonogestrel (ETNG), and injectable DMPA, in adolescent girls.

Methods: Following IRB approval, 59 sexually active, HIV-negative adolescent girls (ages 15-19) were recruited from Children's National Medical Center and Medstar Washington Hospital Center in Washington, DC from 2017 to 2019. After contraceptive counseling, participants self-selected into different study arms: Control (condoms only), combined oral contraceptive pills (COC), LNG-IUD, ETNG and DMPA groups, which included 10 participants per group. Vaginal swabs were collected at baseline prior to contraceptive use, and again at a 3-month follow-up visit. Vaginal secretions were tested for pro-inflammatory immune mediators, IL-6, TNF- $\alpha$ , IL-1 $\alpha$ , IL-1 $\beta$ , IP-10, MIP-1 $\alpha$  using ELISA. Biomarker data were then analyzed using Wilcoxon Rank Sum Test and Kruskal Wallis Test (SAS) to evaluate differences between visits across treatment groups.

Results: There were no significant changes in mean or median biomarker levels between the baseline and follow-up visit for any treatment group.

Conclusions: The study indicated that inflammatory immune-biomarkers in the genital tract of adolescent girls was not significantly different after 3-months of use of any of the progestin-based contraceptives investigated. Importantly, we demonstrate the need of future research studies in this with larger sample size and longer follow-up period to evaluate safe and effective contraceptives in adolescent girls to prevent unintended pregnancies and HIV transmission.

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Mimi Ghosh

**MILKEN INSTITUTE SCHOOL OF  
PUBLIC HEALTH****Assessing HIV Care Transition Readiness  
among Adolescents and Youth through the  
Milestones Initiative: A Retrospective Cohort  
Study of Patients Aged 13-24 Years at  
Children's National Hospital, Washington,  
DC**

Background: Transitioning from pediatric to adult services is known to be associated with worsening of health outcomes and decreased retention in care among adolescents and youth living with HIV (AYLHIV). The Milestones Initiative was implemented at Children's National Special Immunology Services (SIS) in Washington, DC to evaluate the preparedness of AYLHIV for transitioning to adult healthcare. This study aimed at identifying factors associated with HIV care transition readiness among AYLHIV.

Methods: This retrospective cohort study from June 1, 2019 to January 31, 2021 utilized electronic medical record (EMR)-based SIS patient database for collecting demographic (age, gender, race/ethnicity), clinical (mode of HIV transmission, viral suppression, duration of HIV diagnosis, case management acuity level, other chronic health conditions), and mental health comorbidity data. Participants' transition readiness assessment questionnaire (TRAQ) scores (1-4; with 1 being the lowest preparedness) were collected from the Milestones Initiative SIS database. Differences in mean TRAQ scores by demographic and health characteristics were analyzed using unadjusted two-sample and paired t-tests, as well as adjusted Analysis of Variance (ANOVA).

Results: Data from 103 AYLHIV were included (50.5% female; 100% non-Hispanic Black/African American; mean age=19.54 ± 2.78 years; mean baseline TRAQ score=2.32 ± 0.78). Baseline TRAQ scores differed significantly by age ( $p < 0.0001$ ), gender ( $p = 0.0325$ ), mode of HIV transmission ( $p = 0.0002$ ), viral suppression ( $p = 0.0005$ ), and duration of HIV diagnosis ( $p = 0.0117$ ). Participants with repeat TRAQ scores over the study period ( $n=35$ ) experienced a mean increase of 0.13 in transition preparedness, with a significantly greater mean improvement among AYLHIV recently diagnosed with HIV (within the prior year) compared to those living with HIV for longer than 10 years ( $p = 0.0127$ ).

Conclusions: Differences in HIV care transition readiness by patient-related factors were observed in this cohort. Progress in TRAQ scores was related to duration since HIV diagnosis and might indicate that AYLHIV who were diagnosed perinatally require additional support compared to those who acquired HIV horizontally. Knowledge of factors associated with transition readiness can inform tailored, multidisciplinary interventions to increase successful transition in HIV care among AYLHIV.

**Primary Presenter**

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**MILKEN INSTITUTE SCHOOL OF  
PUBLIC HEALTH****Changes in Inflammatory Biomarkers  
Associated with HIV pathogenesis in  
Survivors of Acute Sexual Assault**

Background: Sexual assault has been associated with an increased risk for HIV; while the social and behavioral drivers are better characterized, the immuno-biological mechanisms remain unknown. The objective of this study was to evaluate genital tract biomarkers associated with HIV pathogenesis in acute sexual assault cases, compared to those who have never been exposed to sexual assault.

Methods: Nineteen cervical lavage wash samples were collected at the Women and Infants Hospital of Rhode Island (WIHR) from women who experienced sexual assault within the past 5 days. These cases were compared to controls, defined here as subjects not exposed to sexual assault, from a previous study who were recruited from The George Washington University and the Washington D.C. metro community area. A sandwich ELISA was used to detect the following pro-inflammatory cytokines/chemokines: IL-1 $\alpha$ , IL-1 $\beta$ , IL-6, TNF- $\alpha$ , and MIP-3 $\alpha$ . The results were analyzed using the Mann-Whitney U test (GraphPad Prism). We also investigated the differences in biomarker levels 0-12 hours, 13-24 hours, and 25-72 hours after assault.

Results: There was a significant upregulation in levels of pro-inflammatory cytokines IL-1 $\alpha$  ( $p=0.0168$ ) and IL-1 $\beta$  ( $p=0.0387$ ) and downregulation in TNF- $\alpha$  ( $p=0.0064$ ) in Cases compared to Controls. IL-1 $\alpha$  ( $p=0.0246$ ) and IL-6 ( $p=0.0322$ ) were significantly higher in those sampled between 0-12 hours compared to 13-24 hours and 25-72 hours after assault.

Conclusion: An increase of inflammatory response is associated with risk of HIV. There was a significant change in pro-inflammatory cytokines, IL- $\alpha$ , IL-1 $\beta$ , and TNF- $\alpha$  within 5 days after assault. In addition, IL-1 $\alpha$  and IL-6, were upregulated within the first 12 hours. Our data points to an increased inflammatory response immediately following a sexual assault. Investigation of the association of HIV and acute sexual assault can contribute to development of trauma-informed care and determine the urgency of HIV prevention intervention needed following assault.

**Primary Presenter**

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RESEARCH SHOWCASE

## HIV/AIDS

# MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

## HIV Protease Drug Resistance Mutations in Five American Cities, 1999-2015

HIV can quickly evolve resistance mutations that protect the virus against the drugs prescribed to treat it. Antiviral resistance is one of the leading causes of HIV and AIDS treatment complications in the United States. Understanding the common types and the levels of HIV drug resistance in a geographic region can help guide treatment plans and assess the effectiveness of HIV drug resistance prevention programs. Past studies have tracked HIV drug resistance types and levels within cities, regions, or throughout the country, but variance in drug resistance between cities has received little attention in the scientific literature. This study analyzed HIV protease gene sequences from five U.S. cities with high rates of HIV from 1999 to 2015 to find whether HIV drug resistance types and rates differed by city, and whether the presence of drug resistance prevention programs lowered the prevalence of drug resistance mutations.

Boston, Washington DC, New York, San Diego, and Seattle were selected for study based on data availability. Sequences were collected from the Los Alamos HIV Sequence Database and analyzed for drug resistance profiles using the Stanford HIV Drug Resistance Database's HIVdb program. The HIVdb data was then processed using R scripts to find the prevalence and types of drug resistance mutations.

Significant differences were found between the cities analyzed in both the prevalence and types of drug resistance mutations. Different types of mutations were found to be more or less common depending on the sequence's city of origin. Cities with programs focused on surveilling and preventing HIV drug resistance tended towards a decreasing trend of resistance. This research suggests that HIV drug resistance programs may have been effective so far in achieving their goals, and opens a possible pathway for HIV treatment plans to be tailored by geographic location to increase their efficacy.

### Primary Presenter

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**SCHOOL OF MEDICINE AND  
HEALTH SCIENCES****HIV-associated Thrombotic Microangiopathy:  
A Thrombotic Thrombocytopenic Purpura  
(TTP)-like Syndrome****Case:**

A 44-year-old man with a past medical history of HIV was brought into the emergency department from a homeless shelter with fever and acute encephalopathy. He was febrile, tachycardic, and had a lactate of 5.3 mg/dL. His HIV labs were notable for CD4+ count of 3 cells/m<sup>3</sup> and VL of 965,000 copies/mL. Other labs on presentation were notable for a hemoglobin of 12.7 g/dL and platelet count of 99,000/mcL. He was found to have streptococcus pneumonia bacteremia and meningitis for which he was treated with ceftriaxone, vancomycin, and dexamethasone.

During his hospitalization, he was noted to have down trending platelets to less than 20,000/mcL and an associated hemoglobin drop to 5.4g/dL. Hemolysis labs were notable for a haptoglobin of <math>20</math>, an LDH of 2,142, ADAMTS13 level of 54.4, and multiple schistocytes on peripheral smear. No bleeding or thrombosis was noted. INR was 1.05. His Plasmic Score was 4, but because of the high likelihood of thrombotic thrombocytopenic purpura (TTP), urgent initiation of plasmapheresis was initiated. After three rounds of plasmapheresis, the patient's labs showed platelet 117, Hgb 11.0, Lactate dehydrogenase (LDH) 1303, haptoglobin 105. After a fourth round of plasmapheresis, he showed sustained clinical response, with platelet counts remaining stable within normal limits.

**Discussion:**

Idiopathic TTP is characterized by elevated LDH, thrombocytopenia, microangiopathic hemolytic anemia (schistocytes seen on peripheral smear), and a reduction in ADAMTS13. Thrombotic Microangiopathy (TMA) describes the clinical features of TTP without a decrease in ADAMTS13 level or ADAMTS13 autoantibodies. TTP is relatively rare in the general population; however, it has been shown that the rates of TTP-like syndromes in HIV patients have been estimated to be up to 40 times higher than in non-HIV patients. Some case reports and meta-analyses have found that many HIV positive TTP patients have normal levels of ADAMTS13 and no trace of autoantibodies to ADAMTS13. We presented a case of HIV-associated Thrombotic Microangiopathy (TMA), a TTP-like syndrome with normal ADAMTS13 levels. In this case, the rapid initiation of plasmapheresis resulted in the resolution of his TTP-like syndrome. An analysis of 20 HIV affected patients with TTP-like syndrome showed that none of the patients with a CD4<math>100</math> cells/IL had a severe deficiency of ADAMTS13. HIV/AIDS patients with may present atypically with a TTP-like syndrome despite the a lack of serum ADAMTS13 levels and ADAMTS13 autoantibodies. Therefore, ADAMTS13 should not guide treatment decisions in TTP-like syndromes in those with AIDS.

**Primary Presenter**

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RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### “Un Violador en Tu Camino” A Rewriting of Chile’s Constitution: Tracing the Feminist Movement

This thesis examines gender in jurisprudence and legislation through the emerging feminist and Mapuche Indigenous women’s rights social movements in Chile. The theoretical framework presented synthesizes feminist theories of collective identity and gender, theories of gender-based violence and social movements, and Indigenous women’s resistance against gender colonial violence. The analysis centers on how gender and citizenship’s portrayal influences social movement identity and the role of developing progressive gender- policies. This thesis also contributes to a growing body of intersectional research examining how social movements shape progressive gender policies as a tool to generate new political agendas and awareness of global gender violence.

I find that gender and citizenship are primary orienting principles in the movement’s underlying ideologies and collective identity. As illustrated through the Chilean feminist anthem, “Un Violador en Tu Camino” or “A Rapist in Your Path” spread globally, addressing the widespread systemic violence to suppress women. The anthem was first performed at the “International Day for the Elimination of Violence against Women” in November 2019. Videos of the performance quickly became viral and spread from France and Mexico to Kenya and India, igniting a global feminist movement. The movement demands responsibility and accountability by governments for the violence and deaths of women around the globe. The “Un Violador en Tu Camino” feminist movement engages in collective identity processes fundamentally rooted in the politics of gender- violence. As a result, state governments have prioritized gender policies and representation.

This research implies an integrated theory using jurisprudence and traditional gender role attitudes to study violence against women. Latin American countries such as Chile feature strongly-held traditional beliefs concerning gender roles, and these beliefs are associated with increased levels of violence against women and femicide. These findings confirm the theoretical literature on patriarchy and gender roles influence legislation. This study provides new insight into the intersectional fabric within mainstream feminist movements in Chile. The implications of this research will contribute to the growing body of knowledge of the impacts of transnational feminist mobilization on gender- policies. Previous research has not analyzed the contributions of the “Un Violador en Tu Camino” anthem to the global mainstream and marginalized Indigenous women’s movements. More importantly, this analysis evaluates the legislation and government response sparked by the anthem’s movement. With the current 2020 Chilean national plebiscite, the rewriting of the constitution will be a testament to the efforts of the feminist movements demanding gender equity within the legislation.

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RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Remembering the Resistance: Enslaved Women's Fight for Bodily Autonomy

Slavery scholars have written extensively about the industry of breeding enslaved women and their contributions to this subject area are insurmountable. While most researchers focus on the lives of enslaved women pertaining to their daily trauma, labor or reproduction, I focus on enslaved women's stories of resistance against sexual exploitation and reproductive coercion because their stories have been largely ignored. It is important to include the voices of enslaved women when we discuss slavery because these narratives make the lives of enslaved women palpable. Because slavery was dependent on the exploitation of Black women's reproductive labor, I communicate the pain of enslaved women and provide insight of these women's resistance by any means necessary. Using historiography and by studying the Works Progress Administration's (WPA) Federal Writers' Project (FWP), the Slave Narrative Collection, I honor their resistance and memory by retelling their stories of resistance and how they chose to spare the lives of their children from a heinous life of slavery. This collection was compiled from 1936-1938 in seventeen states and recorded over two thousand formerly enslaved interviews.

My research explores the notion that enslaved women were victims of their circumstances and rebuffs this with their own words of defiance. I discovered these women revolted against the very institution that profited off their reproductive labor. Denying their enslaver the fruits of their wombs was a tangible protest of slavery and the degradation of the sanctity of giving birth to a child. Some of these women resisted oppression by exerting control over their bodies and the lives of their children. It is important to include their stories in their voice in order to provide a clear understanding of their experiences. When we explore the history of slavery, it's imperative that the stories of resistance against sexual exploitation and reproductive coercion be chronicled using the recorded narrative of these women. These stories by the enslaved women teach us about fighting for bodily autonomy. I am convinced that when we provide a clear portrayal of slavery that allows for enslaved women to share their stories, we honor not only their memories, strength and courage but their well thought out, deliberate and dangerous sacrifices as well.

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# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Friendly Fire: An Analysis of Lesbian Depictions in Postcolonial Film

This article shows how the Indian film “Fire” by Deepa Mehta and the Kenyan film “Rafiki” by Wanuri Kahiu function as similar cultural phenomena that require an understanding of the colonial past and its influence on the present rather than a simplistic prescription of religious homophobia. By analyzing the love stories between the women in these films, issues of gender roles, religion, and sexuality are illuminated as sites of conflict where colonial influence complicates all narratives. This article also demonstrates how these conflicts were further proved by the real-life responses to each of these films by way of viewing bans and, in some cases, violence, as well as the LGBT advocacy efforts that followed the backlash. Using postcolonial and queer theory to analyze both the films themselves and the events that followed their release, I argue that mainstream Western narratives of homophobia are not nearly enough to understand the actual conflicts present in these films and the backlash they received.

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# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Second Language Development of Mandarin Tones: A comparative study of Native English-Speaking Children and Adults

Mandarin tones are often recognized as being the most challenging aspect for second language acquisition. Specifically, those who come from a stress language background, such as English, encounter many obstacles with tone development. The main difference between tonal languages and stress languages are their prosodic features. At word level prosody, Mandarin uses four tones to convey the meanings of words. However, Mandarin prosody at the sentence level is an interaction of both tone and intonation, but the meaning of each word does not change. This type of language acquisition is difficult for adult learners of Mandarin since the stress is placed in different locations compared to their native language.

Based on previous research, native English-speaking adults find the Mandarin second tone, a high-rising tone, to be the most complicated to accurately produce. Further research shows that adult learners' second tone is constrained by a universal phonological constraint known as the "anticipatory dissimilation" and results in a high error rate at various syllables. This topic has only been studied with adult learners; no research has been conducted with children who learn Chinese as a second language. Therefore, the objective of this study is to fill the research gap by examining if native English-speaking children are also constrained by the anticipatory dissimilation similar to their adult counterparts. The core of this study investigates a group of native English-speaking children between the ages of 12 to 37 months who are enrolled in a Montessori school in Washington, D.C. with a focus on Mandarin second language acquisition. This phonological study of tone acquisition is designed to collect speech by giving these students a combination of common colors and animals and asking them to pronounce the name of each colored animal in Mandarin. This data is collected using PRAAT, a speech analysis software, to examine evidence of the anticipatory dissimilation effects in children's speech.

Through this study, the participating children's acquisition of Mandarin tones will be closely observed. Their tonal error patterns will be carefully examined and compared with those of adult learners. With this data on hand, the research will contribute to the understanding of the mechanisms of tone acquisition by English speaking learners at various ages. Pending these results\*, this study will positively impact Mandarin acquisition for children and also provide insight into how adult learners can more accurately produce the Mandarin second tone.

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RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### “Willing Deeply and Inwardly”: Neurotheology and Free Will in Kierkegaardian Existentialism

Writing in the mid-nineteenth century, Søren Kierkegaard considered the relationships between philosophical and theological thought and early advancements in psychology that occurred during his lifetime. Although Kierkegaard’s pseudonymous writings pose interpretative challenges, his journals reveal a complex understanding of volition that underpins many of Kierkegaard’s pivotal contributions to philosophy and theology. Given Kierkegaard’s engagement with psychology, the emerging interdisciplinary field of neurotheology provides a unique framework for reconceptualizing Kierkegaard’s ideas in the context of neuroscientific and psychological research.

Neurotheology scholarship seeks to facilitate a productive dialogue between the neurosciences and religious studies. However, most existing neurotheology research has been produced by neuroscientists and involves investigating the neural correlates of spiritual experience. Consequently, countless opportunities exist for religious studies scholars to critically engage with neuroscientific findings. Similarly, recent scholarship involving neuroexistentialism examines existentialist philosophy in the context of neuroscience, but lacks input from religious studies scholars and fails to address the theistic roots of existentialist thought. Therefore, my research seeks to address gaps in existing neurotheology and neuroexistentialism research from the standpoint of religious studies.

In this thesis, I apply a methodological approach based on neurotheology to analyze Kierkegaardian free will, engaging with specific research findings in cognitive neuroscience and psychology. I argue that Kierkegaard’s perspective regarding free will can be viewed as compatible with contemporary decision-making research, particularly given the lack of scientific consensus regarding philosophical free will. Specifically, Kierkegaard’s writings reflect emotion regulation strategies that appear to mediate some neurophysiological influences on the brain’s valuation system during the preconscious decision-making process. Additionally, the psychological concept of differentiation of self parallels Kierkegaard’s emphasis on willing to be oneself, reaffirming his core notion of the relationship between volition and self-identity. Given the crucial role of free will and choice within Kierkegaard’s writings, the clear points of congruence between Kierkegaard’s views and contemporary findings support the enduring viability of Kierkegaardian thought.

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RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### America's Polarized Pandemic: The Impact of Social Media Images on Face Mask Perceptions, Attitudes, and Behavior During COVID-19

Face masks became a contentious subject during the COVID-19 pandemic. This was probably due to multiple factors, including evolving public health recommendations, increased proliferation of fake news, and the politicization of the pandemic by American political elites. This study first analyzed perceptions of politicization and polarization of face masks and face coverings using a small sample population of American adults (n = 252) between October 8th, 2020 and October 15th, 2020. On average, participants felt face masks to be a nationally politicized and polarizing issue split along party lines. They also reported mostly pro-mask attitudes and a high ratio of consistent mask usage. An experiment was then conducted to determine how viewing a satirical, pro-mask meme or a medically branded, pro-mask infographic might impact face mask attitudes and behaviors. Each participant randomly viewed one of the two images. Those who viewed the infographic exhibited stronger mask attitudes and were more likely to report wearing a face covering regularly. This study captures point-in-time evidence of some American adults' perceptions of face masks during the COVID-19 pandemic. This increased understanding may support public health officials and pro-mask advocates to communicate their messages more effectively. It also adds to two new, but growing, fields of research: COVID-19 and memes.

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RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Liberating Physical and Discursive Spaces in Post-War Vienna: The Work of VALIE EXPORT, 1968-1979

The nascent Austrian state, sprung from the dissolution of the Austro-Hungarian Empire, developed a unique national identity cultivated by a centralized government in the decade prefacing the Second World War and again under the regime that followed. In developing exclusionary sociopolitical structures to promote the supremacy of the Austrian government, pre- and post-war chancellors reified Habsburg landholdings as a distinctive Austrian nation, or, to invoke Benedict Anderson's terminology, as "an imagined political community." In constructing Austria as an independent State unified by a conservative, authoritarian government, political leaders recontextualized residents of the region as citizens of that State. Due to expectations of labor output, and, perhaps more importantly, male voices that fill social discourse, in capitalist societies, the ideal citizen body in post-war Austria is white and male.

The Vienna Actionist movement of the 1960s was pioneered by several young, male artists native to Austria who were dissatisfied with Christianity, conservatism, and capitalism, the three pillars of post-war Austria. Their anger manifested as acts of self-mutilation. Violence directed toward the self, argues Beth Hinderlitter, should be read as violence against the anonymous citizen body that prevents its ability to produce. Friend and contemporary VALIE EXPORT similarly rebelled against social strictures through violence, capturing her work through the yet uncolonized media of performance, photography, and filmography. Her approach to public performance varies from the work of the Actionists; EXPORT engages the acts of female self-exposure and violence to attack against the citizen body in a manner informed by, but unique from, the Actionists. Whereas the purpose of the male citizen is to produce, the function of the female citizen is to reproduce, and, thus, exposure without intention of sexual union negates the value of the female citizen. If the primary objective of the female citizen is to reproduce and to maintain conservative values in the domestic sphere, then in exposing her body, EXPORT deprives the female citizen body of its use

In this paper, I will trace the concurrent rise of Austrian nationalism and consumer culture to illustrate the dominant institutions against which EXPORT rebelled in performative, photographic, and videographic artworks during the period from 1960 to 1979. Engaging critical interpretations of her work as well as their artist's own voice, I argue that VALIE EXPORT rejects gendered language and space, opting to develop a new semantic system yet uncolonized by the male voice through acts of self-violence and self-exposure.

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# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Hacia un español inclusivo/Toward an Inclusive Spanish

Esta investigación está interesada en las formas y el uso del lenguaje inclusivo en el mundo hispanohablante. Los movimientos sociolingüísticos, etnolingüísticos y políticos para el lenguaje inclusivo en español han durado por más de 200 años hasta hoy en día, como lo demuestra el debate que ha inspirado este tema en las oficinas de instituciones oficiales de la lengua española por todo el mundo hispanohablante, con resultados particularmente notables de la Real Academia Española (RAE). Este trabajo contextualiza los discursos más comunes en distintos contextos en cuanto a cuatro formas del lenguaje inclusivo: el desdoblamiento lingüístico (“Bienvenidos y bienvenidas”) y la barra (“Bienvenidas/os”), la arroba (@), la equis (-x) y el morfema -e. A través de la presentación de una historia lingüística y de propuestas de los campos de estudio feministas y queer, el autor subraya e investiga estas alternativas posibles y aboga por el uso extendido de la -e como un género neutro en el español. Esta conclusión se lleva a cabo a través de una investigación que involucra información cualitativa coleccionada por medios académicos e informales como las redes sociales, los sitios web y las fuentes de noticias. El autor argumenta que la existencia de un género epiceno en el español ofrece la mejor opción hacia un español inclusivo y el desarrollo de una conciencia trans en espacios hispanohablantes.

This investigation is interested in the forms and uses of inclusive language in the Spanish speaking world. Sociolinguistic, ethnolinguistic, and political movements advocating for inclusive language have existed for more than 200 years and continue today as demonstrated by the ongoing debate inspired by this topic in the offices of Spanish language institutions throughout the Spanish speaking world, with a particularly notable response from the Real Academia Española in Spain (Royal Spanish Academy). This essay contextualizes the most common discourse in distinct contexts regarding four forms of inclusive language: linguistic doubling (“Bienvenidos y bienvenidas” [Welcome ladies and gentlemen]) and the use of the slash (“Bienvenidas/os”), the @ symbol, the -x, and the morpheme -e. Through the use of a linguistic history and proposals from the academic fields of Feminist Studies and Queer Studies, the author highlights and investigates these possible alternatives and advocates for the extended use of -e as a neutral gender in Spanish. This conclusion is reached through an investigation that involves qualitative information collected from academic and informal sources such as social media platforms, blogs, and news organizations. The author argues that the existence of a neutral gender in Spanish offers the best option toward an inclusive Spanish language and the development of a trans consciousness in Spanish speaking spaces.

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# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Forgotten Women of Normandy, 1945

The Normandy American Cemetery in Colleville-sur-Mer lies in idle silence as the winds of Omaha Beach run against the 9,388 uniformly placed marble headstones that line its grounds. Just over seventy-six years ago, barely the span of a single lifetime, the bravest armed forces in Allied history boarded landing crafts headed to the beaches of northern France, ready to embark upon Operation Overlord, knowing full well that their battlefield fates had been sealed. As the sands of the beaches became a gradient of crimson, American men paid the price of freedom prescribed by the authoritarian grasp that strangled Europe and the world during the Second World War. But as one walks the freshly groomed grounds of the Cemetery, an unexpected anomaly exists within the text of three stones, providing three unlikely names: Sergeant Dolores Browne, PFC Mary J. Barlow, and PFC Mary Bankston. Three African American women lying in a sea of white male soldiers.

These trailblazing women, members of the 6888th Central Postal Directory Battalion, are barely known within the overall narrative of the Second World War, as their sacrifice has been overshadowed by the stories of men that compose United States history books today. The purpose of this research is to change this very narrative that continues to live on, unaffected by the civil rights movements of the past and present. Using primary source documentation, interviews of relatives, and existing literature on the subject, a new narrative comes to light that exposes a legacy of Black exclusion within World War II historiography. Denying this unjust practice is paramount to the preservation of memory and the authentic documentation of the Second World War. Through the lens of Sgt. Browne, PFC Barlow, and PFC Bankston, this research demonstrates how history can and should be told for the sake of maintaining historical truth. The crucial sacrifices made by these women must be remembered by Americans today, otherwise, historical legitimacy hangs in the balance.

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RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Reactions to “WAP”: A Discussion of Black Women’s Bodily Autonomy in American Society

On August 7th, 2020, famous rappers Cardi B and Megan Thee Stallion released their new hit single, “WAP”, which stands for “Wet A\*\* P\*\*\*\*”, a song detailing the artists’ love for their genitalia and their demands of sexual pleasure. Such a creatively vulgar song unsurprisingly triggered an onset of intense reactions from listeners, both positive and negative. More importantly, the rappers’ positioning as Black women publicly celebrating their sexualities is what deemed “WAP” and its subsequent music video controversial by some sectors of the American public. Conservative figures and celebrities like Ben Shapiro, Tucker Carlson, and others slammed “WAP” as disgusting, trashy, and even medically concerning. These critiques are clearly indicative of largely white tendencies to police Black women’s bodies (Cooper Owens 5). At the same time, “WAP” has remained extremely popular. As of August 18th, “WAP” had reached No. 1 onto the Billboard Hot 100 songs chart, and stayed there for over four weeks (Trust 25). “WAP” drew 93 million U.S. streams from August 7th to August 13th alone, which is the most for any track ever in its first week of release (Trust 25). One Los Angeles Times review of “WAP” labels the song as a “savagely, sex-positive triumph,” and even says, “‘WAP’ could be a terrible song and I’d still cheer the fact of its existence,” (Wood 27). This review is just one example of the widespread celebration of “WAP” whose fans have praised the song and its artists for its seemingly feminist messaging, but are these positive reviews truly indicative of support for Black women’s bodily autonomy?

This paper will discuss the nuances of “WAP” and reactions to it, dividing the paper up into five sections: the application of Black Feminist literature, a visual analysis of the “WAP” music video, negative responses to “WAP”, positive responses to “WAP”, followed by the conclusion. Rather than taking a traditional argument, this paper offers a fluid discussion of the complexities of “WAP” and their potential implications for Black women’s bodily autonomy in the United States.

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RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Et in Arcadia Ego: the Kanshi Poems of Ryūnosuke Akutagawa

The Japanese novelist Ryūnosuke Akutagawa (1892-1927), known for *Rashōmon* and *In a Bamboo Grove*, was also a talented kanshi (Japanese term for poetry written in Chinese by Japanese writers) poet. Living during the Taishō period, Akutagawa beheld the rapid transformation of Japan into a modernized, militarized empire, in which the traditional arts like kanshi were gradually overlooked by the mainstream. Being one of the prominent examples of the last generation of Japanese literati who were classically trained in Chinese literature and poetry writing, he mastered the delicate art of composing classical-style poems in Chinese as those aristocrats did in the Heian period. His kanshi works, despite long been ignored by the Anglosphere, provide a comprehensive perspective to the whole picture of the writer's career and the intercultural influences he received regarding the literary history of East Asia.

From his school days, Akutagawa often discussed ancient Chinese poets and quoted their pieces in letters, reflecting an artistic pursuit shaped mainly by the hermit-poet Tao Yuanming. His admiration for classical Chinese civilization collapsed during his visit to China in 1921, however. Upon observing the disappointing reality of a semi-colony and troubled by ill-health, his poetic style gradually resembles more of the Late Tang poets such as Li He, Wen Tingyun, and Xu Hun, showing the tendency of obscuring the traits of reality in poetry, contrary to his travelogue and novels. Following the Chinese poets who passed away too soon at the peak of their reputation, the evolution of Akutagawa's poetry writing indicates his concerns over his artistic life, the declining of classical aesthetics, and, furthermore, the worrying sign of his country turning to war affairs, which he empathized with the Late Tang pieces.

With the English translation of all of his 34 kanshi pieces, this comparative study demonstrates the poetic practices Akutagawa inherited from classical Chinese poetry. It also examines the similarities between the historical background of his era and the Late Tang, which shaped the "anxiety of influence" of the poets, and the ambiguity in the reality of the literary images.

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# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Forgotten Entrepreneurs: New York City's Irish Immigrant Peddlers in the Nineteenth Century

What can the Irish immigrant peddlers in nineteenth-century New York City tell us about the entrepreneurship, urban market, and immigrant experience in the United States? Historians traditionally portrayed America's Irish transplants in the nineteenth century as deprived and desperate exiles, but recent scholarships challenged this assessment by examining these immigrants' bank records from the mid-1800s. Although the new studies revealed the surprisingly sizable savings of Irish-born manual laborers in New York City, they did not devote sufficient attention to the immigrant peddlers. My project addresses this historiographical gap by looking at savings and census data as well as newspaper articles from between the 1840s and 1870s. Deposit records from the Emigrant Industrial Savings Bank in New York City shed light on the transactions of a group of 310 Irish peddlers, while the corresponding census data revealed these immigrants' family history, household information, property ownership, and more. Stories from New-York Tribune, The New York Times, and other outlets also offered a glimpse of how Irish-born peddlers hawked their goods in New York and beyond. Tenacity and entrepreneurship paid off for many Irish immigrant peddlers, who often accumulated more money in their bank accounts than Irish-born skilled artisans and clerks. These street vendors also contributed to a vibrant market that gave New York City's working class greater access to a variety of consumer goods. Nevertheless, the forgotten success of the Irish immigrant hawkers only accentuated the hardship of Chinese immigrants, who faced virulent racism and became the target of the first federal immigration exclusion in the late 1800s. While this project aims to uncover the enterprising spirit of the Irish peddlers, it seeks to understand their achievements in light of the growing inequality between different immigrants in the nineteenth century.

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RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Fabulous FLOTUS: How First Ladies Become American Icons

The identity of the American First Lady comes with the image of glamorous gowns, White House gardens, and public appearances. As the country becomes fixated on the president's agenda, the First Lady of the United States rises to the position of the unofficial figurehead of the first family. While the position remains (fairly) apolitical, these ladies create a legacy that outlives their tenure as FLOTUS. Whether it be Jackie O's timeless style or Hillary Clinton and her notorious ambition, the leading ladies of the White House have been making their mark on America since Martha Washington assumed the role. While the power, title, and significance of her office changes, each First Lady certainly establishes her place in American politics. Whether it is pursuing a public platform, engaging with the American public, or capturing all eyes as the most important piece of arm candy inside the beltway, the First Lady of the United States matches glamour with grace to become an American icon in her own right.

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RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### How Mystery Cults Changed Religion in the Roman Empire

At its height, the Roman Empire controlled the Mediterranean Sea with land on all its sides. One of the greatest strengths of this empire was its ability to tolerate and accept new religions. Religion in Rome was constantly changing due in part to the new citizens that were being accepted in the Empire from the territories that were conquered. The new religions upset the order of the Roman Pantheon – the recognized deities of the Romans. Two new influential cults that entered the Roman world were the cult of Mithras and the cult of Isis. These two mystery cults took over the Roman world in different ways. Romans' understanding of religion and worshipped changed because of the introduction of the two cults to the public and private life. Today, the knowledge of these two cults comes mainly from archaeological sites and written records from the time. What we know today is heavily influenced by scholarly interpretation of the sources from the early 20th century. Through a re-examination and comparison of the two cults, the new understanding of Mithras and Isis can be discovered. This research seeks to understand their influence on the Roman Pantheon and the worship of other deities in the Empire.

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# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Proposal for History Based MICRO Museums in Washington, DC

Imagine a museum. When you ask the typical person to imagine a museum, they likely see a building with many exhibits inside. But what if they weren't? What if a museum wasn't a building or a place at all? Could the magic and power that museums possess be freed from the gleaming structures that exist today? Would they still impart knowledge and wonder if they were?

Despite being the most trusted source for information, museums are historically inaccessible to the majority of the public and tend to be located in wealthier communities. For example, Manhattan has 85 museums while the Bronx has 8, despite the two boroughs having similar size populations. In addition to accessibility, time and price are also hindering factors for much of the population. The MICRO project, created by a team of scientists, is a system of STEM based museum spaces that fit in approximately a two-foot square and are nestled in hospital lobbies, public transportation stations, community centers and other places the audiences already attend regularly. They are interactive, engaging, able to be experienced fully in a small amount of time, and free for all. They are literal pillars of wonder and knowledge reaching the public where they stand, often already waiting, each and every day.

The MICRO project has provided inspiration for my senior honors project in History. Despite being STEM based, the MICRO project format easily translatable to history. The project consists of two parts, a written proposal and a website to provide a visual for the proposal. Two mini museums will be proposed, one on Mount Vernon's Bastille Key and the other on the Cabinet. The Bastille Key is an object at the Mount Vernon Estate which tells the tale of friendship and revolutionary symbolism between two illustrious figures, George Washington and Marquis de Lafayette. The Cabinet is an essential American political institution which has no basis in the founding documents; it was a creation all of George Washington's own making and has survived to this day. These topics were chosen specifically as they are related through their basis in the founding era. The proposal and website will include the design and information for the mini museums, including research, label text, proposed objects/images, and possible locations.

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# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Relationships Between Romania's Film Industry and Political Life

In this paper I examine the interconnections between film and politics in the Eastern European country of Romania. I am interested in this topic because my family of new immigrants to the United States originates in that country and because a group of talented young Romanian filmmakers which has been known as the Romanian New Wave has indeed been making waves in international context. The Saint Louis Post Dispatch in the city where I currently lived has recently published a "top 100 best films in the 21st century according to critics" listing at number 4 the 2007 Romanian film "4 Months, 3 Weeks, and 2 Days" of Romanian New Wave director Cristian Mungiu. Both the existence and the success of the Romanian New Wave are nothing short of a miracle. The country of Romania in Eastern Europe never had a strong film production system or a coherent film distribution system comparable to those of other nations in the region such as Hungary or Poland. During communism Romania's film industry had consisted mostly of propaganda films without much artistic merit and aimed at glorifying the dictatorial regime, whereas in the first decade after the fall of communism in 1989 Romania experienced a shortage of filmmakers, funding for film, theatres, as well as audiences interested in viewing domestic films. The Romanian film industry was at its lowest point in 1999 when no Romanian film was produced. Yet by mid 2010s, Romanian was one of the most spoken languages in the films considered for the top prizes and awarded the top prizes at the Cannes Film Festival and the Berlin International Film Festival. What changed was that a group of young filmmakers, who had been born during communism but went to film school after the fall of communism, started making short films around the year 2000 and, upon gaining public attention, shifted towards full length films thereafter. The new wave of Romanian filmmakers has had such broad appeal to audiences nationally and internationally because of how effectively these filmmakers depict in film the neuroticism derived from having lived in a small country with a history of autocratic political tendencies. The paper discusses how, in depicting politics, the new wave of Romanian filmmakers has had to struggle in making sense of oppressive aspects of the country's past, the bloody anti-totalitarian revolution of 1989, as well as the chaotic outlook of the country's post-communist present.

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Patricia Phalen

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Social Conformity, Critique, and Propaganda: Agency in Indian Boarding School Newspapers, 1880 - 1942

The United States has a fraught history with colonization, most notably with the assimilation efforts against Native Americans. In the late 1800s, notable individuals including Richard Henry Pratt and Thomas J. Morgan led the government in creating Native American boarding schools to teach children white culture in an effort to eliminate Native cultures and diversity, and to control Indian threats against settlers to the growing United States. There has been increasing research on student experiences in these schools and the effects of this education on Native American identity. Though it is difficult to access Indigenous voices in the surviving documentary record, it is not impossible. These boarding schools often had their own student newspapers authored and published by Native American students. However, my research suggests the authority in these newspapers did not lie in the hands of the students and that white administrators exercised editorial control over publications. Examination of the newspapers and cultures of three schools – Carlisle Indian Industrial School, Chilocco Indian Agricultural School, and Sherman Indian High School – reveals that student writing was heavily influenced by school administrators.

There were two goals behind administrators' editing of these newspapers. The first was to produce articles which would modify student's actions. Stories that critiqued student's attitudes or performance could serve as a form of social pressure for students to conform to white culture. The second goal was to entice children at home on reservations to enroll in the schools. By publishing exclusively positive reviews and articles, they crafted a fairytale idea of government education.

While it is important to acknowledge that some children did enjoy these boarding schools and saw them as a respite from the impoverished conditions the government created on some reservations, the school newspapers do not give an accurate portrayal of student life. They were a tool of assimilation used at the school and served as a way to limit Native American students' agency. While there is much scholarship on Native boarding schools, this research will contribute to the gap in examining student agency and the manners in which the government and school administrators were able to limit it. As research is growing on the history of Indigenous communities, their voices are being highlighted and used to reconsider white-authored history. This research shows how these minorities voices need to be examined for white influence and utilized in more scholarship.

### Primary Presenter

Emma Billings

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Undergraduate Student

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David Silverman

RESEARCH SHOWCASE

# HUMANITIES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Troubles with Christianity: How American Evangelicals viewed the Troubles

Northern Ireland has long held a special relationship with American Protestantism, being the origin of many Scots-Irish immigrants who served as the kernel of the evangelical movement in the United States. American Protestants, however, had widely divergent ideas regarding the conflict in northern Ireland that emerged in the 1960s. American fundamentalists made close connections with Ian Paisley and the Ulster Unionist movement. Liberal mainline Protestants, on the other hand, advocated for reconciliation between the Catholic and protestant factions. In my project, I will look at how a third group of American Protestants, neo-evangelicals, viewed the Troubles in Northern Ireland. In my project, I examine how the flagship neo-evangelical magazine Christianity Today (CT) viewed the Troubles in Northern Ireland. CT's coverage of the Troubles is a window into how American neo-evangelicals understood their position, both in the world and also domestically. In particular, I will argue that Christianity Today's coverage of the Troubles reflected a struggle amongst neo-evangelical thinkers to separate and distinguish themselves from their fundamentalist counterparts in both the US and Northern Ireland. In this project, I build off the research of Lauren Turek on American evangelical's perceptions of Rios Montt's Guatemala, which is important given the lack of research on Northern Ireland. American evangelicals, Turek writes, viewed Montt's right-wing government as an evangelical outpost in a Catholic region and an ally in the fight against communism and did not criticize him for human rights abuses his government perpetrated. In contrast to Guatemala, the neo-evangelical elite writing in Christianity Today, most notably J.D. Douglas, opposed Ian Paisley and his brand of right-wing political fundamentalism. Douglas, furthermore, tied Ian Paisley and Ulster Protestant Unionism into a transatlantic network of right-wing reaction which included figures ranging from Carl McIntire to the South African government. Many of Christianity Today's readers, however, sympathized with Paisley, depicting him as an ally in a transatlantic fight against Catholicism and socialism, in a similar attitude to how Montt was viewed in Guatemala. By the latter half of the seventies and eighties, however, these prior divisions lessened as evangelical-Catholic reconciliation began to develop and the magazine focused more on the nature of sectarian violence. This project provides an important insight into how Americans understand the world and the conflicts that define it. My project will showcase an independent study that I completed with Professor Melani McAlister.

### Primary Presenter

Mark Thomas-Patterson

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Undergraduate Student

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Melani McAlister

RESEARCH SHOWCASE

# HUMANITIES

## CORCORAN SCHOOL OF THE ARTS & DESIGN

### Fiber With A Cause: Recovering the History, Craft and Material Culture of African American Weavers before the Great Migration

African Americans' contributions and innovations during the American Revolution and Civil War (both free and enslaved) to textile and fiber design and production have been hidden, buried, and lost. Current textile literature fails to account for the work done by African and African American weavers of the period. This research contributes to scholarly literature in anthropology, ethnography, material culture, and design of textile and fiber. It embeds the African American weaver into the geographic cultures that are rightfully celebrated, such as Ghana, Pre-Columbian Peru, and Japan. Furthermore, uncovering and sharing this history presents a powerful means of cultural preservation, process and design advancement in the textile arts, and reclamation of the craft as a vital trade for African American designers. The methodology of design thinking using a human-centered design approach and the study of material culture will be used. Research into slave narratives, historical accounts, and artifacts reveals a rich history of the processes, methods, and materials used by African American master craftspeople before and following emancipation.

For this project, archived articles, narratives, reference books, and photos will come from the Library of Congress, National Museum of African American History and Culture and The Schomburg Center, The Textile Museum, Textile Society of America, and GWU Art and Design Library. The most significant source of information appears via the discovery of the Federal Writers' Project, 1936-1938.

The research findings indicate African American textile, surface design, and fiber artists directly impacted design, manufacturing, and production. Yet, the historical contribution to innovation has been excluded. Discovered in the research are: free African American weaver Gabriel Fox who learned to weave on Williamsburg plantations during and after the American Revolution; and George Washington Carver whose dyeing process and proficient textile techniques have no scholarly mention.

This scholarly research aims to develop a model that uses the findings to cultivate an innovative studio practice. The user expert interviews, ethnographic research, oral narratives, and historical findings will document [written and visual] the handcrafted work by African American Weavers' who unknowingly impacted textile and fiber production. The hope is that the research will lead to developing a socially engaged, human-centered, and interactive user experience design program that is incorporated in the industry.

### Primary Presenter

Karen Baker

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Graduate Student - Masters

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Karen Baker

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Maria del Carmen Montoya

RESEARCH SHOWCASE

# HUMANITIES

## CORCORAN SCHOOL OF THE ARTS & DESIGN

### A History of Labor at the New Museum

This project chronicles the history of labor at the New Museum in New York City. Contrasting Marcia Tucker's founding mission with the contemporary state of the museum, the inevitable pressures of capitalism on the aspirations of the radically intentioned art museum are illuminated. I explore how the vision of Tucker's New Museum has fared over the years as it exists under late stage capitalism in the NYC art world. How does the museum still profit from its branding as a progressive institution despite its publicly spotlighted union busting practices that contradict their founding mission? This topic is especially timely considering the national wave of museum worker unionization in 2019 and the profound impact of the COVID-19 pandemic on cultural institutions and their employees in the past year. By tracing the lineage of the New Museum's relationship with its employees, this project addresses a significant lacuna in labor and art historical literature and acts as a valuable resource for art workers and academics alike.

### Primary Presenter

Jessica Layton

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Undergraduate Student

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RESEARCH SHOWCASE

# HUMANITIES

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### **Failure, Utopia, and Faith in the Work of Charlotte Posenenske, Adrian Piper, And Lee Lozano**

When artists seek viewer engagement to induce visions of a better future, what does it mean for them to fail? This paper explores the concepts of failure, faith, and utopia in participatory art through the case studies of Charlotte Posenenske's sculptural series, Adrian Piper's Catalysis performances, and Lee Lozano's Infofiction II and Dialogue Piece. These works were intended to create spaces for human interaction, but all failed, instead eliciting only refusals. For Posenenske and Lozano, the consequences wrought by this presumed inefficacy of art to open spaces for utopian dreams and ultimately action, were dire; the two left the art world shortly after their works could not produce their intended outcomes. However, deeming Posenenske, Piper, and Lozano's works as failures leaves out a critical component of what their works desire from viewers: sincerity. The failure to incite striving towards a presented utopia must be reevaluated within the context of authoritarian force and individual action. Here, Søren Kierkegaard's philosophy of true faith as absurd, individual, and unmediated by institutions provides a useful lens through which to understand sincerity, and the significance of desire's self-origination in the genuine nature of feeling and action. The responses of silence and refusal to Posenenske, Piper, and Lozano's works provide cases of falsification—allowing viewers to not fulfill the aims of the artwork maintains the claim of sincerity in a case where viewers do engage.

### **Primary Presenter**

Caitlin Chan

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Undergraduate Student

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RESEARCH SHOWCASE

# HUMANITIES

## SCHOOL OF BUSINESS

### **Big Fish, Big Ponds: An International Comparison of E-Commerce Monopolies and the Political Tools to Regulate Them**

While antitrust has mostly economic connotations related to competitiveness, this paper examines the political aspects of antitrust regulation. As Pitofsky says in his 1979 paper, *The Political Content of Antitrust*, “it is bad history, bad policy, and bad law to exclude certain political values in interpreting the antitrust laws”. Instead, he proposes that antitrust law considers 1) antidemocratic political pressures resulting from excessive concentration of economic power, 2) limited personal and business freedoms imposed by a few economic leaders who control the welfare of many, and 3) corporate giants whose dominance requires state intervention and interference in the free-market system (i.e., too big to fail). In the United States and Europe, e-commerce is dominated by Amazon, a company that wears several hats in the technology world. Given the United Kingdom’s recent exit from the European Union, the country can independently evaluate Amazon’s power and regulate it. In China, Jack Ma’s Alibaba is described as the “Amazon of China”. Both companies are monopolies in their respective markets and are facing a wave of antitrust scrutiny. This paper will apply Pitofsky’s political framework to e-commerce giants Amazon and Alibaba in the US, UK, and China to explain why both companies are political monopolies. Subsequently, the regulatory tools each country possesses to mitigate their respective monopoly will be examined and criticized. Ultimately, the paper will conclude how governments can effectively reform and use antitrust law to regulate e-commerce monopolies.

### **Primary Presenter**

Meaghan Gallagher

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Undergraduate Student

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RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Sensitivity of Diagnostic Codes in Identifying Laboratory Confirmed Congenital Cytomegalovirus Infections in Electronic Health Record Database

Newborn screening studies indicate a prevalence of congenital cytomegalovirus (cCMV) infection among US infants of 45 per 10,000 live births. Studies using administrative data that have relied on International Classification of Diseases, Ninth and Tenth Revision, Clinical Modification (ICD-9-CM; ICD-10-CM) diagnostic codes have found administrative prevalence of 1-3 per 10,000 live births. The sensitivity of ICD-9-CM and ICD-10-CM diagnostic codes in identifying diagnosed cCMV infections has not been evaluated. Laboratory data from an electronic health record database with a nationally diverse subset of healthcare facilities for 2010-2017 were analyzed to estimate the prevalence of laboratory-confirmed cCMV. Infants with laboratory-confirmed cCMV infections were defined as those with a positive cytomegalovirus (CMV) laboratory test (i.e., polymerase chain reaction, direct fluorescent antibody, or culture from saliva, urine, respiratory secretion, or blood samples or IgM serology) in the first 21 days of life. We calculated the sensitivity of CMV diagnostic codes as the percentage of infants with laboratory-confirmed cCMV infections who had CMV diagnostic codes (ICD 9: 078.5, B25.x; ICD10: 771.1 and P35.1) assigned during the first 21 and 90 days of life. Conditions related to cCMV were investigated among infants with a laboratory-confirmed cCMV infection. A total of 7,517,207 infants had encounters in the first 21 days of life at facilities that provided CMV laboratory data to Cerner Health Facts database between 2010 to 2017. We identified 668 infants with laboratory-confirmed cCMV, corresponding to 0.9 cases per 10,000 infants. The sensitivity of CMV diagnostic codes in identifying infants with laboratory-confirmed cCMV within the first 21 or 90 days of life was 10.3% (95% CI, 8.1 to 12.9) and 11.1% (95% CI, 8.0 to 12.6), respectively. The most common cCMV-related conditions identified through diagnostic codes were thrombocytopenia (15%), low birth weight (31%) and jaundice (26%). This analysis of laboratory data identified relatively few infants with laboratory-confirmed cCMV, only 5% of the estimated population prevalence. Our study is the first to assess the sensitivity of diagnostic codes in a non-screened population of infants. Among infants with laboratory-confirmed cCMV roughly 1 in 10 received a diagnostic code for cCMV.

### Primary Presenter

Alexandra Campione

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## RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Optimizing The George Washington University COVID-19 Biorepository for Data and Specimen Collection for Research

COVID-19 has significantly impacted the greater Washington D.C. area. The George Washington University COVID-19 Biorepository was created to understand COVID-19 disease transmission and pathogenesis to inform interventions, therapeutics, and disease control efforts. Since April 2020, the Biorepository has recruited COVID-19 PCR positive participants from the inpatient setting at the GW University Hospital or the GW Medical Faculty Associates (MFA) including through the new Recovery Clinic for patients with ongoing COVID-19 symptoms beyond the acute phase. Enrolled participants are asked about COVID-19 symptoms, medical history, medications, and immunizations during the acute phase of infection between 1-11 days and in follow-up at 10-weeks, 6-months, and 12-months after COVID-19 diagnosis. Participants also provide biospecimens (oropharyngeal and/or nasopharyngeal swabs, blood, urine, and penile, anal, and vaginal swabs) samples during those follow-up timepoints. The purpose of this clinical data and biospecimens are to establish a baseline assessment of clinical symptoms, signs of inflammation in the serum, and underlying mechanisms of the SARS-CoV-2 virus and how these values evolve beyond the acute phase.

Seventy-five COVID-19 PCR positive participants have been enrolled since April 2020 and enrollment and data collection are ongoing. Healthy controls are also being enrolled as a comparison group. Given patient retention and data collection challenges exist, various approaches have been implemented to optimize data and specimen collection. Strategies have included verification of multiple sources of contact information at baseline, utilization of Cisco Jabber app technology to contact enrolled patients, and the implementation of a COVID-19 biorepository email account to send scheduled reminder notifications to patients. Additional retention methodologies have included reimbursement by providing patients gift cards at follow-up visits, and scheduling future visits during baseline. Data collection has also been bolstered through data extraction from electronic medical records. The primary obstacle for this study is maintaining high rates of retention. Future data optimization and retention strategies being considered include administering automated self-administered electronic surveys from baseline throughout follow-up, and using frequent automated follow-up reminder notifications. Such strategies may help to significantly strengthen knowledge about COVID-19 disease progression and risk factors. Such efforts may also provide insight into beneficial data collection and patient retention strategies for biorepositories at other academic centers. The data being collected offer an invaluable resource for GWU researchers to better understand the pathogenesis of COVID-19, which could lead to improved opportunities for diagnosis and treatment options.

### Primary Presenter

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RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### SARS-CoV-2 Viability in Seminal Fluid

Over 27 viruses have been found in human semen, and sexual transmission has been confirmed for several viruses traditionally considered to be non-sexually transmitted, including ZIKV and EBOV. Despite the potential importance of semen as a reservoir for SARS-CoV-2, there is little information on it as a source of transmission or regarding the virus's impact on male reproductive health. Previous studies have found that SARS-CoV-2 is likely capable of infecting the testes due to high expression of ACE2 and TMPRSS2, proteins necessary for viral attachment and entrance, in Leydig and Sertoli cells and differentiated spermatozoa. We mixed a serial dilution of SARS-CoV-2 stock virus ( $6.25 \times 10^5$  infectious particles/mL) that was isolated and grown in a certified BSL-3 facility with uninfected seminal fluid samples collected prior to the pandemic. We demonstrate that the virus survives and remains infectious when mixed with seminal fluid, suggesting that seminal fluid is a hospitable environment for SARS-CoV-2. This suggests that SARS-CoV-2 could be sexually transmitted and may have effects on spermatogenesis.

### Primary Presenter

Arielle Glass

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Recent Alumni

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Melissa Perry

RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Role of HIV-1 Diversity in Sensitivity to Treatment with Monoclonal Antibodies

Patients on antiretroviral therapy (ART) must maintain consistent therapy in order to avoid rebound from the latent viral reservoir. More studies are needed to explore the role viral diversity plays in the potential efficacy of treatment with broadly neutralizing antibodies (bNAbs). To do so, we have characterized HIV-1 genetic diversity in individuals with varying lengths of infection, as well as the sensitivity of their inducible virus reservoir to bNAbs.

Peripheral blood mononuclear cells were collected from 8 well-characterized HIV-1+ males on ART with varied lengths of active infection. Resting CD4 T cells were plated at multiple dilutions in replicate and maximally stimulated to induce latent viruses to grow in the supernatants. Cultures were screened for the presence of virus antigen and those that were positive were collected for analysis. 3-5 viral supernatants of virus outgrowth were obtained from each individual. In order to genetically define each person's viral reservoir, the HIV-1 envelope gene (env) was amplified and sequenced from these reservoir-derived outgrowth viruses by single genome amplification (SGS). At least three sequences were obtained from each well's supernatant. All sequences from an individual were aligned and used to generate a neighborhood-joining tree. If a single virus outgrowth was confirmed phylogenetically in the well, these sequences were then used to generate a well consensus sequence. Consensus sequences were generated and aligned to produce a maximum-likelihood tree displaying all sequences in this study. Wells containing single viruses were then titered and measured for sensitivity to bNAbs in the standard HIV-1 TZM-bl neutralization assay.

Neighbor-joining trees for each participants' sequencing revealed 80% of wells harbored a single virus. Analyzing consensus sequences from single virus wells, we observed a wide range of genetic diversity within each individual as measured by average pairwise distance. For individuals with higher levels of viral diversity, no wells had identical viruses and branched separately; however, low-diversity individuals harbored essentially 1-2 different viruses. Despite utilizing a very small sample size in the analysis, we observed a clear trend toward lower diversity in individuals with short active infections. We observed that greater diversity is associated with increased resistance to bNAbs.

Overall, our data suggests that average pairwise distance (APD) of HIV-1 env increases with infection length and is associated with greater resistance to bNAbs; however, individuals who start ART early in infection and develop limited virus variation are more likely to be sensitive to bNAb treatment.

### Primary Presenter

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RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### When in Trouble, Double Down: Double Oxygenator ECMO Support for Refractory Acidosis in COVID ARDS

A 32 year old previously healthy Latino male presented with cough, fever, myalgias and dyspnea and was positive for COVID-19. He was admitted on high flow oxygen but required mechanical ventilation on Hospital Day (HD)6. He developed oliguric renal failure and progressed to severe ARDS requiring paralytic, proning and PEEP of 16. He was cannulated for VV ECMO on HD9 for refractory acidosis and hypoxia. Murray score was  $>3$ , P:F ratio was 60.

Despite ECMO and continuous dialysis, the patient remained acidotic and was reliant on supplemental ventilator support, ongoing paralytic and heavy sedation. He developed a pneumothorax due to barotrauma and had multiple chest tubes for poor re-expansion. Due to maximum sweep support, an additional oxygenator was added on HD19. The patient had a prolonged recovery with complications of transfusion dependent epistaxis requiring ENT packing and hemochezia requiring rectal and IMA embolization. After significant transfusion he developed acute right ventricular dysfunction which was supported with inotropy and inhaled nitric oxide and later developed sepsis from bacteremia as well. He was finally stable for tracheostomy on HD61 and was decannulated from ECMO on HD66. He has since had cardiac and renal recovery and is weaning from vent support.

ECMO has been used as rescue therapy in COVID ARDS but multi-center studies report mortality rates of 50% to as high as 94%- much higher when compared to MERS or H1NI viral ARDS support. Life threatening complications of bleeding, thrombosis, infection and refractory cardiopulmonary failure are common but COVID ARDS presents new physiologic challenges that are not yet well understood. As of July 27 2020, of a cohort of 148 ECMO supported COVID patients in the SpecialtyCare national perfusion database, the average support duration is 16 days (SD 14 days). Our patient required 57 days on ECMO and is the only patient to have survived double oxygenator support in our database. His case supports future use of additional oxygenators in refractory acidosis, which may be more common in COVID physiology. He also reminds us that prolonged COVID ARDS recovery is possible.

### Primary Presenter

Katie Farrar

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### Research Mentor/ Department Chair

Katrina Hawkins

RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Characterizing Immune Responses to COVID 19

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the etiologic agent responsible for the yearlong COVID-19 pandemic. Though antibody and T cell responses to the virus have been well characterized in both healthy, convalescent, and hospitalized individuals, there is currently limited data on the T cell responses post-vaccine. In this study, we isolated peripheral blood mononuclear cells (PBMCs) were isolated from a COVID-19 vaccinated donor, and determined T cell responses using several immunological assays. We have observed specific responses to the viral structural protein included in the vaccines (the spike protein), and studies are currently underway to characterize the responses in more donors.

### Primary Presenter

Brita Ostermeier

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RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Better Clinical Outcomes in Hospitalized COVID-19 Minority Patients with Accompanying Gastrointestinal Symptoms

**Background and Aims:** The novel coronavirus (SARS-CoV-2) is highly contagious and attacks angiotensin-converting-enzyme-2 (ACE-2) receptors on respiratory epithelium. ACE-2 is also expressed in the gastrointestinal (GI) tract, and multiple GI symptoms have been reported in Coronavirus Disease of 2019 (COVID-19). We conducted a retrospective cohort study of inpatients with COVID-19 at the George Washington University Hospital (GWUH) to assess the prevalence of GI symptoms and their association with clinical outcomes.

**Methods:** We reviewed the charts of 401 adults admitted to GWUH with positive SARS-CoV-2 tests from February 24 to May 21, 2020, ultimately including 382 inpatients.

**Results:** 87% of our cohort was African American or Latinx. 59% of patients reported at least one GI symptom, with diarrhea being the most common (29%). Patients with GI symptoms were slightly younger (58 +/- 15.8 vs. 65 +/- 16.9,  $p=0.0005$ ), have higher body mass index (31.5 +/- Standard Deviation of 8.7 vs. 28 +/- 8.2,  $p=0.0001$ ), and more likely to be Latinx (34 vs. 27,  $p=0.01$ ). Patients who presented with abdominal pain, nausea, vomiting, or diarrhea had significantly lower rates of death during hospitalization compared to those who did not present those symptoms (Odds Ratio 0.48, 95% Confidence Interval 0.28-0.8,  $p=0.004$ ).

**Conclusions:** Our study suggests that GI symptoms portend a less-severe clinical course of COVID-19 which may reflect a different disease phenotype and lower overall immune response. Additional research should focus on more robust symptom reporting and longer follow-up.

### Primary Presenter

Adam Horowitz

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RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Gastrointestinal Symptoms and Outcomes in Patients Hospitalized with COVID-19

The relationship between COVID-19 related GI signs and symptoms and clinical outcomes is an area of significant clinical interest. While there have been studies from China and the U.S. that have looked at this connection, sample sizes were small and often specific GI symptoms were not consistently connected to only COVID-19 infection. Additionally, the sample population in most COVID-19 studies are typically Asian or white and often do not consider potential variation in under-studied populations, such as African-Americans. This study evaluated the prevalence of GI symptoms and association with outcomes in hospitalized COVID-19 patients at a major metropolitan medical center.

Records were retrospectively collected from patients at GW. After adjusting for clinical demographics and comorbidities, multivariate logistic regression analysis was performed.

The most common presenting symptoms of COVID-19 in patients that are admitted to the hospital are cough(38.4%), shortness of breath(37.5%), and fever(34.3%), followed by GI symptoms in 25.9% of patients. The most common GI symptom is diarrhea(12.8%) followed by nausea or vomiting(10.5%), decreased appetite(9.3%) and abdominal pain(3.8%). Patients with diarrhea were more likely to die(OR 2.750;  $p=0.006$ ; CI 1.329-5.688), be admitted to the ICU(OR 2.242;  $p=0.019$ ; CI 1.139-4.413), and be intubated(OR 3.155;  $p=0.002$ ; CI 1.535-6.487). Additional outcomes analyzed were vasopressors, shock, and acute kidney injury. Diarrhea continued to be significant, being 2.738( $p=0.007$ ; CI 1.325-5.658), 2.467( $p=0.013$ ; CI 1.209-5.035), and 2.694( $p=0.007$ ; CI 1.305-5.561) more likely to experience those outcomes, respectively.

This study demonstrates a significant prevalence of GI symptoms in patients who are hospitalized with COVID-19. Diarrhea has an association with overall disease outcomes (ICU, intubation, death, shock, vasopressors, AKI). We hypothesized that having GI symptoms would lead to worse outcomes due a multisystem inflammatory response to COVID. In this study, diarrhea was the only common GI symptom found to be significantly connected to poor patient outcomes. Additionally, this study is notable because it offers data on the spectrum of GI manifestations in a diverse U.S. population with a majority of black patients, a historically under-studied group. Statistics from cities across the U.S. show a disparity between racial makeup and poor health outcomes from COVID-19. Further studies in under-served populations are necessary to fully understand the impact of COVID-19 in large diverse groups. In conclusion, screening questions should be expanded to include common GI symptoms. Providers should note whether their patient is presenting with diarrhea due to the potential implications on disease severity and outcomes.

### Primary Presenter

Hayley Rogers

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## RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### The George Washington University COVID-19 Biorepository for Data and Specimen Collection: A Preliminary Review of Initial Enrollees

In the greater Washington, DC area, there have been more than 1 million cases and 17,000 deaths from SARS-CoV-2, the virus causing COVID-19. Risk factors for infection and severe disease, course of illness, and virologic mechanisms are incompletely understood. The George Washington University has established a biorepository of biospecimens and clinical information to promote scientific inquiry into the SARS-CoV-2 virus and the COVID-19 disease.

A prospective longitudinal cohort study of patients diagnosed with COVID-19 at George Washington University was designed with follow up at 3 time points post acute infection. Biospecimens including naso- or oropharyngeal swabs, blood, and urine as well as clinical data such as clinical course, disease severity, and outcomes were collected.

We have currently enrolled 81 participants and continue to grow. There have been 45 enrollments at baseline, 4 at 10-week, and 6 at 6-month time points. Of these participants, N=23 (51.1%) are female and N=22 (48.9%) are male. The mean age at onset of infection is 54.0 years old. The large majority of participants are black (N=40, 88.9%), followed by white (N=2, 4.4%) and hispanic (N=3, 6.7%). Pre-existing medical conditions included Essential Hypertension (N=30, 66.7%), Diabetes (N=16, 35.6%), Cardiovascular disease (N=14, 31.1%), Hyperlipidemia (N=17, 37.8%), Obesity (N= 28, 62.2%), and current Tobacco Use (N=18, 40.0%). Initial outcomes of our baseline enrollments showed that N=44 (97.8%) required hospitalization. The average length of hospital stay was 9.1 days and N=9 (20.0%) required ICU admission. COVID-19 treatments included Remdesivir (N= 12, 26.7%) and Dexamethasone (N= 17, 37.8%). Outcomes also included N=43 (95.6%) who survived to discharge and N=2 (4.4%) who experienced mortality.

The creation and establishment of a COVID-19 biorepository will be a valuable resource for scientific investigators to study the pathogenesis and mechanisms of the SARS-CoV-2 virus. Essential hypertension and obesity were the most common co-morbidities consistent with evidence that cardiovascular diseases may be associated with severe COVID-19. The population enrolled in this specimen bank sample reflects the diversity of the local community and epidemiologic trends. It provides critical resources to support a better understanding of COVID-19 and its intersection with health disparities. This specimen bank also serves as an invaluable resource to correlate initial clinical and biologic data with patients who experience prolonged or severe illness, as well as post-acute sequelae of SARS-CoV-2 infection, and may help inform researchers investigating potential risk factors and targets for preventative and therapeutic interventions.

## Primary Presenter

Christopher Walker

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RESEARCH SHOWCASE

# IMMUNIOLOGY/ INFECTIOUS DISEASES

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### The GW COVID-19 Recovery Clinic: Establishing a Database and Early Findings

The clinical characteristics of, and therapies for, COVID-19 in the acute phase have been widely described. Many individuals, however, report persistent symptoms several months after their initial diagnosis. Recently, the National Institutes of Health has named this emerging phenomenon as Post-Acute Sequelae of SARS-CoV-2 infection (PASC). Though some follow-up studies have described common persistent symptoms, robust longitudinal data and models for treatment of PASC remain lacking.

The GWU COVID-19 Recovery Clinic led by internists and infectious disease specialists (e.g. pulmonology, cardiology, PM&R, neurology, cognitive) integrates with multiple subspecialties in recognition of the multisystem nature of PASC. Standardized templates and data collection tools are employed including a comprehensive clinical assessment by primary care and subspecialty providers, scales (e.g. PHQ-9, GAD-7, PCL-C, QOL and fatigue), neurocognitive testing (e.g. Hopkins Adult Reading Test, Trail Making Tests, and Letter and Pattern Comparison Test), laboratory evaluation, pulmonary function testing, and imaging. The clinic collects longitudinal data in four clinical phases, including the acute phase (up to 4 weeks), and post-infection phases from 4-12 weeks, 3-6 months, and 6 to 12 months. Data are integrated with the GWU COVID-19 Biorepository to help researchers understand Long COVID pathogenesis and immune responses. Clinical data and research participation are tracked by means of a comprehensive REDCap database integrating subspecialist data.

To date, we have evaluated over 100 patients in the GWU COVID-19 Recovery Clinic with extremely high demand for clinic enrollment. Data abstraction has begun with preliminary results anticipated. To date, fatigue and dyspnea are some of the most common symptoms among clinic patients. Previously published data from China, Italy and France show fatigue, cough, dyspnea and headache to be the most common persistent symptoms in patients recovering from COVID-19. These data are consistent with our preliminary findings and demonstrate the need for a management approach that emphasizes functional recovery via physical and occupational therapy services, and early referral to appropriate subspecialty clinics. Our database will be shared with partners in the Long COVID consortium involving 3 other academic centers and the VA Medical Center in order to harmonize and pool data. Given a significant knowledge gap in the management of PACS, the data being collected is invaluable to inform clinical management, support guideline development, and assess potential treatment and intervention strategies.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## COLLEGE OF PROFESSIONAL STUDIES

### US-China Relations: An Analysis of the “Cyber Problem”

There is arguably no global relationship more significant to the future of world politics as that between the U.S. and China. Many leading experts assess the U.S.-China relationship may have surpassed a tipping point, as evidenced by a rapid deterioration in bilateral ties. China argues U.S. efforts to rebalance the Asia-Pacific region have spurred troubles in an attempt to manipulate actors into adopting a posture of confrontation. While this growing tension is apparent in the physical world, it is also rapidly expanding to the cyber domain. As a result, it is vital for top-level policymakers to leverage the technical expertise of trusted analysts to provide the analysis required for strategic policy. Within the U.S. Department of Homeland Security (DHS) Cybersecurity and Infrastructure Security Agency (CISA), the National Risk Management Center (NRMC) will serve as the center for collaborative risk management activities. Through collaborative efforts, the NRMC will utilize dynamic, cross-sector risk management processes to identify, analyze, prioritize, and manage risk. Through CISA's Cybersecurity Division, analysts will be identified to source the National Association of State Chief Information Officers (NASCIO). NASCIO analysts ensure states comply with the federal government's cybersecurity policy and guidance, continually conducting audits for compliance. With the likelihood of Chinese-based misinformation and disinformation campaigns high, adoption of the DotGov domains by all SLTT stakeholders is vital. China is a formidable adversary that is well-versed in U.S. vulnerabilities; as a result, it is highly likely that a phishing campaign will either precede or quickly follow a cyber-attack. This risk will be mitigated by employing a variety of cyber hygiene assessments services in order to help organizations reduce their risk of exposure by taking a proactive approach. In order to maintain real-time situational awareness in the event of a widescale cyber-attack, it is essential to establish and implement a vector for coordination and collaboration. The National Infrastructure Coordinating Center (NICC) will serve as a dedicated 24/7 information sharing operations center, connecting the dots between DHS and the owners and operators of our nation's critical infrastructure. Concurrent to proactive measures, a fully vetted strategic policy for cybersecurity governance must also address reactive processes and procedures. The National Cyber Incident Response Plan (NCIRP) outlines the national approach for cyber incidents, with particular focus on incidents that are likely to result in demonstrable harm to national security interests, economic or public confidence, and the public health and well-being of the American people.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Advancing Reproductive Rights: Gender Implications of an Incomplete Women, Peace, and Security Agenda in Bosnia and Herzegovina

Reproductive healthcare must not be an afterthought in the post-conflict reconstruction peace process. Instead, it requires the full integration into the Women, Peace, and Security agenda. Failure to access reproductive healthcare is a threat to the security of women, physically and economically. Previously, scholars have approached these issues in regard to sexual wartime violence and post-conflict trauma. While these are certainly areas of importance, these perspectives continue to ignore the prominence of reproductive rights which deny women their independence and place them in vulnerable positions. The aim of this essay is to expose the consequences of an incomplete Women, Peace, and Security agenda in post-war Bosnia and Herzegovina. I argue that reproductive healthcare and rights is essential to strengthening the agenda's pillars and creating sustainable progress in the nation. A comprehensive Women, Peace, and Security agenda must address women's real needs and seek justice for their abuse. Ignoring the former only hinders their ability to secure an independent life. I reviewed reports and surveys, along with social media activity from local organizations to find that Bosnian women face severe insecurities due to widespread reproductive injustices and lack fundamental information needed to support their healthcare needs. After conducting a case study in Serbia and Croatia, I find that the status of reproductive healthcare in Bosnia is equally limited to that of these neighboring countries, despite Bosnia enacted one of the first National Action Plans, nearly a decade before Serbia and Croatia. I argue that in order for Western intervention to effectively promote equality and security in post-conflict nations, reproductive healthcare and rights must be fully integrated into the Women, Peace, and Security agenda.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Open Climate Policy Database

Through the summer and autumn of 2020, student researchers from George Washington University, Cornell University, the University of Chicago, the University of Edinburgh, and the University of Cambridge created a database revealing the climate policies of 193 countries.

The teams from each university first conducted initial research on areas of climate policy, proposing 13 possible policy areas. Researchers voted, selecting Energy Production, Agriculture, Environmental Extraction of Fossil Fuels, and Emissions Reporting as the four most important topic areas. The teams wrote summary briefs on each of the four topic areas following in-depth investigations, including background information on extractive practices, definitions and terms, country-level policies, and international agreements, with the goal of turning the deep-dive investigations into multiple research columns to comprise the database. Each team contributed to the development of the database, with a mixture of columns to be filled out by researchers and columns to be filled using external sources, then assigning weights to the policies or indicators measured by the columns. Researchers then created an index measuring the overall successes and failures of each country in each target area.

We hope this research and our findings further elucidates gaps in transparency regarding data on states' climate policy. Ultimately, this project underscores the critical role students have in driving material climate action and holding large greenhouse gas emitters accountable through our research.

The Open Climate Policy Database, including the full summary of our motivation, key findings, and methodology, can be viewed at <https://www.globalstudentpolicy.org/climate>.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Daoist Spiritualism as a Vessel for Hegemony

Throughout the course of human history empires have waxed and waned, several Chinese dynasties have risen and fallen. During each episode of dynasty construction, leaders pursued a multifaceted approach as a legitimate executive ruler is not all that makes an empire. Someone must also write the laws. Society must be civil. The people need a belief system. Institutions must ensure the continuity of governance. Economics must allow for survival without predation. Cultural power, spiritual beliefs, metaphysics, and more are all crucial elements in building a golden age of hegemony. This paper will take Daoist spiritualism, and particularly the concept of Tianxia (天下), as the focus in an examination of the levers of modern empire building by the Communist Party of China (CCP).

Tianxia roughly equates to “all under heaven” and implies a universalist, all inclusive system of international relations. Tianxia dates back to the Zhou dynasty (circa 1000 BCE) when Han kingdoms in the Central Plain region of China were the dominant player in the international system. Zhao Tingyang, a contemporary philosopher, is credited for bringing this Daoist spiritualism into international relations theory. Zhao among others note that Daoism and its extensions, including Tianxia, is the spiritual heritage of the Chinese.

Around the world, there have been numerous examples of supra-national religious authority, and some such as Islam are still flourishing today. For 1000 years, the Catholic Church was the “whirlpool” that maintained order among the European kings. Authors David Kang, Feng Zhao, and Ji-young Lee have all published refined examinations into the historical IR systems in East Asia. They all show examples of Chinese Tianxia working to sustain a stable regional order. This is coupled with many aspects of Chinese culture being imprinted on its tribute states. A core mechanism of Tianxia, the Tribute System, was the vessel, but it was the contents that mattered.

In this chapter, I will explore the Chinese use of Daoism as a spiritual component in dynasty construction, specifically Tianxia as an alternative to Westphalian nation states. I seek to compare elements of instances of supra-national spiritual authority, including in past golden eras in China, to bring light to their role in empire building and the establishment of international order. I will then attempt to explain what this implies for the “Rise of China” narrative and the Chinese Communist Party’s efforts at establishing a hierarchical hegemony in Asia.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Analyzing the Effectiveness of “No Concessions” Policies in Hostage Negotiations

It's estimated that every year anywhere from 200 to 300 Americans are taken hostage abroad. The outcome of American hostages is dependent on the type of group that is holding them. Since the Reagan administration, the United States has operated under a strict “no concessions” policy with terrorist organizations. The concept of “no concessions” is based on denying terrorists funding, credibility, and attention, with the common argument being that making concessions only encourages more hostage taking in the future. The objective of this research is to explore if “no concessions” policies succeed in protecting U.S. citizens abroad, and deterring hostage taking in the future. This research compares the outcomes of citizens from countries with “no concession” policies to the outcomes of citizens from countries that allow concessions. This research will also examine why those outcomes appear to be that way. This research relies on previous research, government documents, and detailed accounts from hostage's experiences. The datasets used to make analyses came from the Combating Terrorism Center at West Point and the National Consortium for the Study of Terrorism and Responses to Terrorism.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### **Cultivating an Entrepreneurial Ecosystem: Replicating Israeli Science, Technology, and Innovation Best Practices in Egypt and Jordan**

In developing economies within the Middle East, limited employment opportunities may lead to greater social, political, and economic instability; however, technological research and innovation are avenues for economic growth. Innovative technology-based startups have become popular avenues of job creation for states seeking to develop economically. Israel transitioned from an emerging economy to a developed market in the years following the Great Recession and is frequently referred to as the “Start-up Nation” within technology entrepreneurship literature. This study seeks to contribute knowledge on the extent to which Israeli best practices in science, technology, and innovation can be replicated in the emerging economies of Egypt and Jordan as a means of stimulating economic growth, given the presence of geopolitical tensions and the natures of political economy systems. I make technical comparisons of innovation policies and practices in each state primarily through document reviews, analyzing the political, economic, and technological factors in place that would either facilitate or hinder innovation policy implementation. I employ Mill’s Method of Difference to compare all three case studies across variables of natural resource presence, human capital capacity, and market classification. This study aims to assess the entrepreneurial environment through 30 interviews with Israeli, Egyptian, and Jordanian CEOs of small- to mid-sized enterprises to understand key insights on regulations, tax incentives, and availability of venture capital funds not revealed through the document reviews. I find that Israel, Egypt, and Jordan share similar human capital capacities, but do not generate equivalent economic outcomes. This finding may indicate potential limitations or complexities of endogenous growth theory, which argues that state improvements in human capital lead to economic growth.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### **Brexit: A Fluke or the Future of British Conservatism? Analyzing the Post-Brexit Conservative Party's Populist Status Quo**

The British people's vote to leave the European Union in 2016 — known as the Brexit vote — represents the outcome of a successful populist movement. More recently, the Conservative Party's staggering 2019 electoral success shows that the populist "Get Brexit Done" message remains popular both amongst traditional Conservatives as well as broad swaths of the working class in former Labour strongholds. This study asks why the Conservative Party has changed so markedly in response to the ongoing Brexit negotiations and explores explanations for the Party's new rhetoric, policy changes, and factional shifts within halls of Westminster.

While some scholars look at the supply-side causes of populism (elites and political parties) and others look at the demand-side causes (the voters), this study applies a third school of thought that examines the relationship between supply and demand by analyzing a series of interviews with Conservative Party staff as well as public opinion polling. In doing so, the study concludes that there has been a deep, reciprocal, and simultaneous onset of populist Euroscepticism within both the Conservative Party and the working class that has structurally re-aligned the Conservative Party for decades to come, from more 'libertarian' to more 'authoritarian' in nature. A feedback loop has locked the new Conservative base into a new mentality that the Conservative Party then reciprocates and feeds back to the voters. This research provides the broader scholarly literature on populism with an example of the aftermath of populist movements when both elites and voters are able to forge relationships and work together in tandem to achieve their goals.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Fulfilling the Vision of Colombia's Gender-Inclusive Peace: The Formal Reintegration of The Farc-Ep's Ex- Combatant Women

In 2016, the Colombian government and the FARC-EP, a guerrilla group, signed a monumental peace agreement that would bring a formal end to the country's decades-long armed conflict. The agreement was an unprecedented move toward peace in Colombia, and also a revolutionary arena for the participation of one demographic that had systematically been excluded from peace and reconciliation efforts: women. In order to determine whether Colombia's peace process truly has been revolutionary for its inclusion of women, this research explores how a state institution—the Agency for Reincorporation and Normalization (ARN)—has developed reintegration programming for women who are former FARC-EP combatants. Based on data collected through content and discourse analyses on legal documents, webpages, and social media outreach campaigns, I argue that the explicit acknowledgement of the impacts of conflict on women as well as the participation of women in the final peace agreement have been crucial steps to developing more inclusive reintegration programming. Despite the progress made on women's inclusion, the ARN's programming falls short in two ways. First, it misunderstands gender as a social identity by conflating "gender" with "women," as evidenced by the lack of meaningful inclusion of all genders in programming as well as the treatment of women as a homogeneous social group with comparable experiences. Second, the ARN fails to design and implement intersectional programming that consistently recognizes gender as an identity among many others, including sexuality, ethnicity, and race. Ultimately, the inclusion of women in the peace process has made strides toward fostering a democratic and inclusive peace in Colombia, but the ARN must make adjustments to their design and implementation of reintegration programming in order to effect long-term positive social change and ensure that it properly accommodates all former combatants.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Are Higher Levels of Economic Freedom Associated with an Increase Foreign Direct Investment?

Though investment-led growth is recognized by many authors as desirable for developing countries, such countries continuously struggle to attract foreign capital. Many argue that creating an investment-friendly environment through freedom-promoting reforms is an important starting point. In this work, I research the relationship between economic freedom and foreign direct investment (FDI). Utilizing President Trump's trade policy changes as inspiration for the lens through which I view this relationship, I address the following question: are higher levels of economic freedom associated with increased levels of FDI? To answer this question, I focus on three specific sub-components of economic freedom from The Heritage Foundation - Property Rights, Government Integrity, and Business Freedom - for 153 countries for the years 2013-2018. Overall, I find a significant, positive relationship for each economic freedom sub- component and FDI. When the data is separated into different samples, those before and during Trump's Presidency, the coefficients on the freedom measures remain positive and significant but shrink in size in the period 2016-2018. This suggests that the positive relationship between economic freedom and FDI continues to hold, and that though it has weakened, has not changed dramatically over time.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### From Social Exclusion to Social Cohesion: How the Piquetero Movement Achieved Social Policy Expansion in Post-Neoliberal Argentina

In the early 1990s, Argentina underwent a sudden shift from import substitution industrialization to strict neoliberal economic policies, causing unprecedented levels of poverty and unemployment. In the face of political and economic subordination, the working class and unemployed turned to collective action to demand social protection from a government they felt was not listening to them. Between 1997 and 2007, the Piquetero movement – the “Picketers” – carried out hundreds of protests that directly influenced Presidents Eduardo Duhalde and Néstor Kirchner to pass more inclusive employment, pension, and healthcare policies, among others. Given that unions historically dominated civil discourse in government agenda-setting, this thesis explores how a movement of mainly unemployed citizens became a legitimate vehicle for influencing Argentinian social policymaking.

Findings are based on a rigorous review of scholarly literature covering social cohesion, Argentinian politics and economics, Latin American social movements, and the Piquetero movement itself, as well as analysis of key quantitative data on economic trends and protest activities. Three conclusions were formulated to explain the success of the movement as an agent for change. First, the strong sense of social cohesion within the movement made the protest activities highly organized and persistent. Second, the size and visibility of the protests, which regularly shut down roads and cities, made the movement impossible to ignore. Third, the democratic political structure of Argentina meant that meeting the demands of the movement was necessary for presidents to secure the lower class vote for reelection. These findings emphasize the ability of social movements, which have become a common method for civic engagement in Latin America, to influence government action. They also highlight the importance of the social sphere in development discourse. Economic narratives tend to dominate development literature as it relates to economic growth and the improvement in well-being assumed to come with it. However, in times of collective struggle, short term safety nets take priority over long-term development, and the Piquetero movement was an impressive demonstration for how to effectively assemble people in a democratic space to create immediate social change.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### How do Greenlandic Parties Engage with Language and Identity?

National identity is used in analyses of ethnic conflict and separatism, but the concept of national identity itself is under-examined. Greenland's gradual adoption of home rule and its recent debate over language policy make Greenland an ideal case study of the creation of national identity.

This study analyzes party publications and news coverage to examine Greenlandic identity today. Greenlandic identity is put into context with literature on national identity as well as existing descriptions of Greenlandic political development. From 1953 to 1979, Greenlandic identity rapidly developed. The 1979 vote for home rule was the result of mobilization against a variety of cultural topics. Perceived Danish impositions in lifestyle, education, and economic structure fueled a movement in favor of a corresponding Greenlandic "counter-identity."

The 1979 vote for home rule gave Greenland's new government authority over education, the status of the Greenlandic language, and settlement politics, all issues associated with the prior debate over Danicization and Greenlandic identity.

Although Greenlandic identity was first espoused in contrast to a Danish identity, the replacement of Danish political institutions has undermined the value of Greenlandic identity as a critique of Danish rule in Greenland. Even though Greenlandic mobilization has altered the political landscape, a Danish-Greenlandic binary continues to dominate Greenlandic politics. Defining Greenlandic identity as a rejection of Danish identity is no longer a political strategy in itself; Greenlandic goals and perceptions have changed since 1979.

Since the vote for home rule, language has grown more salient as a symbol of Greenlandic identity. Language policy has eclipsed symbols that were important in 1979, such as the rejection of Danish reforms in education and the Greenlandic fishing industry. These changes in perception have key implications for the nationhood and political development of Greenland.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Danger and Deception: The Aftermath Of Agent Orange's Use in South Korea

Between 1967 and 1971, the United States military assisted in spraying 59,000 gallons of the herbicide Agent Orange along the demilitarized zone between North and South Korea, and between 1974-1978, improperly buried hundreds of its excess barrels in South Korean soil. These combined actions have had widespread negative impacts on the health of thousands of Koreans and Americans, resulting from exposure to the toxic chemicals composing the herbicide. The realization of Agent Orange's toxic properties occurred gradually, and distinctly unevenly, between Korea and the U.S. This research provides a timeline of when scientists, government officials, and the public—in both states—learned about the true effects of Agent Orange on human and environmental health. This research then accounts for what caused the nearly 40 year lapse in knowledge experienced by the Korean public, and what eventually closed the gap. Ultimately, this research determines that the United States is wholly responsible for the presence of Agent Orange in Korea, the subsequent contamination of soil and groundwater from its burial, and the human and environmental health impacts from exposure to Agent Orange. Additionally, the U.S government is responsible for withholding information on Agent Orange from Korea, which exacerbated the devastating health effects. Only through activism by the general public in both states was the truth finally uncovered for all.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Roots Empowerment

Many Afro-descendants are unable to trace their lineage back to Africa and beyond due to the destruction of African Empires and the lack of documentation for enslaved Africans brought to the New World. Although the Freedmen's Bureau initiated recordkeeping for the newly freed slaves starting with the 1870 Census, the scarcity of documentation prior to 1870 is often referred to as "the brick wall" by genealogists. Therefore, The African Surnames Project is crucial in helping black people reclaim the identity that enslavers took from them; it is also vital in preventing the dehumanization and erasure of black communities' stories in the Americas. The objective of this study is to initiate and maintain an ancestry database for Afro-descendant families in the United States and Latin America in order to trace the lineage and migration patterns of black families that have African surnames corresponding to specific locations in Africa such as Bobo, Senegal, and Cuffe. We analyze public information from census records from 1870-1940, directories through Excel, and genealogy software in order to create family trees and find connections between communities that have a strong African influence. Additionally, we contact families for interviews to receive additional information about their familial connections. The study is unearthing the connection to Africa as well as the ancestors and extended relatives of many Afro-descendant families. For example, enslavers brought enslaved people who later became the Senegal Family largely to the present state of Louisiana; however, many of the Senegal family members later migrated to Texas and California. The connections also point to toponyms, as many street names such as Bobo Drive reveal African surnames. The project promotes the Pan-African unity of Afro-descendants throughout the Americas by encouraging them to trace and embrace their collective identity. Importantly, family members are collaborating with us as we continue this multi-year project. As an African American who is interested in International Affairs and Latin America, this is a very fascinating project for me to be working on. Being a research assistant for this phenomenal project, I am more than just a student worker. I have the opportunity to contribute to research discoveries along with the faculty, analyze data, and reach out to both the families and the two professorial colleagues in Brazil and Colombia who work with Professor Captain on this project.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### **Pawn or Player? Somaliland's Agency in the Pursuit of Its Foreign Policy Interests**

Since its self-declared independence in 1991, the autonomous region of Somaliland in Northern Somalia has struggled to gain international recognition despite its relative stability, successful development of good governance and security structures that seemingly qualify the region for statehood. Nevertheless, in recent years, Somaliland has found itself in the midst of heated battles between regional and global powers seeking influence in the Horn of Africa. Somaliland is strategically situated along the coast of the Red Sea, an area that has become increasingly more important over recent years due to the high volume of trade, its proximity to the resource rich Persian Gulf, and the array of security threats present in the area. Given Somaliland's stability, it provides unique new opportunities for the nations of the world to be invested in the region. Similarly, for Somaliland, whose opportunistic foreign policy strategy constantly seeks ways to achieve greater international recognition, is eager to attract international engagement. Somaliland has demonstrated its willingness to involve itself in national rivalries, serving as both a player and pawn in the game of geopolitics while attempting to realize its national ambitions. The degree to which Somaliland has agency in these dynamics, the strategies it uses to achieve its own foreign policy interests, where it is successful and how it is used by others in the international system can provide insight into the role of small states and unrecognized states in high-level, complex power dynamics. Furthermore, the case of Somaliland in particular highlights key trends in the Horn of Africa and Red Sea arena, providing useful tools for regional analysis.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### The Indigenization of Mental Health and Psychosocial Services for Rohingya Refugees in Bangladesh

Since August 2017, the Rohingya refugee emergency has been one of the largest ongoing humanitarian crises globally, requiring immense inter-agency, inter-sectoral, and government coordination to provide essential services throughout refugee camps in Bangladesh. Within this response, organizations providing Mental Health and Psychosocial Services (MHPSS) have faced immense challenges in providing essential care to those who have experienced and witnessed systematic violence and persecution. As a result, it is critical to ensure essential services are culturally-grounded and cognizant of the socio-cultural and political dynamics affecting the mental health and psychosocial wellbeing of Rohingya refugees and their ability to access MHPSS. This research examines how and to what extent have MHPSS been indigenized by various humanitarian organizations for Rohingya refugees in Bangladesh, addressing specific concerns related to cross-cultural challenges. Previous scholarship has individually examined interventions and challenges within the Rohingya response, however this paper evaluates how programs have specifically adapted programming to socio-cultural dynamics within an indigenization framework. The paper also examines the active incorporation of Rohingya refugees and their critical roles in the development, implementation, and modification of these services. Thematic analysis of interviews with field practitioners and secondary resources related to MHPSS programs for Rohingya Refugees demonstrate that adaptations specifically related to stigma-sensitive language, targeted psychoeducation programs, traditional cultural activities, and the use of Women and Girl Safe Spaces are critical to MHPSS adaptation in the Rohingya context. Analysis of current interventions also reveals increased scope for indigenized MHPSS development in critical humanitarian response sectors i.e. education, the importance of the physical environment for healing, and gendered grievances critical to holistically addressing the psychosocial wellbeing. Recommendations highlight opportunities for the development of religious based psychosocial interventions and the need to explicitly mainstream MHPSS considerations across humanitarian programming.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Informal Circularity: How Waste Pickers in Ghana Can Help to Achieve the Sustainable Development Goals

Solid waste management (SWM) has been an enduring challenge for cities in the global South due to rapid urbanization and economic growth which has led to unprecedented increases in the waste produced, and the importation of solutions and infrastructure not suited to global South contexts. The result is SWM systems that are rapidly becoming less sustainable over time and which also largely cater to higher income neighborhoods while neglecting lower income areas, especially informal settlements. Informal waste pickers help to solve both of these problems - by picking materials from dumpsites to resell, thereby contributing to a more circular economy and by ensuring low-income areas also receive needed waste collection services. However, as a result of the stigma associated with their work, they often face discrimination, exploitation by middlemen, and at best neglect by authorities in addition to severe environmental and health impacts. Through a framework of sustainability, these challenges can be overcome, and waste pickers could contribute to a new vision of a greener, more circular urban life in numerous ways. This paper examines informal waste management practices by workers in Kumasi and Accra, Ghana and asks the following questions: what is the potential for informal workers that process waste to contribute to Sustainable Development Goal #11, the "Sustainable City,"? What are the structural impediments to realizing this potential? Other studies have investigated the sustainable nature of the work done by informal waste pickers, collectors, and itinerant buyers in Ghana, but few have been able to address their activities within the context of the broader structures that govern the SWM system as a whole, including international development agency priorities, global e-waste flows, and municipal policies. The following study fills this gap by tracking flows of solid waste within Ghana's two major cities using a combination of primary and secondary research. A structured questionnaire will be administered to up to 50 waste pickers and middlemen at dumpsites in Accra. This will then be supplemented by informal interviews with city waste officials, representatives at several waste processing companies, and experts on SWM in Ghana. Once obtained, the findings will be interpreted in the context of meeting various targets of Sustainable Development Goal #11. Most of all, this paper aims to find possible opportunities for integrating the work of informal waste pickers into the formal SWM system and making their practices more sustainable.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Two Presidents, One National Strategy: US Security Policy Toward Venezuela (2015-2021)

On January 23, 2019, President Donald Trump's administration formally recognized Juan Guaidó as the interim president of Venezuela after the 2018 presidential election results were heavily disputed as illegitimate. The United States' decision to support Guaidó's claim to power shifted US-Venezuela relations toward more cooperation, but under the unique predicament of President Nicholas Maduro still holding control over part of the government. This shift in US security policy stems from the ongoing humanitarian crisis in Venezuela, aggravated by both economic collapse and political instability, which have converged into an issue of international security over the past six years. President Joe Biden's Administration must now determine what stance to assume on the issue of Venezuela's two presidents, which presents incoming policy-makers with the following question: why was US security policy toward Venezuela sometimes more cooperative and sometimes less cooperative—January 1, 2015-March 31, 2021? This study aims to address this question by identifying the domestic and international circumstances which changed between presidential administrations and further influenced US-Venezuela relations. A detailed chronology of changes in domestic politics as well as in the international system is provided in order to determine what contributed to the shift in US-Venezuela policy. Through analyses of the system, state, and individual levels, this study observes how changes in the distribution of power, domestic political landscape, and the introduction of new international actors altered US security policy toward Venezuela. By examining these levels, it can be determined that formal recognition of Guaidó was motivated less by the goal of promoting democracy in Venezuela and more so to promote domestic interests. For the US, rather than choosing to collaborate with other Latin American states on a long term, cohesive strategy to incentivize Maduro's exit, tensions continued to escalate between both countries. This study concludes with suggestions for the Biden Administration moving forward concerning their security policy agenda, and uses observations from the past to develop a US diplomatic response to the dilemma of Venezuela's two presidents.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Misogyny and the Manosphere: How the Incel Threat Slips Through the Cracks of the National Security Agenda

Since 2014, the number of fatalities attributable to incel violence has climbed to nearly 50 (Hoffman et. al., 2020). Although originally harmless, the incel (“involuntary celibate”) movement has festered into a hateful ideology sharing strategic and philosophical similarities with white supremacy and jihadi extremism. Using the Department of Homeland Security’s 2019 Strategic Framework for Countering Terrorism and Targeted Violence as a case study, this research will demonstrate how a failure to address the threat posed by misogynistic extremists weakens the national security agenda writ large. After providing a background on the movement, this work will outline why the incel movement amounts to a domestic terror threat, identify points of weakness within DHS’s Framework, and offer actionable solutions. Policy recommendations will focus on the importance of “adding gender” to analytical discourse, not only in relation to the incel threat, but to all discourse seeking to address the root causes of violent extremism. By focusing on inceldom as a microcosm of hegemonic masculinity, militarized masculinity, misogyny, and racism, this body of research will ultimately argue that gender and gender-informed policy is the new front of the modern security landscape.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Women's Role in the 2019 Social Movement in Chile

The role of women in Chilean social movements has always been essential. Neoliberal reforms instituted during the Chilean dictatorship (1973-1990) created vast inequality in Chile which impacts every facet of life for Chileans. Not only did reforms result in the privatization of essential goods and services such as water, education, healthcare, and pensions, it also created a system which creates and perpetuates inequality. In October 2019, a social movement against this inequality was ignited by students who refused to pay for the metro after a fare increase. While it started with a metro fare increase, it turned into a massive country wide protest against inequality created by neoliberal reforms. Social movements, such as this, have always been driven by women. During the dictatorship, women were organizing clandestine meetings and protests. Now, feminists are demanding the end to systematic oppression and patriarchal violence, which is so deeply intertwined with inequality and neoliberal policies.

Not only is the role of women and feminists so central and essential to the 2019 social movement against inequality, but cultural production by Chilean feminists has created a worldwide campaign for women's rights. A protest song called A Rapist in Your Path, performed by Chilean feminist collective Las Tesis, became an international rally cry. The song describes how institutions such as the police, the judiciary, and political power structures uphold systems which violate women's rights. Performances of the Chilean song took place all around the world: Mexico, Colombia, France, Spain, Australia, the United Kingdom.

In my paper, I discuss the creation of neoliberal policies under Pinochet and the history of protests and feminists movements in Chile. Further, I analyze the role of women within the 2019 social movement and the specific demands of women and feminists within the movement. I also investigate the issues with intersectionality of the feminist movement in 2019, as well as the cultural production of feminists during this time. I focus specifically on Las Tesis, and their protest song Un violador en tu camino, or A Rapist in Your Path.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### **Economic Diversification of Arctic Cities: Exploring the Potential to Break Away from Fossil Fuel Extraction Industries**

With rising international demand to become independent from nonrenewable energy sources, as seen by such international agreements like the Paris Climate Accord, it is necessary to analyze the livelihood and potential for arctic cities to diversify their economy. It is known among climate change experts that the Arctic region experiences the effects of global warming to a stronger degree than the global average. Many arctic cities' economies are dependent on fossil fuel extraction, which contributes to environmental degradation and are prone to boom-and-bust cycles. This dependency complicates the resiliency and sustainability of arctic communities.

This research focuses on case studies of Arctic cities which are most successfully on the path to economic diversification. It will also analyze fossil fuel dependent arctic cities and their individual potential to diversify from non-renewables. The goal is not to erase the benefits of specialization, but to explore several more sustainable industries which are suited for a particular city's culture and capabilities. The methods of this study will be to look at the economic possibilities and conditions of the surrounding region, its historical development, and the economic and legal policies of the governments which it falls under. When a certain industry is dominant in a region, it can shape the whole culture of an area, having an effect on architecture, family structures, gender relations, social values, and ties within the community. For example, many cities have found promising success in the industries of IT, ecotourism, biomedical technology, and artisanship. Indigenous arctic peoples' leadership and participation are crucial in this process, having inhabited the region for a millennia before the arrival of settler populations. Indigenous interests should be prioritized in economic diversification efforts in the Arctic especially when concerning natural resources and ecotourism. The findings from this study will shed light on a current gap in research on the future of economic sustainability in the Arctic.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Gender as a Barrier in Winterveldt, South Africa

This study was born out of the unique and valuable relationship that exists between the George Washington University Theater Department and the Bokamoso Youth Centre of Winterveldt, South Africa.

South African Apartheid ended in the late 1990's but the legacy of the violent and segregationist policy lives on in the obstacles within underserved townships. With little to no support from the government, townships across the country battle with unfathomably high levels of crime, violence and drug abuse fueled by a complete lack of opportunity and more than 50 percent unemployment rates. Gender issues, which are pervasive in every community across the globe, are compounded by socioeconomic challenges and underdevelopment. Our study set out to measure how gender impacts the social and economic mobility of youth in the area.

COVID-19 has presented a number of challenges for our team which has slowed, but not halted, our progress. Fieldwork for this study is ongoing and findings are therefore inconclusive at this time. Despite this, as we have begun to analyze incoming data, thematic codes have begun to emerge from the text. What we can say, conclusively, is the following:

Gender issues have a noteworthy impact on the economic opportunity that young community members have access to. This applies to both women and men, who face differing but challenging circumstances within Winterveldt. Despite this, it is clear that the Bokamoso Youth Centre provides an unparalleled safe learning space for youth to overcome personal obstacles, which include topics of gender. Almost all participants who attend or have attended Bokamoso gave similar accounts of the empowering gender equality that exists within the Centre when compared to the gendered issues they face in their daily life. A few participants, particularly males, expressed that Bokamoso kept them from committing acts of gender-based violence when they may have otherwise.

Further detail on the specific effects of gender on youth in the community are to come as our findings are finalized. More information on the prevalence of gender-based violence in the community and those most at risk for gender-based targeting will be revealed, as well as a more nuanced understanding of how gender dynamics interact with other aspects of daily life for people in the community. The implications of these findings will be beneficial to the community members of Winterveldt, and especially beneficial to the operations of the Bokamoso Centre.

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RESEARCH SHOWCASE

# INTERNATIONAL AFFAIRS

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### China-Pakistan Economic Corridor as Goeconomic Strategy and its Impact on Uyghur Internment Camps

Since 2017, the Chinese Communist Party (CCP) has operated internment camps in Xinjiang Uyghur Autonomous Region to detain the Uyghur minority as a part of their policy on war on terror. Subsequently, the operation of the camps increased the CCP's degree of control in Xinjiang, as the party implemented close surveillance to control Uyghur activity and imprison any potential dissidents. This research investigates the goeconomic factors that motivate the CCP to conduct mass-incarceration of Uyghurs in Xinjiang. Xinjiang provides a great goeconomic importance to China due to its strategic location that is conducive for the Belt and Road Initiative (BRI). Therefore, it is in utmost interest of the CCP to develop the region to execute the BRI - especially the China-Pakistan Economic Corridor (CPEC), which is the flagship of the BRI. The research studies the goeconomic gains that Xinjiang provides to the CCP from Xinjiang's involvement in the CPEC, which such gains spur the CCP to imprison the Uyghurs. The paper begins by discussing the history of the CCP oppression against the Uyghurs and the Uyghur secessionist movement to point to the root of regional instability in Xinjiang. Then the paper refers to Blackwill and Harris's definition of goeconomics to demonstrate that Xinjiang is a key instrument in the CPEC for defending Chinese goeconomic interest, as well as equating the CPEC as the Chinese goeconomic strategy in procuring energy. The paper proceeds to discuss the prioritization of the CCP's development of the Kashgar-Gwadar railway and Gwadar Port to explain how these two infrastructures avail China to defend its national interest and provide enhanced routes for China to utilize for importing oil. The conclusion summarizes China's goeconomic interest in Xinjiang that prompts the CCP in mass-incarcerating Uyghurs, thus ensuring regional stability apt for administration of the CPEC. The conclusion defines that the Chinese goeconomic interest consists of energy procurement, which is evident from China's drive on creating efficient trade routes that paves greater security and accessibility towards the Arabian Sea. Moreover, such goeconomic interest in creating a more secure trade route highlights China's insecurity towards the route that passes Malacca Strait, which the strait's geopolitics can strangle China's access to oil. Lastly, the conclusion discusses potential areas for future research.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Covariate Balancing Functional Propensity Score for Functional Treatments in Cross-Sectional Observational Studies

Functional data analysis, which handles data arising from curves, surfaces, volumes, manifolds and beyond in a variety of scientific fields, is a rapidly developing area in modern statistics and data science in the recent decades. The effect of a functional variable on an outcome is an essential theme in functional data analysis, but a majority of related studies are restricted to correlational effects rather than causal effects. This paper makes the first attempt to study the causal effect of a functional variable as a treatment in cross-sectional observational studies.

Despite the lack of a probability density function for the functional treatment, the propensity score is properly defined in terms of its top functional principal component (FPC) scores. Two covariate balancing methods are proposed to estimate the propensity score, which minimize the correlation between the treatment and covariates. The appealing performance of the proposed method in both covariate balance and causal effect estimation is demonstrated by a simulation study. The proposed method is applied to study the causal effect of body shape on human visceral adipose tissue.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### What is Written on a Dog's Face: Implications of Phenotype Diversity in Human-directed Canine Communication

Humans and dogs have a unique shared evolution, the study of which may shed light on the origins of human communication. The domestication of dogs and dogs' coexistence with humans have influenced the biological and social development of both species. While the suite of physical changes that now separates dogs from extant wolves has largely been selected for by humans, evidence suggests that some changes may not have been as deliberately cultivated as others. In adapting to the social environment of humans, dogs have acquired both behavioral and anatomical traits that engender successful interaction with humans, specifically in regard to communication. In particular, dogs make eye contact with humans and use a variety of facial cues to effectively "speak" to human companions without words. Moreover, dogs and non-human primates show striking patterns of convergent evolution in terms of facial patterning, and previous research suggests that in primates, degree of phenotypic facial diversity corresponds with degree of sociality. Does the overall effect of prosociality in dogs supercede intentional breeding for specific physical appearances? Through behavioral and physical phenotype analyses (observing rates of expression and coding facial coloration and patterns) of dogs living in households with humans, this project evaluates the potential impact of superficial facial markings and pigmentation on the production of human-directed facial expressions in domesticated dogs.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Hurwitz Action in Complex Reflection Groups

The Hurwitz action is a combinatorial action that is used to measure how one factorization is related to another. This study focuses on the factorizations of an arbitrary element in the complex reflection groups. Using combinatorial and graph-theoretical techniques, this study finds an if-and-only-if statement of when two factorizations are related via the Hurwitz action. Furthermore, this study provides a formula that counts the number of Hurwitz orbits of an arbitrary element.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Electric Polarizability of Hadrons from Lattice QCD

Electric and magnetic polarizabilities are two of the fundamental properties of hadrons which help us understand the distribution of charge and currents inside hadrons and how they respond to external electromagnetic fields. For nucleons, these values are determined experimentally through Compton scattering of photons on nucleons and polarizabilities are extracted from these experiments using chiral perturbation theory (ChiPT). For charged pion, the most compelling prediction of the polarizabilities comes from ChiPT. On the experimental side, all the experiments measure charged pion polarizabilities indirectly because no free pion target is available. The results obtained from these experiments have considerable uncertainties, and they vary over a huge range of values.

Our goal is to calculate the polarizabilities of charged mesons using Lattice QCD. For neutral hadrons, such calculations were carried out and the results were encouraging. For charged hadrons, however, the fact that they are accelerated in the presence of a background electromagnetic field introduces new challenges that we are investigating.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Statistical Characterization of Temperature and Pressure Vertical Profiles for the Analysis of Laser Heterodyne Data

Due to complex interconnected feedback mechanisms, simultaneous detection of greenhouse gases (GHGs) is essential to understanding climate change. Vertical profiles of GHGs derived from Laser Heterodyne Radiometry (LHR) measurements are dominated by the troposphere and lower stratosphere. Errors in atmospheric transport models currently applied to atmospheric measurements limit the accuracy of GHG fluxes. Ground-based vertical profile measurements, obtained with instruments such as Fourier Transform Spectrometers (FTSs) and LHRs, are less dependent on vertical transport than satellite measurements, making them more useful in constraining surface fluxes.

We present an analysis of historic pressure and temperature profiles from radiosonde launches that will be used in retrieval of mixing fractions for greenhouse gases (including carbon dioxide, methane, and water vapor) in LHR data. With over 2,700 stations worldwide, the global coverage for weather balloon observations is extensive. Radiosonde stations included in the Integrated Global Radiosonde Archive (IGRA), are launched simultaneously twice daily at 00:00 and 12:00 UTC. Global stations span all time zones in both the Northern and Southern Hemisphere.

Mesa Photonics and George Washington University are developing a variant of LHR known as Precision Heterodyne, Oxygen-Corrected Spectroscopy (PHOCS) that simultaneously collects high-resolution, oxygen spectral line shape data. Because oxygen concentrations in the troposphere and lower stratosphere are constant, these line shapes are uniquely sensitive to both temperature and pressure profiles and constrained fitting of these line shapes enables more precise GHG concentration retrievals.

Our approach is to collect historic data over several years (typically the prior decade) for a particular date window surrounding a PHOCS measurement date for stations across the globe, and mine this data for observation probability distributions as a function of level altitude, local time of day of launch, latitude, etc. These distributions will then be used as Bayesian priors to constrain temperature and pressure fits during the oxygen spectral fitting routine. Subsequently, these priors will be used to estimate uncertainties in vertically-resolved GHG mixing ratios.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Loss of Adar1 Increases T cell Migration and Prolongs Survival in Ovarian Cancer

Novel therapies are urgently needed for ovarian cancer (OC), the fifth deadliest cancer in women. OC is generally characterized by an immunosuppressive tumor microenvironment (TME) and less than 10% of patients respond to immune checkpoint blockade (ICB) therapy, though better OC prognosis is associated with high tumor-infiltrating CD8 T cells. DNA methyltransferase inhibitors (DNMTis) remove methylation and activate transcription of double-stranded (ds)RNA in OC. These dsRNAs are sensed in the cytoplasm and trigger the induction of type I IFN and also the transcription of interferon-stimulated genes (ISGs). Adenosine deaminase 1 (ADAR1) is an ISG that edits mammalian dsRNA with an A-to-I nucleotide change. These edited dsRNAs cannot be sensed by dsRNA sensors, and thus ADAR1 can inhibit this type I IFN response. Our preliminary RNA-seq analysis from human OC cell lines indicates that RNA editing by ADAR1 is increased after DNMTi treatment.

To test the hypothesis that Adar1 loss will amplify the DNMTi-induced IFN response in OC, we implanted mice with syngeneic ID8 murine OC Adar1 knockdown (KD) cells or control cells and treated with DNMTi. We show that DNMTi treatment reduces tumor burden and extends survival in this OC model. Loss of Adar1 significantly prolongs survival in this model, which is further improved with DNMTi treatment. DNMTi treatment of murine OC cells combined with Adar1 KD increases T cell migration in transwell migration assays and also enhances expression of chemokines CCL5, CCL2, and CXCL10. We are currently performing immunophenotyping analyses to interrogate the composition of immune cells in the TME in the mouse model of OC. These studies thus describe a role of Adar1 in the DNMTi-induced immune response in OC.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Past, Present, and Future: How the Evolution of the Human Gut Microbiome can Inform Modern Health and Disease

Gut microbiome research has expanded exponentially in the past decade, but few studies have been dedicated to a comprehensive understanding of the evolutionary context of the gut microbiota. An evolutionary perspective is needed to understand how gut microbiota have evolved in the past in response to changing diets and lifestyles, knowledge which can then help inform modern-day research and clinical studies on gut dysbiosis and health solutions. This literature review has four primary objectives with the goal of synthesizing information on modern gut microbial composition and its evolutionary path: 1) Characterize the core gut microbiome in health and disease in humans; 2) Compare the core microbiomes of western populations and populations following more traditional subsistence strategies; 3) Contextualize the structure of modern human core microbiomes using ancient studies that examine coprolites, soil, or bone samples for bacterial preservation and sequencing; 4) Examine actualistic studies of wild great ape populations to determine gut microbial structure in comparison to ancient and modern human populations.

The results of this review, though incomplete, suggest that changes in gut microbiota of individuals following a western lifestyle have outpaced the ability of nuclear DNA to co-evolve, resulting in a divergence of their compatibility. This incongruity could result in misregulation of important systems such as the immune system, metabolism, and the central nervous system, leading to society-wide detrimental health effects and increase the prevalence of non-communicable chronic diseases. The gut microbiota of contemporary peoples following a traditional subsistence lifestyle are more similar to ancient gut microbial structure than they are to contemporary populations following a western lifestyle, which are characterized by decreased diversity in bacterial species. However, all human populations, past and present, group more similarly together than they do to wild great ape populations. The great ape populations may be useful in future longitudinal studies to determine if and how a healthy microbiome confers fitness benefits.

This paper suggests future avenues of cross disciplinary research, including long-term studies in genetics, primate research, biological anthropology and bioarchaeology. These areas of research converge in their importance in characterizing the modern human gut microbiome and its variations in health and disease to be better applied in a clinical setting on gut health. Understanding individual differences in gut microbiota structure and why the differences exist will also expand the field of pharmacogenomics.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Effects of Hydroxymethylfurfural in High Fructose Corn Syrup on Honeybee Health

Hydroxymethylfurfural (HMF) is a compound that forms from the dehydration of high fructose corn syrup (HFCS) in many processed foods and drinks. While the consumption of HMF is not known to be harmful to humans, many studies have found that it raises serious health concerns for honeybees. In the late summer months through the fall, foraging honeybees tend to supplement the loss of nutrients from flowering plants with other sugary sources. In urban areas, such as the George Washington University campus, the sugary supplements come from soda cans and other sugary garbage found in trash cans. In this study, I fed caged honeybees sugar water, Gatorade, and Mountain Dew (drinks with varying levels of HFCS) to find out how harmful HMF formed from HFCS was to their health. After conducting three separate trials, I analyzed the results to find that there was a significant difference in the death rate between the control cages (sugar water) and the Mountain Dew cages in each trial. Just as expected, honeybees fed Mountain Dew had the highest death rate, followed by Gatorade. The control had the longest survival time. Caffeine was ruled out as a possible variable in death rate due to the fact that Gatorade doesn't contain caffeine.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Search for Next-Generation Photovoltaic Materials: Antimony Halides as Perovskite Candidates

Perovskites have emerged as attractive materials in the development of photovoltaic devices. Low dimensional perovskite derivatives are promising alternatives to the existing lead-based perovskites which suffer from degradation under prolonged humidity and light irradiation. Low dimensional antimony halide perovskites are a relatively unexplored family of materials that couple the potential for improved stability with desirable photophysical properties such as small band gap energies. Presented is a series of eight previously unreported antimony halide perovskites synthesized from acidic aqueous solutions of antimony oxide and halogen substituted pyridines. Single crystals were structurally characterized using X-ray diffraction, and these materials feature anionic one-dimensional antimony halide chains, which assemble into three-dimensional networks via halogen and hydrogen noncovalent interactions [NCIs] between ion pairs. Solid state diffuse reflectance measurements were used to investigate the optical band gaps and are consistent with the band structures determined by density of state (DOS) calculations. The relative band gap energies reveal a dependence on atypical orbital overlap, which can be explained by 2nd sphere interactions with the metal-halide chain. NCIs are categorized and quantified using natural bond order (NBO) and second order perturbation theory (SOPT) calculations. These calculations reveal Wiberg bond index values, stabilization energies, and antimony halide bond characteristics that are correlated to the band gap energies. Our findings serve as a promising platform to further explore how noncovalent interactions can be harnessed in tuning the properties of next-generation perovskite materials.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### A Random Card Shuffling Process

Consider a randomly shuffled deck of  $2n$  cards with  $n$  red cards and  $n$  black cards. We determine the average number of steps it takes to go from a randomly shuffled deck to a deck that alternates in color by performing the following move: If the top card and the bottom card of the deck differ in color place the top card at the bottom of the deck, otherwise, insert the top card randomly in the deck. We use tools from combinatorics, probability, and linear algebra to model this process as a finite Markov chain.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Next-Generation Optoelectronic Materials: Indium, Antimony, and Bismuth Halide Viologen Perovskite Derivatives

Perovskites have emerged as promising candidates in the development of next-generation semiconducting materials and photovoltaic devices. Existing lead-based perovskites, while impressive in their light harvesting ability, are toxic and suffer from degradation over prolonged use. Substitution of lead in halide perovskites by closely related metals such as indium, antimony, and bismuth provide a potential for increased stability, small band gaps, and other properties suited for optoelectronic materials. This study presents a family of metal halide perovskite derivatives utilizing viologen organic cations. Single crystal diffraction experiments reveal that these compounds assemble into supramolecular networks via noncovalent interactions between metal halide anions and viologen cations. These interactions were investigated via electrostatic potential surfaces and natural bonding orbital (NBO) calculations. The inclusion of viologen cations, as a redox active species, facilitates charge transfer between ion pairs, manifesting as deep yellow and orange colors in the crystals. The optical properties were rationalized via calculated band structures using density of states (DOS), revealing low lying unoccupied  $\pi^*$  molecular orbitals residing on the viologen capable of accepting photoexcited metal-halide electrons. This family of compounds presents an important step towards modulating the optical properties of hybrid perovskites and the development of next-generation materials.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Investigation into IVGQR via Compton Scattering

Despite decades of investigation, the structure and behavior of the nucleus remains a topic of debate. The Hydrodynamic Model - proposed in 1948 - defines the nucleus as a fluid-like blob with defined boundaries. This model is used as the framework on which this research project is built on. This project investigates the behavior of the nucleus when exposed to electromagnetic radiation. At specific frequencies, electromagnetic radiation will cause the nucleus to oscillate (Giant Dipole Resonance - GDR) and jiggle (Isovector Giant Quadrupole Resonance - IVGQR), which results in the dynamic behavior of the shape and electric moment of a nucleus as a whole. This research project investigates the interference between the GDR and IVGQR through Compton scattering of a linearly polarized photon beam on a Sn-124 target at numerous specific beam energies. The asymmetry in the scattering cross section for photons detected parallel and perpendicular to the plane of polarization - plotted as a function of beam energy - gives the parameters for a curve that characterizes the IVGQR. The ROOT data analysis framework and the GEANT-4 simulation platform are being used to organize, analyze and simulate the experimental data in order to generate these asymmetry curves and ultimately determine the IVGQR parameters. From the analysis of the Sn-124 data, the IVGQR parameters that we find will be compared with the expected characteristics. This research will further the understanding of the IVGQR phenomenon, which assists in the understanding of the behavior of nuclear matter under extreme conditions - such as inside of a Neutron Star.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Quantitative Analysis of the DNA interaction with Divalent Cations

Surrounded by phosphate groups in the helix form, a DNA molecule is intrinsically negatively charged and hence experiences the electrostatic interaction between cations. In addition to electrostatics, the Boltzmann distribution accounts for both entropic and energetic aspects of the interaction and provides the probability of different microstates ascribed by different configurations of divalent cations. Taken together, the Poisson-Boltzmann equation sheds light on the interaction between DNA and divalent cations. Since measuring the attractive force between the DNA and divalent cations poses a huge challenge on researchers, an innovative approach was devised—measuring the intensity of the repulsive force between DNA molecules. In order to do so, the osmotic stress method (OSM) and X-ray diffraction (XRD) were primarily employed in this research to resolve this issue. In order to obtain DNA pellets, polyethylene glycol (PEG) was used which pushed the DNA molecules and rendered them precipitated. Although PEG is electrically neutral, it pushed the DNA molecules due to molecular crowding, thereby serving as a “squeezer”. With the DNA pellets, researchers ran the small-angle X-ray diffractometer and calculated the inter-distance between DNA molecules. Altogether, these experiments yield the dependence of inter-DNA distances on the “squeezing” forces by PEG. With the quantitative data, researchers concluded that the mass percentage of polyethylene glycol (PEG) is inversely proportional to the inter-distance of DNA molecules and that PEG exerts pressure on DNA molecules and renders them condensed as expected.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Sublethal Glyphosate Alters Honey Bee Memory Retention

Honey bees (*Apis mellifera*) are major pollinators of important economical value, contributing over \$20 billion from pollination services. After almost 15 years, Colony Collapse Disorder (CCD) is still a phenomenon with unknown causes in which the worker bees rapidly abandon their hive, leaving behind the brood, honey, and the queen. Recent research has focused on fungi, parasites, and pesticides as potential causes of CCD. This study investigates the effects of sub-lethal doses of glyphosate (10 ng glyphosate/ 5  $\mu$ L of sugar water), the active ingredient of the herbicide Round-Up. Using the proboscis extension reflex, we used classical conditioning protocols to train honeybees to recognize a scent (conditioned stimulus), initially associated with a light antennal touch of a swab soaked with sugar water (unconditioned stimulus). Subsequently, honeybees were divided into a treatment group fed 5  $\mu$ L of  $2.05 \times 10^{-6}$  mg of glyphosate/ mL of sugar water and a control group fed 5  $\mu$ L of 2:1 ratio sugar water. We tested bees' memory retention in both groups by measuring how successful we were to illicit PER. We found that the honey bees treated with glyphosate had a significantly lower success rate of 23%, compared to the control group's success rate of 49.7%. In a second study, we investigated the effect of sublethal doses of glyphosate on the spatial memory of honeybees training them on a path in a maze by classical conditioning. When subsequently we tested for memory retention, bees treated with sub-lethal doses of glyphosate had a higher rate of incorrect maze turns compared to control bees. In addition, anecdotal evidence showed treatment bees behaving in a very unnatural manner, buzz-flying through the maze compared to walking in control bees. Future studies will focus on the cognitive effects of sublethal doses of additional pesticide classes.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Systematically Searching for VLITE Transients

Sources of light in the sky that experience an acute change in brightness over timescales of seconds to years, referred to as transients, can help pinpoint high-energy events in our sky such as supernovae or gamma-ray bursts. We use data from the VLA Low Band Ionospheric and Transient Experiment (VLITE) to search for such transients. By running VLITE images through the LOFAR Transients Pipeline – an algorithm that finds sources in VLITE images, marks each source’s flux over time, and quantifies these changes in flux (into two variability parameters:  $\eta$  and  $V$ ) – and supervised machine learning strategies, anomaly detection and logistic regression, initially developed for LOFAR data, we can identify these transients. Here we present the results of an investigation into systematic uncertainties in the measured fluxes and their effect on finding transients. Finally, we present the results of the machine learning strategies when applied to VLITE images with injected simulated transients.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Making the Most of Radio Peaks in Gamma-Ray Burst Afterglows

The study of gamma-ray burst (GRB) afterglows across the electromagnetic spectrum allows us to derive information about the physical processes in their jets as well as the circumburst environment. The physical parameters of a GRB jet as well as emission processes at its shock front are able to be constrained through broad-band modeling with well-sampled observations, though individual parameters can be determined in some cases. Using a limited number of observables, it is possible to constrain the value of a specific parameter which in turn can be used to strengthen the model for the entire burst. We expand upon a method that utilizes peaks observed in afterglow radio light curves and spectra to constrain the fraction of the shock energy that resides in electrons,  $\epsilon_e$ . This diagnostic tool depends on a relationship that can be formed between  $\epsilon_e$  and observables of the burst, while most importantly leaving a weak dependence on the other unknown parameters. We expand the sample of 36 radio afterglows from the initial study with 15 additional GRBs, allowing for a systematic check of the modeling approach. With this expanded methodology and larger sample, we assess the initial results on the width of the distribution of  $\epsilon_e$ , which provides important input on GRB shock physics. Additionally, we use the computed value of  $\epsilon_e$  to further investigate particle acceleration mechanisms, connecting it to the parameter that describes the minimum Lorentz factor for the accelerated electrons.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Vortices and Ferry Wheels from Acoustic Multipoles

The need to manipulate micro and nano scale particles with precision is apparent in the modern technological age. The prominent current method is optical manipulation where optical tweezers can be used to move individual atoms. However, they cannot be used on opaque or light sensitive molecules and apply very little force due to the low intensity of light used, limiting their use in biology and pharmacology. Here, high-frequency acoustic tweezers are presented as a solution to these drawbacks. Acoustic tweezers use superposition of surface acoustic waves to manipulate particles. Low-frequency acoustical tweezers have been successfully used before but were limited to the manipulation of samples in the centimeter range. High-frequency acoustic vortices, in the gigahertz range, aim to manipulate micrometer sized samples with forces equal to or greater than those produced during optical manipulation. Acoustic tweezers offer a non-damaging method of manipulation for light sensitive structures such as proteins. This poster explores the theoretical modeling of surface acoustic waves through the Bessel beam solution to the wave equation, and demonstrates the creation of an acoustic ferry wheel with a manipulable rotational speed through the superposition of two Bessel beams of opposite and variable frequencies. The Bessel beam approach is taken for its symmetry, ability to be manipulated for multiple waves, and for its accuracy in the representation of the vortex created at the center of an interdigital transducer array.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Searching for Pulsar Microlensing Candidates

Gravitational microlensing events, in which massive compact objects, such as black holes or neutron stars, distort the light from individual stars, can shed light on various astrophysical phenomena. These events can be modeled with a series of equations, which can be used to infer the mass of these objects, and is often characterized by a sudden change in brightness. It is theorized that one can use microlensing to determine the mass of pulsars, a type of rotation-powered neutron star, found in such situations. If successful, determining the mass of pulsars can aid in understanding the internal structure of neutron stars, which is dependent on parameters such as mass and radius. This project investigates various approaches in searching for pulsar microlensing events, primarily utilizing data from the Hubble Space Telescope. Three main methods were explored: examining observations within the coordinates of known pulsars for stars projected to be close enough for lensing to occur, examining observations of known pulsars and possible background stars located near the center of the Milky Way, and analyzing observational data of the center of the Milky Way for microlensing events involving previously undiscovered or "unseen" pulsars.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### High Resolution Microscopy Analysis of Amylin Trafficking in the Nucleus and Nucleolus of Pancreatic Beta Cells

Human islet amyloid polypeptide (hIAPP) is a regulatory protein cosecreted with insulin from pancreatic beta cells, which plays a complex role in glucose homeostasis. In patients with Type Two Diabetes Mellitus (TTDM), human amylin tends to aggregate, forming toxic plaques which cause a loss of pancreatic beta-cell mass. Because of its function as a hormone, hIAPP should be processed through a cell's biosynthetic compartments, endoplasmic reticulum, and golgi apparatus before being secreted into the blood. However, recent studies from our lab have uncovered an alternate trafficking pathway, where hIAPP is transported into the nucleus, and sometimes nucleolus, of cells. This portion of hIAPP's trafficking mechanism has yet to be elucidated. The purpose of this project is to investigate the novel role of the nucleus and nucleolus in amylin turnover in pancreatic beta-cells. This study presents preliminary data and proof of concept toward our long-term goal of understanding how and why amylin is trafficked into the nucleus and nucleolus, and what impact this may have in stressed beta-cells. To accomplish this, we treated human islet cells with one of four different chemicals to disrupt nuclear and nucleolar function and organization: RNA polymerase II inhibitor beta-amanitin, which disrupts nucleolar organization, RNA polymerase I inhibitor actinomycin D, which disrupts nucleolar organization, nuclear export inhibitor leptomycin-B, and nuclear import inhibitor ivermectin. We utilized various diabetes-mimicking treatments such as high glucose, thapsigargin, and tunicamycin to induce cellular and ER-stress in human islet cells to test amylin trafficking under pathophysiologically relevant conditions. We then stained for amylin, as well as for proteins that indicate nuclear/nucleolar organization (such as nucleolin) with fluorescent antibodies or dyes and viewed the cells under a fluorescent confocal microscope. This visually displays changes in protein localization and nuclear/nucleolar structure. Preliminary results supported previous findings from our lab showing amylin translocation into the nucleus and nucleolus of stressed, T2DM islet cells. Disrupting the nucleolar organization with RNA polymerase II inhibitor, alpha-amanitin, induced a significant reduction in amylin intracellular protein levels in non-diabetic islets, demonstrating that nucleolar organization is critical to proper amylin synthesis and trafficking. Elucidating the complete trafficking and cytotoxic mechanism of hIAPP could reveal potential druggable targets for the treatment of TTDM.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Examining the Spin-Crossover Temperature of Trispyrazolylborate Iron (II) Complexes using Density Functional Theory

Fe (II) and Fe (III) are the oxidation states of iron most commonly encountered in complexes. When surrounded by appropriate ligands, some of these metal centers, which have  $d^6$  or  $d^5$  electron configurations, present two distinct stable spin states and experience a spin conversion between those states, induced by external stimuli: temperature, pressure, or light. This phenomenon is called spin crossover, and the metal complexes are called spin crossover complexes. The two spin states are characterized by different numbers of unpaired electrons, colors, and bond lengths. In general, the low spin state is favored by ligands that are more  $\sigma$ -donating and  $\pi$ -accepting. As the low spin state becomes more stable, the transition temperature to the high spin state rises. In this work, we utilized computational chemistry, specifically density functional theory (DFT), to investigate the temperature dependence of the spin crossover of complexes involving Fe (II) as the metal cation and functionalized trispyrazolylborate ligands. To control the crossover, varying numbers of electron-withdrawing nitro groups and electron-donating amine groups were introduced at three different positions on the ligand backbone. Calculations were performed using Gaussian 16 on the high performance Pegasus cluster at GWU. Functionals and basis sets were selected by benchmarking a range of literature methods against experimental data acquired in our research group. Preliminary studies on functionalized pyrazoles indicate that substitution in position 4 has a markedly different impact on the molecular orbitals from HOMO -4 to LUMO +4 than substitution in positions 3 or 5. This is confirmed by calculating the enthalpy ( $\Delta H$ ) of protonation of those molecules as evidence of their relative donor character. Complexes with amino substituent groups have, as expected, the overall higher  $\Delta H$ , ranking in the order of 5-amino > 3-amino > 4-amino, while nitro-substituted rank in the following order: 3-nitro > 4-nitro > 5-nitro. Those results are only partially consistent with the experimental data on the full complexes, suggesting that steric effects combined with electronic effects determine spin-crossover properties and prompting us to run calculations on the whole complexes. In addition to investigating the enthalpy of spin crossover, UV-Vis absorption spectra were also calculated using time-dependent DFT for both spin states of each complex, confirming existing experimental results and predicting the colors for complexes that have not yet been synthesized experimentally.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### PIP, Pesticide Indirect Photodegradation Database, to Aid in Computational Design of Safer Pesticides

Pesticides persistence can adversely affect human and environmental health due to continuous exposure to these chemicals and subsequent bioaccumulation. Indirect photodegradation by excited chromophoric dissolved organic matter (CDOM) represents one of the major routes for abiotic breakdown of substrates based on amino arene, aryl ether and sulfide cores. To that end, one of the grand challenges of green chemistry is to develop a robust strategy for the design of agricultural products with controlled degradation metrics. Here, we showcase the development of PIP, Pesticide Indirect Photodegradation Database, used to collect all available experimental and our own calculated data for the redox reaction kinetics and thermodynamics between oxidizable pesticide cores and CDOM. The goal of this effort was to create an open-source, interactive platform to assist with transformation predictions of existing and with the development of new pesticides. Presently, PIP houses 121 CDOM/Pesticide pairs, 30 unique CDOMs, and 75 unique pesticides. Of these, the most-common CDOM cores are ketones/aldehydes and quinones; among pesticide, the most-represented are substituted phenols, phenylureas, aryl ethers, anilines, sulfides, and sulfonamides. The most abundant properties available for the CDOM-pesticide pairs are second-order rate constants for the quenching of triplet state CDOMs (available for 121 pairs), CDOM triplet-state energies (37 pairs), pesticide oxidation potentials (91 pairs), CDOM ground-state reduction potentials (26 pairs), and CDOM triplet-state reduction potentials (35 pairs). Computed properties include free energies of the CDOM-pesticide electron transfer and free energy barriers associated with the redox process, computed at the density functional level of theory. PIP also provides relevant physicochemical properties for both CDOMs and pesticides, focusing on energies of frontier molecular orbitals, which can be used to quickly approximate degradation kinetics and thermodynamics using built-in linear models. Structural patterns of the oxidizable cores involved in CDOM/pesticide redox reactions and corresponding properties associated with the photodegradation process can be mined within PIP using the SMARTS language to provide a better understanding of the structure-property relationships and to aid in design of new pesticide analogs.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Sleeping Around: Social and Ecological Determinants of Nesting Behavior

Sleep is a universal factor in the health of almost every animal on Earth and can affect development, cognition, hormone levels, and memory consolidation. In order to combat the negative effects of sleep deprivation and regulate their sleep, animals of different taxa evolved different ecological and behavioral adaptations that allow for deeper and longer sleep periods. Previous studies on both wild and captive chimpanzees exemplify the variety of sleeping adaptations that arise under differing non-social factors, such as how environmental elements affect site and tree selection. However, these existing studies ignore complex socio-ecological interactions, including food competition, infanticide, dominance rank, kinship, and outside factors that occur in and between chimpanzee communities.

In order to better understand sleeping adaptations in chimpanzees, a focus on the social and ecological determinants of sleeping site selection is necessary. Using focal follows from the pre-existing long-term dataset at Gombe National Park, Tanzania, this study seeks to understand the ways in which females maximize sleeping potential and reduce stress-levels while simultaneously navigating risky areas within the community range. Risky areas can be defined as areas of the range that are in close proximity to other groups of chimpanzees or to human settlement - otherwise known as border areas. We hypothesize that female chimpanzees will preferentially nest in core areas and with other individuals depending on the calculated "riskiness" of the site. Dominant individuals will have the lowest risk sleeping site selection, with core areas located in the center of the range and intrasexual infanticide risk reduced by sleeping alone. Low ranking females will inhabit core areas near border areas, making individuals increasingly at risk for between group aggressive events, and will nest with others (preferentially with kin to reduce infanticide risk) because there is safety in numbers. To find our results and analyze these stated factors, we will implement geographic information system (GIS) mapping and other statistical analyses to map core areas, sleeping sites, and risky areas, and then compare these to dominance rank and kinship data. This study is an ideal model for research on sleep adaptations and may provide evidence for the connection between sleep, gregariousness, and kinship in chimpanzees as well as exemplify the ways in which human intervention impacts the natural sleeping patterns of said primates.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Quantifying Sexually Dichromatic Facial Patterns and Asymmetry in Wild Red- Bellied Lemurs (*Eulemur Rubriventer*)

The importance of sexual selection in shaping color and pattern difference in males and females of a species was first described by Darwin, but continues to be of interest to biologists today. Much of the research in this area has been focused on birds (i.e. peacocks) but some mammals also exhibit such patterns of sexual dichromatism (i.e., males and females have different hair patterns and coloration).

A notable example is the white eye patches of red-bellied lemurs (*Eulemur rubriventer*). We hypothesize that by quantitatively measuring and comparing differences in certain aspects of the males' sexually dichromatic eye patches we may be able to assess male quality, and thus could be associated with male reproductive success. In collaboration with colleagues studying this species in the wild and past alumni, we developed a method to characterize and quantify variation in male lemurs' eye patch patterns via digital photography and imaging analyses using the program ImageJ. For this analysis, white eye patches of twenty-four males in a wild population of red-bellied lemurs across Ranomafana National Park were quantified by size, shape and symmetry. These males reside in different social groups, and offspring parentage has been genetically identified via microsatellite genotyping (N = 1-3 offspring per group).

Microsatellite-marker based paternity analysis was used to expand the sample size and determine which male is the father of each offspring. This involved extracting DNA from fecal samples already present in the GW Primate Genomics Lab. The extracted DNA was amplified by Polymerase Chain Reaction (PCR) to target and genotype seven highly variable segments of DNA (microsatellite markers) that are used for paternity analyses.

Since reproductive success among red-bellied lemurs appears to be variable in this population, we examined whether eye patch shape and size are associated with aspects of reproductive success. Our analyses indicate that the males with the highest reproductive success have the smallest eye patches. Analyzing patch symmetry showed there is a bias towards more symmetric features in the study population overall. However, there is not a glaring relationship between symmetry and shape. A preliminary analysis of pictures of the same individuals show there is no statistical significance in brightness that might have affected the integrity of the data, and showed this newly developed method of studying phenotypic traits is replicable with a form of accuracy.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Effect of Sublethal Doses of Dicamba on Honeybee Cognition

Following the widespread weed resistance to glyphosate-based herbicides, farmers have begun to more heavily depend on alternative herbicides, such as dicamba, as substitutes for weed control. Despite extensive studies detailing the effects of pesticide exposure on the neurological functions of honeybees, no research has been conducted to investigate the effects of modern formulations of dicamba on the cognitive health of honeybees. This experiment tested the effect of sublethal doses of dicamba pesticide on the cognitive and neurological health of *Apis mellifera* honeybees. The procedure involved the classical conditioning of the Proboscis Extension Response (PER) to the exposure of lemongrass. After conditioning the honeybees and feeding them either sugar water (control) or sublethal doses of dicamba (treatment), the honeybees' cognitive functions were evaluated by noting their retention of the PER upon exposure to the scent of lemongrass.

Preliminary results supported the prediction that honeybees exposed to sublethal levels of dicamba would fail to display retention of the PER. A chi-square analysis revealed that significantly more control honeybees retained the PER than experimental honeybees ( $\chi^2 = 94.566$ ;  $p < 0.001$ ).

Furthermore, a t-test analysis revealed that the failure ratio (number of total bees conditioned / number of bees with PER observed) of the control group was significantly less than that of the experimental group ( $p < 0.001$ ). Taken together, these results not only suggest that retention of the PER is affected by exposure to dicamba but also may signify that exposure to dicamba impairs the cognitive health and associative learning capabilities of honeybees. Thus, the results of this experiment have implications for future research into the direct contribution of dicamba exposure on the prevalence of Colony Collapse Disorder in honeybee colonies and for future modifications of the EPA's pesticide risk assessment process to include evaluations of the non-lethal consequences of pesticides on non-target organisms.

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RESEARCH SHOWCASE

# NATURAL SCIENCES AND MATHEMATICS

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Machine Learning Reveals Machinery of Online Misinformation Surrounding Vaccines

Online misinformation about vaccines is one of society's most pressing issues and it is imperative to understand the underlying mechanics of how it spreads. However, it is particularly difficult to analyze how anti-vaccine narratives move among different online groups because of the huge volume of new material created daily. This high volume of content makes it almost impossible for humans to effectively moderate online misinformation.

Here we use machine learning to help analyze the spread of these narratives. Specifically, we use an unsupervised algorithm called Latent Dirichlet Allocation (LDA) to capture the emergence and evolution of topics. These "topics" are bundles of words which are used together across multiple posts. LDA finds topics with minimal human input, allowing it to efficiently handle large volumes of data from social media. Our approach identifies topics in posts with a high coherence, meaning the word groupings have a high "goodness of fit." This LDA analysis technique could be generalized to yield real-time monitoring across multiple platforms.

In this study, we ran the LDA algorithm over a set of posts taken from anti-vaccination and pro-vaccination Facebook groups discussing COVID-19 during two different time frames and made two important discoveries: (1) there are more conversation topics in anti-vaccination groups than pro-vaccination groups and (2) pro-vaccination groups tend to focus in on many fewer topics than their anti-vaccine counterparts. These results suggest that anti-vaccination groups can appeal to a broader array of interests to more effectively recruit new members.

Additionally, we zeroed in on anti-vaccination groups using Dynamic LDA (which tracks topic change over time) during the first six months of 2020. We discovered that a Dynamic LDA model can effectively track the rise of conversation topics surrounding politics and stay-at-home orders by analyzing the change in individual coherence scores. Because of its ability to create useful models of large quantities of data from social media, this machine learning is a powerful aid in managing online misinformation.

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RESEARCH SHOWCASE

# NEUROSCIENCE

## CHILDREN'S NATIONAL MEDICAL CENTER

### Prenatal Maternal Stress Exposure and Variations in Cerebellar Volume

Intrauterine developmental programming, the period of cued fetal acclimation to the environment, underlines a well theorized prenatal event; however, the mechanisms underlying neurodevelopmental delays in utero due to maternal stress have yet to be fully elucidated. Maternal psychological distress has, for many years, been presented in the literature relative to the postpartum period. Only within the last few decades have the stages of pregnancy received analyses comparable to the postnatal experience regarding maternal stress, anxiety, and depression. We employed robust resting-state fMRI technique, innovative deep learning algorithm, and defined psychometric instrumentation with the aim of elucidating conceivable association between prenatal distress in pregnant women sans pre-existing medical conditions with cerebellar morphological change of the offspring. Our results indicated a dose response relationship, the percent cerebellar volumetric change from MRI at two time points showed negative correlation between the number of psychological distress signatures expressed by the mother during middle-to late gestation.

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RESEARCH SHOWCASE

# NEUROSCIENCE

## INSTITUTE FOR BIOMEDICAL SCIENCES

### An Obligatory Forebrain-Hypothalamic ER Stress Driven Circuit Mediates Hepatic Steatosis During Obesity

Non-alcoholic fatty liver disease (NAFLD) affects 1 in 3 American adults and encompasses a spectrum of steatogenic liver disorders that lead to an increased risk for obesity-related mortality. While most investigations have taken a liver-centric perspective, our recent findings indicate that alterations in the subfornical organ (SFO), a forebrain sensory circumventricular region, mediates hepatic steatosis during obesity. Importantly, the SFO has dense excitatory projections to the paraventricular nucleus of the hypothalamus (PVN), an integrative nucleus that plays a critical role in autonomic and endocrine control. Thus, we hypothesized that this forebrain-hypothalamic circuit mediates NAFLD. We employed a chemogenetic intersectional viral targeting strategy to constitutively excite or inhibit neurons that project from the SFO to the PVN (SFO-PVN neurons). Short-term chemogenetic silencing of SFO-PVN neurons in high fat diet (HFD) fed obese male mice drastically reduced hepatic steatosis (Oil Red O percent area:  $11.91 \pm 2.2$  vs  $3.3 \pm 1.0$ , HFD saline vs. HFD CNO,  $p < 0.05$ ,  $n=6-8$ ). We have previously shown that brain endoplasmic reticulum (ER) stress is obligatory for NAFLD. We next reasoned that excitatory signaling from the SFO drives ER stress in the PVN. We first developed a novel large-field-of-view scanning electron microscopy technique to evaluate ER ultrastructure in a large number of PVN neuronal soma of HFD and normal chow fed mice ( $n=4$ /group). Blinded analysis revealed that 100% of PVN neurons in HFD animals demonstrated clear evidence of ER stress (113/113 neurons), whereas ER ultrastructure alterations were much less evident and/or mild in PVN neurons of normal chow mice (42/80 neurons). Moreover, gene expression of unfolded protein response (UPR) markers (e.g. CHOP, XBP1s) in micropunches of the PVN indicated marked UPR activation in response to HFD feeding. Interestingly, chemogenetic inhibition of SFO→PVN neurons in obese mice resulted in a marked decrease in PVN UPR activation back toward normal chow levels (e.g.  $49.9 \pm 1.5$  PDI positive cells/section, HFD CNO,  $p < 0.05$  vs. HFD saline,  $n=4$ ). Lastly, a viral construct that allows for ER targeted overexpression of 78-kDa glucose-regulated protein (AdGRP78), a key ER chaperone, was selectively targeted to the PVN of obese male mice. Relative to control animals (AdLacZ), upregulation of PVN GRP78 resulted in a clear and consistent reduction in hepatic steatosis (Oil Red O percent area:  $15.7 \pm 2.6$  vs  $6.7 \pm 1.3$ , AdLacZ vs AdGRP78,  $p < 0.05$ ,  $n=4$ ). Collectively, these findings characterize a previously unrecognized forebrain-hypothalamic-ER stress circuit that is involved in hepatic steatosis, which may point to future therapeutic strategies for NAFLD.

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RESEARCH SHOWCASE

# NEUROSCIENCE

## INSTITUTE FOR BIOMEDICAL SCIENCES

### B Cell Depletion Reduces Glial Reactivity in an Animal Model of Multiple Sclerosis

Multiple sclerosis (MS) is an autoimmune, demyelinating disease of the central nervous system (CNS), characterized by myelin damage, infiltration of peripheral immune cells and severe functional deficits. Antibody-mediated peripheral B cell depletion therapies have been shown to significantly reduce the volume of MS lesions and formation of new lesions, suggesting a pathogenic role for B cells in MS. However, long-term systemic B cell depletion can severely immunocompromise the patient, and a better understanding of how B cells contribute to neurological dysfunction in MS is needed. In the current study, we aim to define the pathogenic role of both peripheral and CNS infiltrating B cells in MS by spatial depletion of B cells. For peripheral B cell studies, we used a combination of anti-CD19 and anti-B220 to deplete peripheral B cells in mice induced with experimental autoimmune encephalomyelitis (EAE), an animal model for MS. For CNS B cell studies, we utilized an inducible caspase 9 (iCP9) mouse with a CD19 promoter to selectively ablate CNS infiltrating B cells in EAE mice. We report that peripheral B cell depletion reduced splenic and circulating B cells, and iCP9 activation in CNS CD19+ B cells selectively ablated CNS B cells with no effect on the peripheral B cell population. Elimination of peripheral B cells reduced Iba1+ microglial and GFAP+ astrocyte reactivity as shown by morphological changes and decreased expression of neurotoxic factors. Similarly, CNS specific B cells reduced glial reactivity, which was associated with reduced myelin and axonal damage and functional impairment compared to control EAE animals. To determine if EAE B cells directly contribute to increased CNS glial cell reactivity, B cells were isolated from EAE animals and co-cultured with spinal cord glial cells. Glial cells stimulated with EAE B cells showed increased astrocyte and microglia reactivity compared to cells co-cultured with healthy B cells. This was associated with oligodendrocyte death and disrupted myelin sheaths. Our data suggest that pathogenic B cells in EAE invade the CNS and contribute to glial reactivity and myelin damage and as such provide novel insight into the underlying mechanism of MS pathology.

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RESEARCH SHOWCASE

# NEUROSCIENCE

## INSTITUTE FOR BIOMEDICAL SCIENCES

### HIV-1 Nef Disrupts Oligodendrocyte Morphology and Myelin Integrity in the Central Nervous System

HIV-associated neurocognitive disorder (HAND) is a spectrum of cognitive impairments that remain a common consequence of HIV infection. While the advent of combined antiretroviral therapy (cART) has substantially reduced the most severe forms of HAND, milder forms continue to affect 30-50% of HIV-positive individuals. Clinical and experimental studies have implicated preferential white matter damage in HAND pathogenesis, but the mechanisms underlying HIV-associated demyelination remain unknown. Our lab has previously shown that the HIV-1 negative factor (Nef) protein is secreted from cells in extracellular vesicles (EVs) and impairs cholesterol efflux from macrophages in the periphery by downregulating and inactivating a critical cholesterol transporter, ATP-binding cassette A1 (ABCA1). Since oligodendrocytes require cholesterol for the synthesis, formation, and potentially the maintenance of myelin sheaths in the central nervous system (CNS), the current study examined the effects of Nef EVs on oligodendrocyte morphology and myelin structure as well as ABCA1 expression in the CNS. EVs carrying recombinant Nef were produced by transfected HEK293T cells and applied to mouse spinal cords *in vivo*, mouse cerebellar slice cultures *ex vivo*, and mixed mouse cortical cultures *in vitro*. EVs produced by cells transfected with an empty vector served as control. Immunohistochemical analysis of Nef EV-injected spinal cord white matter from adult mice showed decreased myelin basic protein (MBP) immunoreactivity consistent with myelin lesions that were not observed in controls. Nef-treated cerebellar slice cultures also showed decreased myelin along cerebellar axons, indicated by decreased ratio of MBP to MBP + medium chain neurofilament (NFM) immunoreactivity. Furthermore, treatment with Nef EVs resulted in morphological disruptions of mature oligodendrocytes and decreased ABCA1 protein expression *in vitro*; the morphological disruptions were attenuated by pretreating cultures with AMS-55, an inhibitor of the Nef-Calnexin interaction. Together, these data suggest that Nef perturbs myelin integrity in the CNS, impairs mature oligodendrocytes, and alters ABCA1 expression in cortical cells. Further work will examine the role of Nef-mediated myelin impairment in HIV-associated cognitive deficits.

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RESEARCH SHOWCASE

# NEUROSCIENCE

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Refinement of Optic Nerve Function and Myelination during Postnatal Development

Retinal ganglion cells generate a pattern of action potentials to communicate visual information. Myelin, an insulating sheath, facilitates signal propagation by wrapping axons and, when deficient (as observed in optic neuritis), can cause significant visual deficits. However, the relationship between optic nerve function and the extent of myelination is currently unknown. We tested if myelination patterns are correlated with changes in optic nerve function during postnatal development using extracellular nerve recordings, immunohistochemistry, western blot, and scanning electron microscopy. Comparing compound action potentials from C57Bl6 mice across ages 4-12 wks revealed an increase in the number of functional axons and shifts toward more fast-conducting axon populations at 5 and 8 wks ( $p < 0.05$ ,  $n=8$ ). At these ages, nerve assessments suggest increases in myelin and neurofilament protein concentrations ( $n=2$ ) and lower g-ratios ( $n > 2$ ). Increased expression of a mature sodium ion channel (Nav 1.6) at nodes of Ranvier was observed at 6 wks ( $p < 0.05$ ,  $n=3$ ), while axon diameter, axon density, and nodal density remained unchanged across ages. Changes in the normal optic nerve to favor faster axonal conduction correlate with additional myelin proteins, thicker myelin around axons, and node maturity, suggesting that these properties are critical in the refinement of optic nerve signaling during postnatal maturation.

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# NEUROSCIENCE

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Brain Cellular Senescence as a Potential Mediator of Angiotensin II-Induced Hypertension

Hypertension affects 1 in 3 US adults and is a leading risk factor for heart attack and stroke. The hormone angiotensin II (Ang II) is a well-recognized driver of hypertension through its sympathoexcitatory actions within the central nervous system (CNS). Although a number of pro-hypertensive CNS mechanisms have been elucidated, how these mechanisms translate into long-term alterations in CNS circuits remains unclear. Importantly, stress-associated pathways can culminate in cellular senescence and the senescence-associated secretory phenotype (SASP). Chronic senescence/SASP leads to changes in cell metabolism, macromolecule damage, and a pro-inflammatory environment. Thus, we hypothesized that CNS cellular senescence may be a key contributor to hypertension. We first performed a proof-of-principle experiment to determine if CNS cellular senescence is involved in blood pressure regulation. C57Bl/6J male mice were fitted with intracerebroventricular (ICV) cannulas and implanted with radiotelemeters for conscious recording of cardiovascular parameters. Following surgical recovery, the senescence inducing agent doxorubicin (0.00125 mg) or vehicle control was administered daily for three days ( $n=3/\text{group}$ ). Daily ICV administration of doxorubicin induced marked elevations in mean arterial blood pressure within 48 hours that were sustained throughout the study (72 hours:  $107\pm 1$  vs.  $123\pm 1$  mmHg; ICV vehicle vs. doxorubicin,  $p<0.05$ ). Relative to controls, ganglionic blockade elicited a greater fall in blood pressure in doxorubicin-treated animals ( $\Delta-11\pm 4$  vs.  $\Delta-56\pm 6$  mmHg; ICV vehicle vs. doxorubicin,  $p<0.05$ ). Given these findings that CNS cellular senescence is associated with a hypertensive phenotype, we next profiled senescence in key nuclei during hypertension development. Male C57Bl/6J mice were implanted with subcutaneous osmotic minipumps for Ang II infusion (600 ng/kg/min). Brains were collected at baseline and after 14 days of Ang II infusion ( $n=4-5/\text{group}$ ) and micropunches of cardiovascular/autonomic nuclei including the organum vasculosum lamina terminalis (OVLT), subfornical organ (SFO), and paraventricular nucleus of the hypothalamus (PVN) were collected. Two-week administration of Ang II resulted in a robust increase in the key senescent gene p16 (CDKN2A) in the SFO ( $6.1\pm 0.8$  fold baseline,  $p<0.05$ ). Interestingly, Ang II-induced hypertension was not associated with changes in p16 in the OVLT ( $2.2\pm 0.7$  fold baseline,  $p=0.2$ ) and PVN ( $1.5\pm 0.4$  fold baseline,  $p=0.4$ ). Additionally, Ang II-induced senescence in the SFO was paralleled by the upregulation of SASP indicators (e.g. Interleukin-1 $\alpha$ :  $6.5\pm 1.4$  fold baseline,  $p<0.05$ ). These findings indicate that: 1) CNS cellular senescence is pro-hypertensive; and 2) Ang II elicits cellular senescence/SASP in the SFO. Collectively, our data may point to brain cellular senescence as a novel mediator of hypertension.

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RESEARCH SHOWCASE

# NEUROSCIENCE

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Malignant Pineal Parenchymal Tumors in Adults: A National Cancer Database Analysis

#### Objective:

In the absence of randomized trials for adult pineal parenchymal tumors (PPT), we use a national database to evaluate treatment trends and the survival impact of surgery, radiation, and chemotherapy.

#### Methods:

The National Cancer Database was queried for adult patients with histologically confirmed PPT diagnosed from 2004 to 2016. Univariate and multivariate Cox regressions were used to evaluate the prognostic impact of covariates. Kaplan-Meier survival curves were generated for comparative subanalyses.

#### Results:

A total of 202 patients met inclusion criteria. A plurality of pineoblastoma (PB) patients were treated with trimodal therapy (43.6%, 24/55). Pineal parenchymal tumor of intermediate differentiation (PPTID) patients were most commonly treated with either surgery alone (35.1%, 47/134) or with surgery and radiation (32.8%, 44/134). Factors associated with improved overall survival on multivariable analysis included younger patient age, female sex, lower comorbidity score, receipt of surgery, and receipt of radiation (each  $p < .05$ ). Receipt of chemotherapy is not associated with survival. Subanalyses revealed that the effect of radiation on survival is most prominent in PB patients and in PPTID patients who had not received surgery. No survival benefit of adjuvant radiation is demonstrated in surgically treated PPTID patients.

#### Conclusions:

Currently, there is a paucity of data regarding treatment outcomes for adult PPT tumors, and this is the largest study to date.<sup>1,2</sup> While radiotherapy and surgery were found to increase survival in all PPT patients, there was no survival benefit of adjuvant radiation in surgically treated PPTID. This suggests overtreatment of many PPTID adult patients with radiotherapy.

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RESEARCH SHOWCASE

# OBESITY

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Addressing Obesity in the Pediatric Primary Care Clinic: A Mixed-Methods Study

**Background:** Obesity is a chronic multifactorial disease with lower socioeconomic status populations facing an increased burden of disease. Most pediatric clinical strategies thus far have focused on combined efforts of meeting the needs of patients and families through early outreach in the areas of nutrition, physical activity, and behavior modification. However, without addressing the sociocultural determinants of obesity, these efforts will continue to be limited in their effectiveness and implementation.

**Objective:** The main objective of this study was to examine local primary care pediatric clinician's current management practices of patients with obesity.

**Methods/Design:** A mixed methods study was conducted. Our methodology involved distributing a survey through the Children's National Health Network (CNHN) to a subgroup of 380 pediatric providers in Washington, DC and its surrounding metropolitan area. Three focus groups were conducted with a subgroup of primary care clinicians in Washington, DC to further explore behaviors and barriers to addressing obesity in the primary care clinic.

**Results/Discussion:** Preliminary results indicate that 82 pediatric clinicians completed the qualitative survey and each focus group ranged between 4-10 clinicians. 6 themes emerged regarding clinician barriers including time, clinician perceived familial resistance, cultural competency, environment, lack of team support, and resource knowledge. The majority (53%) of clinicians indicated that they were unaware of community resources to effectively address weight management. And the majority (>60%) indicated that additional obesity related training would be very or somewhat helpful. The AAP published its last set of clinical guidelines for pediatric obesity management in 2007, followed by multiple recommendations for care. Clinicians continue to request more robust protocols and linkages to resources to better address obesity more effectively in their primary care settings.

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# PREVENTION AND COMMUNITY HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Anti-E-Cigarette Industry Sentiments and Associations of Use Among Youth and Young Adults in The United States

Background: Anti-tobacco industry sentiments are protective against smoking, but the relationship between industry sentiments and e-cigarette use remains unknown.

Methods: A nationally representative sample of U.S. youth and young adults were surveyed in Fall 2019 (n=9554). Surveys measured beliefs about whether e-cigarette and cigarette companies are the same, and agreement with the statements (1) e-cigarette companies lie about harm, and (2) tobacco companies want young people to vape. Separate weighted multivariate logistic regression models estimated odds of current use and intentions to use (among non-users) by each industry perception. Models controlled for harm perceptions, friend/household use, sensation seeking, ever e-cigarette use, combustible use, and demographic characteristics. Models were then stratified by harm perceptions and friend/household use.

Results: Disagreement that companies lie about harm and tobacco companies want young people to vape increased odds of current use (adjusted odds ratio (aOR)=2.07, 95% confidence interval (CI): 1.54-2.79; aOR=1.90, 95% CI: 1.51-2.40, respectively) and intention to use (aOR=3.92, 95% CI: 2.23-6.88; aOR=2.22, 95% CI: 1.47-3.35, respectively). Belief that e-cigarette and cigarette companies were different entities increased odds of current use (aOR=1.42, 95% CI: 1.10-1.84) and intentions to use (aOR=1.89, 95% CI: 1.19-3.01) compared to belief that companies were the same. Effects were significant among those with low harm perceptions and friend/household e-cigarette use.

Conclusion: Positive e-cigarette industry sentiments were associated with both current use and intentions to use. Changing industry sentiments may be an important factor in the effort to prevent youth and young adult e-cigarette use, particularly among those more susceptible.

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## RESEARCH SHOWCASE

# PREVENTION AND COMMUNITY HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### The Effect of a Written Prescription on Physical Activity: A Systematic Review of New Zealand's Green Prescription

The Green Prescription (GRx) is a primary care initiative of New Zealand that treats the prescription of physical activity in the same way as the prescription of a pharmaceutical treatment. The program involves written advice from a health professional, referral to trained support personnel, and monthly contact to improve the patient's physical activity.

Although the program has existed since 1998, no review of effectivity has been conducted. The aim of this review was to collect all of the studies published on the Green Prescription and determine if it had the intended result of significantly increasing physical activity over time.

The Navigation Guide methodology was used to conduct a systematic review on the association between New Zealand's Green Prescription and physical activity. A comprehensive and replicable search strategy was used to search the databases PubMed, SCOPUS, CINHAL, SPORTdiscuss, Web of Science, and Cochrane Library. Inclusion criteria reflected the PICO statement:

Population: Adults in New Zealand

Intervention: Green Prescription (GRx)

Comparator: Control Group or Before/After GRx

Outcome: Physical Activity

Individual studies were assessed for risk of bias in areas of recruitment, blinding, exposure assessment, outcome assessment, confounding, incomplete outcome data, selective outcome reporting, and conflict of interest. The overall quality of the body of evidence was then determined based on the systematic rating of preselected upgrading and downgrading factors. Finally, the overall strength of the evidence and association were determined.

The search resulted in 105 unique studies, 8 of which met the inclusion criteria. The risk of bias across studies was "low" and the overall quality of evidence was given a "moderate" rating due to high consistency and precision, but lack of magnitude. Among New Zealand adults that received GRx, the reported results showed an average of 34 to 64 more minutes/week of physical activity than control groups.

Based on analysis and interpretation of the evidence, it was concluded that the current body of evidence is "limited" as future studies may change the magnitude of the association. However, further studies are unlikely to change the direction of the effect and a positive association is seen between the Green Prescription program and physical activity. As chronic disease rates continue to climb in New Zealand and worldwide, effective and low-cost interventions like the Green Prescription have important public health implications. If prescribed to a significant proportion of the population, this program could lead to substantial decreases in adverse health outcomes related to physical inactivity.

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RESEARCH SHOWCASE

# PREVENTION AND COMMUNITY HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Impact of Tobacco Use on COVID-19 Outcomes: A Systematic Review

Tobacco smoking is a known risk factor for contracting respiratory infections. In the context of the COVID-19 pandemic, it is important to understand the impact of smoking tobacco on COVID-19 outcomes, including severe illness, hospitalizations, and mortality, in order to implement effective medical response and public health policy. A search of PubMed, LitCovid, Scopus, and Europe PMC (for pre-prints) conducted on February 20, 2021, included search terms focused on COVID-19, tobacco, and outcomes. Findings indicated that those with a history of smoking tobacco (compared to never-smokers) were at increased risk for developing severe infections and for experiencing pulmonary embolisms and stroke, which increase likelihood of mortality. In light of these serious risks, public health policies such as prioritizing tobacco smokers in vaccine campaigns may reduce the burden of hospitalizations and deaths due to COVID-19.

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RESEARCH SHOWCASE

# PREVENTION AND COMMUNITY HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Systematic Observation of Mask Adherence and Social Distancing in Northern Virginia Fitness Center

SARS-CoV-2 is now one of the deadliest pandemics in history, with approximately 2.46 million deaths worldwide as of February 22nd, 2021. According to the World Health Organization, COVID-19 is an infectious disease that is spread through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. In the United States mitigation and prevention guidelines and restrictions related to COVID-19 are set by local and state governments. Currently the state of Virginia has a stay-at-home order between the hours of 12:00am and 5:00am with some exceptions; all public and private gathering be limited to 10 people; and wearing a face covering indoors and outdoors is required except when an individual is exercising or using exercise equipment (indoor or outdoor is not defined). Individual businesses and areas can also require mask wearing and social distancing based on preference of the owner, even if the law does not require. The Onelife Fitness gyms in Northern Virginia and Maryland require masks to be worn at all times while exercising in the gym, whereas others highly recommend mask wearing but members are not required to keep them on during exercise. The Systematic Observation of Mask Adherence and Distancing, or SOMAD, was launched by the Kaiser Permanente and the RAND Corporation to help find out more about adherence to mask-wearing and physical distancing behaviors. The GW SOMAD team is collecting observational data in the D.C. region, including at the Onelife fitness gym. Observational data over a four-month period is recorded at the same time once during the week and once on the weekend via a google form on a mobile device/smart phone. Results from observations at Onelife gym will include percent of individuals wearing masks correctly/incorrectly; physical distancing; and will be stratified by gender and other demographics.

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## RESEARCH SHOWCASE

# PREVENTION AND COMMUNITY HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Innovative Approaches to Creating a Public Health System Dynamics Model in Mesa, CO

#### Background

Public Health 3.0 centers local health departments (LHDs) at the core of creating impactful change through intentional cross-sectoral collaborations that would address upstream factors affecting the public's health. The Center for Community Resilience at the George Washington University developed the Resilience Catalyst (RC) program, which is being used to guide Public Health 3.0 implementation in Mesa, Colorado, one of nine RC sites. The RC program takes a participatory approach to identify an adversity focus area, the systems associated with it, and determine an implementation plan for working with community partners. A key component to the RC program is using system dynamics modeling to inform strategies for community action and policy change.

#### Methods

To understand the community context of Mesa, we conducted key informant interviews (KIIs), theory of change sessions, a group model building (GMB) session, and data analysis. During the GMB, we worked directly with community stakeholders to identify relationships between key variables, such as housing cost and access to health care, in causal loop diagrams (CLDs). We then used KII data, secondary quantitative data, and peer-reviewed literature to develop stock and flow models and equations to numerically describe the relationships between variables. To validate the structure and equations, we compared the model to historical data. Designing stock and flow structures requires a detail-oriented, iterative approach to ensure the model is useful for each community.

#### Results

We constructed a model to reflect the complex system in Mesa with 186 variables, comprising 26 unique stock and flow structures. The model went through an even more thorough iterative process than anticipated. The educational attainment variable, in particular, started with three stocks, but evolved to six stocks in total. The stocks also changed in composition, grouping educational categories differently and utilizing conveyor stock types to model processes where people are considered part of a population for a given length of time before moving into the next flow.

#### Discussion

The educational attainment stock and flow structure contained several key decision points such as the use of conveyor stocks and grouping of education levels. For each decision, potential limitations were considered. For example, setting four years as the standard for graduation means not accounting for students who needed five years to graduate, making the model less accurate. Next iterations of the models will include additional arrayed variables to highlight inequities, improved equation sophistication, and incorporation of COVID-19 effects.

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RESEARCH SHOWCASE

# PREVENTION AND COMMUNITY HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### The Association of Adverse Childhood Experiences and Long-term Health Outcomes within Veteran Populations

Adverse Childhood Experiences (ACEs) are traumatic events that occur during childhood. These experiences are categorized as events that distressing and increase the incidence of toxic stress during the critical window of development that occurs during childhood. Witnessing violence, experiencing physical, mental, and/or sexual abuse, and having parental figure/caretaker who experiences mental health problems or substance abuse issues are examples of what would classify as an adverse childhood experience. Previous research has determined that there is significant correlation between experiencing multiple ACEs during childhood/adolescence and negative health outcomes throughout adulthood. While a multitude of studies have examined ACEs from a life course perspective to determine how they impact physical, mental, and social functioning, there is a lack of research that examines the prevalence of ACEs among veteran populations and if a greater exposure to adverse experiences will lead to more negative long-term outcomes among this group. Studies have found that for every ACEs an individual is exposed to, there is an increased risk for suicide. Veteran populations tend to experience lower life expectancies and tend to commit suicide at significantly higher rates when compared to the general population. Therefore, it is of utmost importance to explore factors that may contribute to these health disparities within veteran populations. The Behavioral Risk Factor Surveillance System (BRFSS) is a survey developed by the CDC to collect data from individuals within the United States on their behavioral risk factors, chronic conditions, and preventative health service engagement. Using BRFSS data collected during the 2019 survey, I will analyze this data to determine if there is evidence that veterans are exposed to ACEs at a higher rate than non-veterans and examine if there is correlation between ACE exposure and an increased likelihood of negative physical and mental long term health outcomes. Preliminary results indicate that veterans tend to experience childhood physical abuse at slightly higher rates than non-veterans, which may support my hypothesis that veterans' populations will be exposed to more adverse experiences in childhood than non-veterans. By exploring how prevalent ACE exposure is within the veteran population and how ACEs subsequently impact physical and mental health outcomes over the life course, we will be able to have an increased understanding on how to design an intervention to address health disparities with the veteran population.

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RESEARCH SHOWCASE

# PREVENTION AND COMMUNITY HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Mask Wearing and Social Distancing Adherence in the US

Mask wearing and social distancing is an effective protocol in reducing the spread of COVID-19; however, mask-wearing and social distancing measures are not uniform across the United States. To understand the demographics of mask wearers and those who don't wear masks, and the association of legislative mandates on public mask-wearing behavior, individuals in public spaces in Washington DC, Springfield, Illinois, and Lawrenceville Georgia were observed (n= 12,047 currently in progress) during the months of November to May. Public locations were picked based on whether people have the potential to interact and socially distance with others.

Observational methodology was used to document adherence to correct mask usage and physical distancing. Additionally, observations were collected at the same location during the same time of day on week and weekend days in order to document behavioral trends.

Purpose: This research is meant to critically examine and compare the adherences to mask wearing and social distancing in various cities across the United States to better understand the public response to the COVID-19 pandemic and to measure the degree to which the public adheres to their respective mandates.

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RESEARCH SHOWCASE

# PREVENTION AND COMMUNITY HEALTH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Facilitating Aging in Place and Community by Empowering Participation in Society: A Mixed Methods Study on the Co-Development of a Theory of Change with Suburban-Dwelling Older Adults

Background: Older adults in moderate income suburban communities are at high risk for institutionalization should their health or finances decline as the access to their wealth is within the home in which they dwell. Often, they liquidate their assets in order to access additional support. This demeaning process negates the vision of aging in place. Aging in place services are not only preferred by older adults, but they also are shown to be a more cost-effective solution to institutionalization. Communities have recognized the need for action planning to support the needs of older adults to age in place; however, plans often lack empirical evidence, they leave out older adults, and the planning process takes a top-down approach.

Objective: In order to meaningfully participate, it is imperative that communities develop action plans that capture the voice of older adults. Through the development of a theory of change, older adults of varied ability levels can meaningfully participate in society. The purpose of this study is three pronged at a micro, meso, and macro level. At the micro level the goal is to assess the relationship of participation in society with a) individual characteristics of community-dwelling older adults and b) environmental characteristics in suburban communities. At the meso level the goal is to: a) garner a deep understanding of participant perceived barriers and facilitators and b) elicit suggestions for addressing them in order to c) inform a focused situation analysis and theory of change. At the macro level, the goal is to understand fidelitous empowerment procedures of participation in society through person-centered community action planning. In order to develop community action plans that shape policy and facilitate meaningful participation, local communities must first begin to develop an evidence-based understanding of strategies for engaging older adults in the plan development processes.

Methods: Guided by the Consolidated Framework for Implementation this study aims to advance research on aging through engagement of older adults in the theory of change process. Presently in the data collection phase, this explanatory sequential mixed methods study samples older adults from three suburban communities through a telephonic survey and interview to examine how participation in society is related to community features and individual characteristics. The use of a theory of change can allow for customizable, theory-driven, and evidence-based approaches for strategies to engage and empower older adults to participate in the development of community action plans.

Results: Pending

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## RESEARCH SHOWCASE

# PREVENTION AND COMMUNITY HEALTH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Barriers to Infant Preventative Care During the COVID-19 Pandemic

**Background:** Preventative care visits, declared essential by government entities, hospitals, and professional organizations, decreased during the COVID-19 pandemic putting infants at risk of poor health outcomes. Parental reasons for visit decline have not been formally studied, especially among those who are disproportionately impacted by COVID-19.

**Objectives:** Understand barriers to infant preventative care during the COVID-19 pandemic.

**Methods:** Retrospective EMR chart review of three academic outpatient centers in Washington, DC identified patients who missed a 2, 4, 6, or 12-month preventative visit by at least 1 month between March 16th, when the shut-down of nonessential services in DC began, and September 30, 2020. Respondents who verbally consented completed a telephone survey in English or Spanish. The survey included self-reporting of primary mode of transportation to the clinic, nine closed-ended (yes or no) questions, and an opportunity for one open-ended response. Demographic information was collected via the EMR. No financial incentives were provided. Appointments were made by the study team when necessary and requested.

**Results:** 347 patients met all inclusion criteria. A total of 66 parents participated in the survey with 177 parents eligible but not reached and 104 parents who declined participation. Respondents and non-respondents did not differ by insurance type, race/ethnicity, or difference in age of visit missed; respondents primarily represented Black/African American parents (87.9%) with public insurance (87.9%) and primary care providers in under-resourced neighborhoods. The most common responses were concern about exposure to COVID-19 during the clinic visit (74.2%) and belief that well visits were not exempt from the government stay-at-home order (60.6%). Concern for exposure during travel to the visit (42.4%) and lack of childcare for other children (36.4%) were cited. Insurance lapse was not a frequent response (10.6%).

**Conclusions:** The leading concern from parents was exposure to COVID-19. The eligible respondents were overwhelmingly representative of a community with higher burden of disease which may have increased perception of risk. Inconsistent messaging about types of services available contributed to decline in preventative visit compliance. To many respondents, it was not clear that non-emergency medical offices were an essential business. Improved communication between parents and the providers of medical services is important to improve compliance with well visits. Results, although limited by small sample size, volunteer bias, and recall bias, show that addressing real and perceived threats of COVID-19 infection and clarifying recommendations from trusted institutions are necessary to avoid future gaps in care, especially for communities with disproportionate COVID-19 disease burden.

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RESEARCH SHOWCASE

# PREVENTION AND COMMUNITY HEALTH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Exploring the Lived Experiences of Pediatric Primary Care Clinicians in a Novel Produce Prescription Food Insecurity Intervention

**Background:** Food insecurity (FI) is a pervasive toxic stress that became a regular part of the pediatric clinicians lexicon after a groundbreaking 2015 AAP policy statement. Since then, varying strategies have incorporated screening/intervention protocols into primary care. Produce prescription strategies incorporate clinical/community collaboratives to better address FI. Limited data exists on the lived experience of clinicians in these programs.

**Objective:** The main objective of this study was to explore the experiences of clinicians who enrolled patients in a produce prescription program in a pediatric primary care setting in Washington, DC.

**Methods/Design:** Pediatric primary care clinicians at an urban pediatric primary care clinic in Washington, DC identified and enrolled food insecure families into a produce prescription food delivery program which delivered a box of fresh produce to families every other week for 8 weeks. One year after completion of the program, clinicians were contacted to explore their lived experiences through a qualitative interview.

Qualitative interviews were coded using thematic content analysis.

**Results/Discussion:** Twelve clinicians completed the qualitative interviews. Five preliminary themes were generated including clinician gained knowledge, changes in screening practices, deeper relationships with patients and families, enhanced awareness of familial experiences, and desire for increased clinician engagement. Clinicians expressed that the program offered a tangible resource to address FI. They also noted that although the program did not affect screening for food insecurity, it motivated them to talk more about FI.

Incorporation of a clinical-community produce prescription intervention to address FI in families was feasible and well accepted by pediatric primary care clinicians. Future interventions should explore the addition of better closed loop communication strategies as well as methods to improve clinical education for families.

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RESEARCH SHOWCASE

# PSYCHIATRY/MENTAL HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Prevalence of ADHD in Children and Knowledge and Attitude of Parents about ADHD in a Tertiary Hospital in Dharavi, Mumbai, Maharashtra, India

The rise in Mental Health awareness has created a gap in public knowledge and understanding of the prevalence and stigma surrounding mental health globally. Specifically, to understand the prevalence and stigma of Attention-Deficit/Hyperactivity Disorder (ADHD) in children between the ages of 6-15 years who visit the Children Psychiatry Out-Patient Department (COPD) of a Tertiary Municipal General Hospital in Dharavi India, with a caregiver; the prevalence and knowledge/attitude of the caregivers regarding ADHD was surveyed.

IRB approval was obtained from the Tertiary Municipal General Hospital to receive data. Before conducting the caregiver survey the Psychiatrists (providers) were interviewed. The prevalence of psychiatric diagnosis, including ADHD, was taken retroactively from their analog account of patients and was tabulated. Caregiver ADHD knowledge was taken after the provider, on the Vanderbilt scale, diagnosed the child with ADHD. The caregiver was then instructed, in their native language, on the study and was offered to be enrolled with verbal consent. Each caregiver was verbally given a demographic survey and an Attitude and Knowledge Questionnaire. After the survey was performed an informational brochure about ADHD was presented to them and with the provider present.

The COPD analog data dated back to early 2017 and recorded 1789 patients (72.5% male) categorized under 97 diagnoses, with an ADHD prevalence of 15.71% (281 out of 1789). During this survey, a total of 25 caregivers (64% mothers) had been questioned, resulting in the mean age of 38.5 years, 10.4 years of education, and a monthly household income of 31,676 INR (~ 436.58 UDS). There was no significant correlation found between the demographic questions and the number of knowledge questions correctly answered. Of the eight providers questioned, five wrote that there are misconceptions about ADHD and mental diagnosis due to lack of mental health education. Moving further more caregiver knowledge data needs to be gathered over a longer period of time in order to gather statistically significant data. It's projected by the providers and previous research literature that the more provider and caregiver interaction occurs, the more knowledgeable caregivers will be about mental health disparities, slowly reducing the stigma around mental illnesses in India.

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RESEARCH SHOWCASE

# PSYCHIATRY/MENTAL HEALTH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Alternative Therapies in Treatment Resistant PTSD: A Literature Review

Post-traumatic stress disorder (PTSD) is a debilitating psychiatric disorder affecting an estimated 8.3% of adults in the United States. With a growing awareness and prevalence of the disorder, it has become clearer that traditional therapeutic methods and pharmacologic modalities are frequently insufficient. This literature review strived to determine the efficacy of multiple emerging alternative treatments for PTSD, such as mindfulness-based stress reduction, neurofeedback, and transcranial magnetic stimulation. Via search on PubMed, thirty-two clinical trials were reviewed with eight studies included in this review. All eight studies were found to have statistically significant improvement of PTSD symptoms, with TMS showing reproducible results across three studies. As research continues to emerge regarding the psychopathology of PTSD, more innovative and neurologically informed therapies are being developed; however, feasibility, reproducibility, and further global investigation are needed before adapting therapy recommendations for PTSD.

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RESEARCH SHOWCASE

# PSYCHIATRY/MENTAL HEALTH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### A Patient-Centered Understanding of the Impact of Social Distancing Requirements on Adults with Serious Mental Illness during the COVID-19 Pandemic

In response to COVID-19 mitigation policies, mental health and social service agencies have had to rapidly change their operations, creating challenges for patients with serious mental illness (SMI). This study aimed to explore the experiences of adults with SMI navigating these altered systems during the pandemic. In-depth interviews were conducted with 20 hospitalized adults with SMI in the fall of 2020; they were coded using thematic analysis. Most participants found the new systems effective at meeting their essential needs. However, several reported significant unmet needs, including inability to access mental health care and public benefits. These participants lacked identification documents, housing, and/or a personal device. While none of the participants used telemedicine before COVID-19, the majority reported no or minimal problems with telemental health. Those reporting difficulties did not have personal devices, were receiving audio-only services, or viewed telemedicine as less personal or too distracting.

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RESEARCH SHOWCASE

# PUBLIC HEALTH

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### When Patients Recover from COVID-19: Data-driven Insights from Wearable Technologies

Coronavirus disease 2019 (COVID-19) has become a serious issue for public health as it is highly contagious and may cause severe health damage or even loss of life loss in patients with weak immunity. A way to quickly and accurately identify patients who are likely to go on to develop severe symptoms at an early stage is urgently required to improve outcomes and reduce the burden on limited public medical resources. This paper presents a new classification model that utilizes uncertainty quantification to identify COVID-19 disease stages using Long-short Term Memory (LSTM) and Deep Dense network to exploit temporal stream data from wearable devices. It will help patients understand their current disease situation and ensure they receive the optimum treatment regime. This research will also help doctors optimize their usage of limited medical resources and enable them to provide their patients with an immediate treatment plan remotely that addresses their specific disease situation. Our experimental results demonstrate that our proposed model achieves substantially better prediction accuracy than existing state-of-art methods. Moreover, we explore the importance of different vital indicators to help patients and doctors identify the critical factors for different COVID-19 stages.

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RESEARCH SHOWCASE

# PUBLIC HEALTH

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Challenges in Resource Utilization for Caregivers of Persons with Dementia: A Qualitative Study

**OBJECTIVE:** The purpose of this paper is to highlight primary caregiver experiences with a city health department's Alzheimer's Disease and Related Dementias (ADRD) policies designed to support a loved one experiencing cognitive impairment and/or ADRD during the time of coronavirus.

**METHOD:** Local community partners supported recruitment to reach caregivers from underserved and underrepresented backgrounds. Caregivers were defined as individuals aged 45 to 85 that provide at least 10 hours of unpaid care for a community-dwelling loved one. Five, 90-minute focus groups, using a virtual conference platform, were conducted during the COVID-19 pandemic with 24 caregivers of individuals with ADRD residing in Washington DC. We analyzed de-identified transcripts using thematic analysis.

**RESULTS:** Caregivers were mostly non-Hispanic black (75%) females (75%) with at least a high school education (42%). The care recipient was likely to be a parent (71%), with moderate (29%) or advanced (50%) dementia and living with the caregiver (92%). Caregivers described challenges and frustrations of accessing services and resources intended for city residents with memory loss/ADRD. Caregivers reported on unmet caregiver needs, and unease with home-based personal aides and companionship services. The COVID-19 pandemic increased challenges with accessing services and resources, creating significant disruptions to the care recipient's routine, and led to caregivers reporting providing 24/7 care as traumatizing.

**DISCUSSION:** Policies and resources are in place to provide support for older adults. Caregivers from underrepresented backgrounds providing care for loved ones with ADRD experience increased burden when depending on in-home health aides and other resources. COVID-19 has impacted the caregivers and care recipient's ability to access services and resources leading to increased caregiver burden. Federal, state, and local policies need to be flexible for the ever-changing needs of individuals with ADRD and to support the overall well-being of the caregivers.

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RESEARCH SHOWCASE

# PUBLIC HEALTH

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Let's talk about Sex... or Not?: A Look at Patient-Provider Communication About Sexual Health Among East-Asian American College Students

Previous studies have shown there is a low volume of communication between Asian-American young adults and their health care providers regarding sexual health. Few previous studies have examined these communications specifically amongst young adult patients of the East Asian-American diaspora. This qualitative interview study identifies barriers to these communications. Twelve East Asian-American, young adult participants revealed the following themes through Zoom interviews: (a) Asian culture frames sexual health as a taboo topic, (b) a continuation of pediatric visits throughout college, (c) a preference to be asked questions by providers, (d) a need for provider-emphasis of a judgment-free zone, (e) a general lack of knowledge of sexual health topics, (f) a preference to confide in close friends over a provider confidante, and (g) a heavy use of the internet for seeking sexual health knowledge. These thematic findings suggest the need to better address and alleviate, if not eradicate, the various barriers to improving East Asian-American sexual health outcomes and communications. Health care providers can begin to mitigate the gap in sexual health education by providing information and fostering conversations about sexual health with their East Asian-American patients. Larger community efforts, such as through university health centers, can begin to reach out to East Asian-American college students to provide non-pediatric care and sexual health information, especially to first-year students. Future studies could expand on these findings by interviewing more participants, including patients and providers, to determine both perspectives on sexual health communication.

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# PUBLIC HEALTH

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### As Most Anemic Women in India Do Not Know Their Anemia Status, What Are Predictors for Knowing One's Anemia Status?

**Introduction:** Anemia is a blood disorder that affects over half of women of reproductive age (WRA) in India. Through the WHO's guidance, the Indian government has recommended WRA, of any pregnancy status, take iron-folic acid (IFA) supplements. However, distribution practices for IFA are insufficient; out-of-school, non-pregnant women have to independently obtain these supplements. Therefore, recognizing that one is anemic is the first step in obtaining IFA for out-of-school, non-pregnant women. Since anemia symptoms manifest as symptoms of physical labor (fatigue, weakness), many women don't realize they are affected, which leads to low IFA supplement consumption. This study seeks to explore the predictors of knowing one's anemia status.

**Methods:** As a part of the Reduction in Anemia through Normative Innovations (RANI) Project, WRA from 81 villages in Odisha, India were randomly selected to take part in a survey that measured their anemia-related perceptions, including self-reported anemia status, direct and indirect psychosocial predictors, demographics, knowledge about anemia, and previous anemia diagnosis. Additionally, hemoglobin tests were conducted to obtain an objective diagnosis of anemia, which was compared to self-reported anemia-status. We conducted logistic regressions among the sample of anemic women who took part in the RANI Project (n = 2,604) to investigate the predictors of knowing one's anemia status.

**Results:** Only 6% of anemic women knew that they were anemic. Interestingly, accurate knowledge regarding anemia had almost no correlation with knowing one's anemia status. Predictors of actually having anemia such as education, age, pregnancy, and communication regarding anemia were also unrelated to status knowledge. WRA with a previous anemia diagnosis were likely to know their current status (OR = 15.94, p < .001), along with those who were already taking IFA (OR = 4.14, p < .001) or with a strong perceived personal risk for anemia (OR = 2.32, p < .001).

**Discussion:** WRA who have received a diagnosis of anemia, or understand that they have a strong personal risk for the disease are more likely to know their anemia status. Since knowing about anemia is not linked to knowing one's anemia status, future interventions should ensure that individuals increase their risk perception related to anemia, instead of focusing on knowledge about anemia. Additionally, as IFA supplement usage is directly related to knowing if one is anemic, health systems should aim to distribute IFA to all WRA and conduct hemoglobin testing to aid in anemia prevention.

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RESEARCH SHOWCASE

# PUBLIC HEALTH

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Bodies and Boundaries During COVID-19

Our bodies exist both as physical entities and abstractions in our minds. While informed by the biological, our “imagined bodies” also reflect cultural constructs, and they help us comprehend the world of microorganisms we know surrounds us but cannot be readily perceived. The COVID-19 pandemic provides an opportunity to understand this imagined body, as the fictions and meanings that inform these conceptions become clear in public reaction to the pandemic and public health measures. Understanding this imagined body also becomes critical in scrutinizing the assumptions made by public health officials and evaluating public health measures’ efficacy. By trying to demarcate the boundaries of the imagined body, I argue that the body revealed by COVID-19 is subject to the individualistic values of Western culture and can be explained through the lens of control. Furthermore, in coping with a threat that cannot be sensed without technology, people have attempted to make the invisible visible. Doing so, allows a semblance of control to persist, harking to larger Western narratives of the Nature/Culture divide and the latter’s supremacy.

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# PUBLIC HEALTH

## SCHOOL OF NURSING

### **Cannabis Use and Self-Reported Difficulties Concentrating, Remembering, or Making Decisions Among Adults 50 and Over**

Background: Marijuana, or cannabis, is the most commonly used illicit drug in the United States, and its use is growing among adults, generally, and among older adults, specifically. This trend is expected to continue as an increasing number of states legalize cannabis for medical and/or recreational purposes and the public's attitudes about cannabis use continue to become more permissive (Yang et al., 2020). A recent study reported a 75% relative increase in past-year cannabis use in adults over 65 years of age from 2016 to 2018, with individuals reporting at least one chronic health condition showing a 95.8% relative increase (Han & Palamar, 2020); yet, little is known about the relationship between cannabis use and older adults' functional abilities including their difficulties concentrating, remembering, or making decisions. A 2020 study, which focused on self-reported cognition without examining concentration or decision-making, found that subjective cognition worsened in former and current cannabis users over 50 years of age, especially those with cannabis use disorder (Benitez et al., 2020).

Objective: We aimed to investigate the relationship between older adults' reported past-month cannabis use and serious difficulty concentrating, remembering, or making decisions.

Method: Our primary data source was the 2016-2019 Behavioral Risk Factor Surveillance System. We limited our sample to respondents 50 years of age and older who had complete responses to the question about past-month cannabis use in the 20 states and 2 territories that fielded the cannabis use module (N=245,837). We used bivariate analysis to examine the characteristics of the sample, including the prevalence of older adults' difficulty concentrating, remembering, or making decisions, by reported past-month cannabis use. We used additive multiple logistic regression analysis to estimate the association between past-month cannabis use and serious difficulty concentrating, remembering, or making decisions, controlling for a variety of covariates including age, gender, education, race, and health status.

Results: Research is ongoing.

Conclusions: Given states' changing policy environments and the increased use of cannabis by the older adult population, understanding the relationship between cannabis use and functional abilities is vital to public health. Our study makes an important contribution to what is known about cannabis use in older populations and its potential adverse effects. Our findings will inform patients, clinicians, and policymakers' decisions about older adults' use of cannabis and its associated health risks.

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# PUBLIC HEALTH

## SCHOOL OF NURSING

### Examining HPV-Related Beliefs and Health Information Use through the Health Belief Model Lens: Towards Cancer Prevention Among Racial-Ethnic Minorities

Human papillomavirus (HPV) awareness, and HPV-vaccine awareness, are essential in the prevention of HPV-related cancers. Although racial/ethnic minorities have high incidences and mortality rates from cervical cancer, previous studies have reported low HPV and HPV-vaccine awareness and knowledge among these groups. The Health Belief Model (HBM) is a value-expectancy theory that can be used to explain and predict individual changes in health behaviors. Using the HBM framework, data from the 2019 Health Information National Trends Survey were used to examine the relationships between HPV awareness and HPV-vaccine awareness, with cancer-related beliefs and health information-seeking behavior.

Among 5,438 participants, most were non-Hispanic Whites (63%), female (58%), over the age of 50 (69%), had at least some college (76%), and had income of \$50,000 or more (55%). HPV awareness and HPV-vaccine awareness, respectively, were lowest among Asians (46%; 55%) and Hispanics (36%; 42%) ( $p < .001$ ). Healthcare providers were identified as the first source of health information among the majority of participants who were unaware of HPV and the HPV-vaccine, whereas the Internet was identified as the first source of health information among participants who were HPV and HPV-vaccine aware. Additionally, though knowledge that HPV can cause cervical cancer was high among individuals who were HPV and HPV-vaccine aware, more than half of these same participants also believed that it was unlikely, or were uncertain, that HPV could cause penile, anal, or oral cancer.

All of the HBM constructs were significantly associated with HPV awareness ( $p < .001$ ) and HPV-vaccine awareness ( $p < .001$ ). Similarly to the 70% of participants who believed that it was unlikely, or were uncertain, that they would develop cancer the future ( $p < .001$ ), approximately 70% also disagreed with the severity statement that there was nothing that they could do to lower their chances of getting cancer. While 64% of participants reported confidence in their ability to get health information when they needed it, an even larger proportion (74%) perceived "having too many recommendations" as a barrier. In multivariate analysis, race, gender, age, education and income were associated with HPV awareness ( $p < .001$ ), as well as with HPV-vaccine awareness ( $p < .001$ ). Culturally-relevant health education/promotion interventions need to be developed and tailored to (1) increase HPV and HPV-vaccine awareness and knowledge among Asians and Hispanics and (2) educate racial/ethnic minorities about their susceptibility and risk perception for cancer.

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RESEARCH SHOWCASE

# PUBLIC HEALTH

## TRACHTENBERG SCHOOL OF PUBLIC POLICY AND PUBLIC ADMINISTRATION

### Associations in Community Health Center Service of the Homeless and Homeless Outcomes

Community health centers serve as an affordable health care option for vulnerable and low-income communities, such as homeless individuals, and offer enabling services, such as case management to ensure that patients get the types of care they need. In the case of homeless individuals, this care may include addressing traditional health needs as well as housing as a social determinant of health. Using HRSA's Uniform Data Set and HUD's System Performance Measures data, I match Continuums of Care to Federally Qualified Health Center grantees. I examine the extent to which community health centers reach the homeless in their community and the extent to which this penetration of the homeless community is associated with better housing incomes among the homeless population. I find that while center receipt of a Section 330(h) homeless grant is associated with higher penetration, the size of the grant does not have a consistent association. Higher penetration is, in turn, associated with better housing retention.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Boot Camp Translation Community Engaged Research Process Evaluation

Boot Camp Translation (BCT) is a method of partnering with community members to translate complex health information into locally relevant language and actionable messaging to improve health. BCT is a method of community engagement in research, where community participants are co-investigators in the research. The BCT process was first developed by the High Plains Research Network and its Community Advisory Council in rural Colorado. This Colorado community used BCT to successfully address the topics of colon cancer prevention, asthma diagnosis and management, and hypertension; BCT messaging techniques led to increased colon cancer screenings, improved care for asthma and increased rates of controlled blood pressure. This initial research illustrated that the BCT model is appropriate for engaging communities in patient-centered outcomes research and building regional community-led solutions.

The Rural Health Research and Community Engagement Core (Rural Core) of the Northern New England Clinical and Translational Research Network (NNE-CTR) set out to conduct the first BCT process in Norway, Maine in November 2020. The Rural Core has been working to conduct community engaged research in Western Maine since 2018, and has since developed partnerships with Western Maine Health, Healthy Oxford Hills, the Oxford County Wellness Collaborative, and other unaffiliated community members. A series of meetings with these partners led to the identification of Adverse Childhood Experiences (ACEs) and their impacts on health as a priority of the community to be addressed by this BCT. The BCT is composed of seventeen individuals who are co-investigators and community members. The BCT will occur over a twelve-month period, consisting of several facilitated group meetings, with an end goal of developing actionable health messaging around ACEs.

Our evaluation will seek to demonstrate the feasibility, reproducibility, worth, and significance of the BCT process. We will use a mixed methods data collection approach. Data will be acquired through an initial and midpoint survey, qualitative interviews with participants and facilitators, as well as through a quantitative measurement tool called the pyramid of engagement, which we previously developed in collaboration with the Institute for Community Health in Malden, MA. Data collection will begin in February 2021 and we expect to be completed with the BCT process in December 2021. The findings of our evaluation will be used to inform future funding opportunities and efforts to scale up this process across the MaineHealth network.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Simplifying the Initiation of Treatment for Patients with DKA/HHS in the Intensive Care Unit at the Veterans Affairs Medical Center

Diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic syndrome (HHS) are serious, acute complications of diabetes, with DKA hospitalizations occurring at an average annual rate of 6.3% and average case-fatality rates of 1%<sup>1</sup>. Prompt initiation of treatment is crucial to ensure standard of care, including administering insulin, fluids, and electrolytes as well as frequent lab checks.

Initiating an insulin drip for patients admitted to the MICU for DKA/HHS was difficult due to incorrect orders placed in CPRS, the EMR of the D.C. Veterans Affairs Hospital (DCVA). Resolution of these issues necessitated multiple discussions with nurses and pharmacists causing delays in initiation of treatment interventions for critically ill patients. The aim of this quality improvement project was to make ordering an insulin drip take less than 10 minutes for 50% of residents to expedite treatment initiation.

Pre-intervention survey showed that 53.4% of residents had difficulty initiating an insulin drip for patients with DKA/HHS at the DCVA MICU. For residents, ordering an insulin drip took less than 10 minutes for 5.2%, 10 to 30 minutes for 31%, 30 minutes to 1 hour for 29.3%, and over 1 hour for 6.9%. PDSA cycle 1 utilized the resident website composed of resources available to those rotating at the VA. Instructions on how to order an insulin drip were posted on the website and the chief residents were asked to inform MICU residents of its presence during pre-rotation orientation. After the first intervention, 27.3% of residents noticed that instructions on how to order an insulin drip were posted on the website. For residents, ordering an insulin drip took less than 10 minutes for 27.3%, 30 minutes to 1 hour for 18.2%, and over 1 hour for 0%. PDSA cycle 2 included posting instructions on how to order an insulin drip in the MICU resident workroom. With this change, 80% of residents noticed that instructions on how to order an insulin drip were posted in the MICU resident workroom. For residents, ordering an insulin drip took less than 10 minutes for 40%, 30 minutes to 1 hour for 10%, and over 1 hour for 0%. PDSA cycle 3 involved creating an order set, including insulin drip orders, in CPRS for the management of patients with DKA/HHS.

Simplifying the ordering process for an insulin drip can expedite the initiation of treatment of patients with DKA/HHS.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Impact of Delayed Lab Collection on Quality of Care in Hospitalized Patients

Delays in care have a well-studied deleterious effect on length of hospitalization, perceived quality of care provided, and overall costs to both the patient and the health system(1-3). While the majority of studies and subsequent quality improvement efforts have been aimed at improving timeliness of treatments, timeliness of diagnostic tests are an equally important area for quality improvement.

We conducted a quality improvement study at The George Washington University Hospital aimed at increasing the total number of laboratory collections ordered for evening collection by the phlebotomy staff. After gathering baseline data, and identifying the stakeholders, we implemented two Plan-Do-Study-Act (PDSA) cycles. The first was an educational intervention for day-team internal medicine residents entering the evening lab orders in a specific format. Following our first PDSA cycle, we actually noted an decrease in laboratory collection rate for unclear reasons. The second intervention involved the night-team internal medicine residents reviewing all evening lab orders prior to collection to ensure that they were properly ordered. This was far more successful a measure as we noted a significant increase in the collection rate following this cycle. We believe that further PDSA cycles should be enacted to engage other stakeholders, including nursing staff, patients, and phlebotomists, as accurate and timely diagnostics will improve health outcomes and delivery of timely care.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### The Impact of Integrating Palliative Medicine Into COVID-19 Critical Care

**Background** – High quality patient-centered care for critically ill patients with COVID-19 has had unprecedented challenges. Many patients become ill unexpectedly and have not previously discussed their healthcare wishes. Clinicians lack experience with this illness and therefore struggle to predict patient outcomes.

**Methods** – We implemented proactive palliative care rounding with critical care medicine (CCM) providers on COVID-19 intensive care units. CCM providers were surveyed about the effectiveness and efficiency of this intervention.

**Results** – 54% of CCM providers responded to the survey (21/39). CCM providers rated the intervention highly across all domains. CCM providers frequently identified that early palliative involvement facilitated serious illness communication, provided support for families separated from loved ones, and allowed clinicians focus efforts on managing complex physiology.

**Conclusions** – Proactive palliative care rounding improves provider- rated quality of care for patients and families, while also providing needed support for the critical care team.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Increasing Documentation of Tobacco Cessation Counseling Among Internal Medicine Residents

Tobacco use remains a public health concern and the #1 cause of preventable disease in the United States. Though smoking rates have decreased in recent years, 34.1 million adults (approximately 14%) were estimated to smoke cigarettes in 2019. Tobacco use is known to cause a myriad of diseases, including cardiovascular disease, pulmonary disease, cancer, and diabetes. It is estimated that 16 million US adults live with a tobacco-related disease. Over 480,000 deaths every year in the US, about 1 in every 5 deaths, can be attributed to smoking. A 2016 survey at a large University medical center showed that residents lack both formal training and confidence in smoking cessation counseling. Of internal medicine residents surveyed, about 50% reported not receiving any formal education in cessation interventions.

In 2020, only 28.01% (n = 657) of tobacco users among internal medicine resident primary care patients were documented to have cessation counseling in the preceding 12 months. The goal of this project was to assess knowledge of how to document and increase rates of tobacco cessation counseling.

Internal medicine residents were surveyed on their knowledge of tobacco cessation counseling documentation. Counseling documentation data was extracted from published MFA quality measure data prior to study and throughout PDSA cycles. For the initial intervention, internal medicine residents were educated on how to document cessation counseling through email reminders. For PDSA cycle two, a document to remind how to document cessation counseling was given to residents seeing active tobacco users. This document also included information regarding nicotine and non-nicotine replacement therapies as well as information on support systems (1-800-QUIT-NOW, [www.smokefree.gov](http://www.smokefree.gov)).

Prior to study, only 44.4% (n=18) of respondents knew how to properly document smoking cessation discussion. 16.7% did not prioritize discussion and 11.1% did not have time to counsel. After education, 83.3% (n =12) respondents knew how to document cessation counseling. The published documentation rates remained unchanged at 28.16% (n= 671).

This study was limited by low response rate. While residents were shown to have increased knowledge of how to document their counseling, rates of documented cessation counseling did not change. PDSA cycle 2 is targeted at prioritizing cessation discussion and reducing the amount of time needed to complete cessation discussion. This cycle is underway and will be evaluated as a tool to increase the documentation of tobacco cessation counseling.

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Michael Knight

RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Improving Understanding of Appropriate Admission Order Status for Resident Physicians

**Background:** The distinction between observation and inpatient status affects health care cost and coverage. Medicare Part A covers inpatient status while Medicare Part B covers outpatient services, including observation status. Furthermore, inpatients under Medicare qualify for skilled nursing facility (SNF) coverage after three consecutive days whereas those under observation do not. The admission status decision depends on the patient's condition and medical history, probability of complications during hospitalization, and hospital administrative policies. The physician has the authority and responsibility for making this decision. **AIM Statement:** To decrease the number of changes in admission order status by 10% over a 5-month time period.

**Methods:** An educational intervention was distributed to internal medicine residents rotating on the medicine wards at George Washington University Hospital. It included a video presentation explaining the differences between inpatient and observation status, a pre-test survey to assess resident knowledge and comfort with these distinctions, and a post-test survey to determine the success of the intervention. The number of changes in admission status order was compared before and after the intervention, between August 2020 and January 2021.

**Results:** In August 2020, before the intervention, there were 59 changes between inpatient and observation admissions. In January 2021, after the intervention, there were 55 changes, representing a decrease of 6.8%. Thirty-nine residents responded to the pre-test survey while 26 residents responded to the post-test survey and 18 residents responded to the follow-up survey assessing information retention. Comfort level with explaining the difference between inpatient and observation status increased after the presentation for 85% of participants, and 100% of participants found the presentation helpful. Average score on knowledge questions related to admission status was 59% correct pre-test and 78% post-test, an increase of 19%. Both comfort level and knowledge decreased 3 months after the intervention.

**Discussion:** Our study showed that provider education and knowledge assessments increased comfort level and knowledge with understanding admission status. Study limitations include low survey response rates, decreasing survey response rates, provider turnover on inpatient rotations during the intervention period, and lack of consistent admission data collected by the hospital. Additionally, knowledge retention and sustainability are other limitations. Future interventions to consider include briefing on properly assigning observation versus inpatient status during intern orientation, real-time feedback to physicians, and collaborating with hospital administration on collecting more robust data on admission status.

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## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Delirium Care in Inpatient Medical Floor at George Washington University Hospital

Delirium is a medical condition that results in altered mental status due to a variety of causes including infection, dehydration, constipation, medications, toxins and metabolic imbalances. Up to 50% of older hospitalized patients and 80% of older Intensive Care Unit(ICU) patients develop delirium. The annual direct healthcare system costs attributed to caring for patients with delirium is estimated to be as much as \$150 billion in the United States. Delirium has also been shown to increase length of stay and decrease patients' function after hospitalization. In addition, delirium increases the risks of falls, pressure ulcers, and aspiration.

COVID-19 has only exacerbated the factors that contribute to delirium due to isolation. With this in mind, a project was designed to enhance pharmacological and non-pharmacological management of delirium by increasing the knowledge and recognition of delirium in hospitalized patients.

Currently, the electronic medical record(EMR) at GWU Hospital(GWUH) has a standard protocol for the documentation and treatment of delirium in the ICU setting, but not on the general medical floors. This is particularly challenging overnight as the physicians are covering a larger number of patients on the medical floor. In addition, the nursing staff may have difficulty managing patients when they are most delirious, at night, leading to a reliance on chemical and physical restraints instead of correcting the source of delirium.

The initial intervention began with education of physicians through distribution of informational material. The next PDSA cycle involved the distribution of pocket cards with information on the screening and treatment of delirium. These two interventions showed an increase in the knowledge and comfort with delirium by 63% as documented by pre and post surveys. The next PDSA cycle involved placing fliers in the team rooms with a scannable QR code.

Working with the nursing supervisors on the medical floor, a pocket card and poster were designed to educate the nurses on delirium identification. Prior to intervention, a survey of the nurses showed that 57.9% did not feel comfortable identifying risk factors for delirium and 100% said they would like additional tools. Prior to the intervention, 0% of patients had delirium documentation in their chart, thus any percentage increase translates into a positive outcome.

This study illustrated the effectiveness of a multi-modal approach to increase the screening and treatment of delirium in hospitalized patients.

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# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Barriers to Resident Clinic Telemedicine

The increased utilization of telemedicine has allowed for the delivery of healthcare through communication technology during the COVID-19 pandemic. However, with the implementation of virtual visits, technological challenges have arisen for patients and staff. These challenges have led to delays in care, limitations on time available to provide care to patients, and increases in patient and provider dissatisfaction. The objective of our project was to address barriers and logistical issues that providers have encountered in telemedicine.

To understand the challenges faced during the implementation of telemedicine in an academic primary care practice, a group of stakeholders including attendings, primary care residents, nurse coordinators, and medical assistants were contacted and feedback was collected. An anonymous survey was then developed and distributed to internal medicine residents regarding logistical barriers during their initial telemedicine clinic experiences (typically one half day every 5 weeks). The primary metrics measured included overall provider satisfaction, and time spent performing clerical non-clinical tasks (detracting from patient care and quality). The initial survey reported 56% of residents were spending  $\geq 6$  minutes assisting patients with connecting to the telemedicine platform. When the survey was repeated in 2 months, 7% of residents reported spending  $\geq 6$  minutes on clerical tasks.

Our team identified that a lack of the correct telemedicine visit login information by patients was the largest barrier encountered by surveyed residents. We designed an intervention in the pre-visit protocol where medical assistants, who contact the patients prior to their visit to collect vital signs, were provided telemedicine visit login information that could be provided to the patient if needed. After supplying the login information to medical assistants prior to the telemedicine clinics, patients were able to receive connection assistance in real-time prior to their scheduled visit, and no residents (0%) reported spending  $\geq 6$  minutes on clerical work in the initial PDSA cycle (n= 6 patient visits between the 2 residents).

Future directions include applying the intervention to a larger group of telemedicine visits in the internal medicine resident practice. In addition, future PDSA cycles will include additional interventions such as sending automatic reminders to patients that include login information and having medical assistants coordinate with providers at the start of the day. The initial improvement within the first 2 months of telemedicine use is likely secondary to overall increased familiarity with the telemedicine platform in our patient population.

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## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Reducing the Number of Unspecified Penicillin Allergies in Patient Charts: A Quality Improvement Initiative

Penicillin allergy is the most commonly reported drug allergy in the United States, yet studies have repeatedly shown that most patients with listed allergies do not have a true allergic reaction. Penicillin allergy labels are associated with increased morbidity, antimicrobial resistance, and higher costs of healthcare. The objective of this quality improvement (QI) project was to reduce the number of unspecified penicillin allergies in patient charts by at least 10% in four months. The percentage of patients who visited the Cohort 5 Internal Medicine resident clinic at GW in the last 2 years with unspecified allergy labels was initially measured. Six PDSA cycles were performed, which consisted of (1-3) chart review and data collection of patients with both penicillin allergy label and a reaction listed, (4-5) contacting patients via email and phone to clarify their allergy and reaction and (6) classifying the penicillin allergy based on a classification scheme as follows: intolerance, allergy, adverse or suspected reaction. A total of 1146 patient charts were reviewed. At the study baseline (cycle 0), 8.8% of patient charts had a penicillin allergy label and of those, 25% had both a penicillin allergy label and reaction listed. Following the sixth and final PDSA cycle, 10.4% of patient charts had a penicillin allergy label and, of those, 110% had both a penicillin allergy and at least one reaction listed. In cycle 6, a minority of charts had multiple reactions listed, accounting for percentage >100%. The final cycle intervention of implementing a classification scheme demonstrated that reactions were broken down to 5% intolerance, 23% allergy, 8% adverse reaction and 3% suspected reaction. Most reactions were classified as an allergy and this was consistent throughout cycles 3-6. However, intolerance and adverse reaction classifications were increased by 2% each from the prior cycle. This project was successful in reducing the number of unspecified penicillin allergies in our patient population over four months, with an increase in specified penicillin allergies by 85% after the final cycle. Long term implications of this intervention may include a decrease in morbidity, hospital readmissions, antibiotic over-prescription, and healthcare costs for the studied patient population. Further interventions to address unspecified penicillin allergies should be sought and may include involvement of ancillary staff, use of standardized questionnaires, as well as the involvement of allergists for skin testing, oral penicillin challenge, and de-labeling.

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# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Overcoming Communication Barriers: An Evaluation of Communication Devices for Healthcare Providers Wearing Powered Air-Purifying Respirators (PAPRs)

#### Introduction

The COVID-19 pandemic has resulted in an increased use of Powered Air Purifying Respirators (PAPRs), by health care providers to mitigate the risk of viral transmission, especially for aerosol-generating procedures. In this study, we evaluate communication devices that could be used concurrently with PAPRs to promote improved communication.

#### Methods

We tested two devices, a Bluetooth earpiece and a throat microphone that operated over mobile networks, against a control scenario in a simulated operating room environment with participants donning PAPRs. Participants read a short paragraph to each other, transcribed short phrases, and evaluated the scenarios according to speech intelligibility, ease of use, and comfort.

#### Results

There were 30 participants of varying PAPR experience. The Bluetooth headset had the most accurate transcriptions, followed by control, and lastly the neckpiece (94.7% vs 88.4% vs 76%,  $p < 0.001$ ).

#### Conclusion

Communication devices have the potential to bridge but also worsen communications barriers between providers donning PAPRs.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Patient Perceptions and Satisfaction with Teledermatology During the COVID-19 Pandemic: A Survey-based Study

**BACKGROUND:** The COVID-19 pandemic has drastically changed the practice of dermatology as social distancing guidelines have led to a shift from in-office care to virtual telehealth (teledermatology). We aimed to determine patient satisfaction, perceived barriers, as well as indications for teledermatology appointments during the COVID-19 pandemic.

**METHODS:** A survey was sent out via SurveyMonkey's online platform to patients of the George Washington Medical Faculty Associates' Dermatology department who attended telehealth appointments during the COVID-19 pandemic.

**RESULTS:** Out of 894 invitations sent, 168 patients completed our survey. The most common reasons for making a telehealth appointment were for a new rash (11.6%), eczema (9.8%), and psoriasis (9.1%). The most common reasons respondents liked telehealth were because of time efficiency (81.1%), not requiring transportation (74.2%), and maintaining social distancing (73.6%). The most common reasons respondents did not like telehealth were due to lack of physical touch (26.8%) and feeling they received an inadequate assessment (15.7%). Very few patients reported that they were unlikely to undertake another telehealth visit (9.94%) or recommend a telehealth visit to others (6.92%).

**CONCLUSION:** Dermatology patients likely perceive telehealth visits as a convenient and safe method for quality care during the COVID-19 pandemic. The lack of physical touch, inability to provide close inspection and/or procedural intervention can be frustrating for patients and therefore meaningful selection of appropriate cases for telehealth visits can optimize the patient experience. Overall, telemedicine represents an effective and safe vehicle for delivering care especially during a global pandemic.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### DisasterConsult.org: Filling the Gaps in Emergency Disaster Preparedness

Over the last couple of years, emergency department disaster preparedness and response programs funding have been cut nationwide. With the ubiquity of unplanned mass casualty events the deprioritization of disaster training in medical education has left many hospital systems and providers under-prepared to respond. As seen with the COVID-19 Pandemic, the lack of readiness to handle mass casualty events can be devastating. Existing emergency disaster plans for hospitals typically lack thorough operational steps and key considerations that providers must remember under extreme duress. To date, there has not been a comprehensive, free, online resource of this type.

We hypothesized that the creation and implementation of a novel, online, just-in-time disaster response toolkit and resource repository called DisasterConsult.org can improve emergency medicine provider readiness and immediate response to no-notice mass casualty incidents. The creation of emergency protocols can help streamline care at the local, regional, state or even national level. The use of the database aims to help hospitals and providers better prepare for the unexpected, optimize patient flow and avoid bottlenecks in order to improve quality care and outcomes. For each disaster topic chosen peer-reviewed literature searches, book chapters, and evaluation of grey literature was critically appraised to create evidence-based comprehensive emergency plans. Current research and data was analyzed to fill in the gaps in knowledge for on-going mass-casualty incidents such as civil unrest injuries and COVID-19. In order to make DisasterConsult.org more accessible to providers, our team has also created a corresponding mobile app for Apple Phones. Since the creation of the website in May, there have been 1,605 domestic and foreign users with a total of over 12,000 page views. The research is ongoing as more topics, including mass shootings, bombings, radioactive and chemical warfare disaster emergency plans are underway. The research can be accessed at DisasterConsult.org.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### FAST Exam Errors at a Level 1 Trauma Center: A Retrospective Cohort Study

Physicians perform the FAST exam (Focused Assessment with Sonography in Trauma) during a comprehensive trauma evaluation in order to determine the patient's need for intervention (surgery, computed tomography scan, interventional radiology procedure, etc.) and disposition planning. A FAST exam can be accomplished rapidly at the bedside and includes an assessment of the heart, lungs, and abdomen. FAST exams have been demonstrated to show excellent specificity but varying sensitivity in the identification of free fluid and organ injury. The objective of our study was to examine all false positive and false negative FAST exams performed in the emergency department over the course of seven years when compared to CT imaging as the gold standard. We performed a retrospective review of false negative and false positive FAST exams completed at an academic level 1 trauma center. We identified 27 false positive and 75 false negative FAST scans, each patient's chart was reviewed in order to collect data on demographics, vitals, trauma details, disposition, and the educational year of the resident conducting the FAST exam. In our study, sensitivity was 70.6% and the specificity was 99.1% for the FAST exam. Among the false positive cohort, fat pads mistaken for pericardial effusions and right upper quadrant (RUQ) or left upper quadrant (LUQ) double line sign were the most common misinterpretations. The most common misinterpretation amongst residents for false negative scans was free fluid in the pelvis, followed by free fluid in the right upper quadrant (RUQ) and left upper quadrant (LUQ). Most of the FAST exams were performed by a PGY-2 resident. Based on our findings we will change our educational focus for training residents, we will implement changes to the curriculum to reduce these types of errors.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Adopting a Telemedicine Model of Asthma Care during the COVID-19 Pandemic

**Purpose/Objectives:** The IMPACT DC Asthma Clinic is an intervention program which transitions children in the DC region who are heavily dependent on the emergency department for episodic asthma care to more effective longitudinal care in their primary medical homes. We sought to study the implementation of a telemedicine model for IMPACT DC during the COVID-19 pandemic designed to address barriers to care and to continue caring for these patients in a safe manner.

**Design/Methods:** A telemedicine model of IMPACT DC was implemented using rapid-cycle improvements and process mapping. Measures for adoption of this model were collected including primary language, patient satisfaction, visit completion, and visit show rate. Patient healthcare utilization data (emergency department visits, hospital admissions, and systemic corticosteroid use) was collected for the six months prior to the IMPACT DC intervention. This data was compared to in-person clinic visits over the same six-month period during the previous calendar year.

**Results:** 360 patients successfully completed a telemedicine visit between April 2020 and September 2020 with an average visit show rate of 52%. The primary language was English in 89% of patients. Patients seen by telemedicine had an asthma diagnosis that was most frequently classified as mild-persistent and well-controlled. The satisfaction survey response rate was 33%; overall average satisfaction with the telemedicine model was high. In the six-month period prior to intervention, healthcare utilization of patients in the telemedicine cohort was as follows: 56% had  $\geq 1$  emergency department visit, 15% had  $\geq 1$  hospital admission, and 49% had  $\geq 1$  oral corticosteroid course. In the comparison group, 701 patients successfully completed an in-person clinic visit between April 2019 and September 2019 with a visit show rate of 39%. The primary language was English in 84% of patients. Patients seen by telemedicine had an asthma diagnosis that was most frequently classified as mild-persistent and not well-controlled. In the six-month period prior to intervention, healthcare utilization of patients in the in-person cohort was as follows: 67% had  $\geq 1$  emergency department visit, 26% had  $\geq 1$  hospital admission, and 61% had  $\geq 1$  oral corticosteroid course.

**Conclusion/Discussion:** The use of telemedicine provides IMPACT DC a feasible and adoptable model to continue caring for children with asthma during the confines of the COVID-19 pandemic, with overall high patient satisfaction. This model addresses access barriers and promises to be an adjunctive tool for reaching families who have traditionally had low show rates and high healthcare utilization.

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## RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Resident Selection: An Orthopaedic Program Director Survey

**Objective:** To determine whether residency program and Program Director (PD) characteristics influence PDs' attitudes regarding applicants in the orthopaedic surgery resident selection process. **Methods:** A novel 19-question survey was administered to PDs of orthopaedic residency programs in 2019–2020. Survey respondents represented academic, community, and military programs. Participating PDs were associated with the American Orthopaedic Association (AOA)/Council of Orthopaedic Residency Directors (CORD).

**Results:** Response rate was 31% (63/203). PDs rank applicants' performance during orthopaedic rotations, United States Medical Licensing Examination (USMLE) Step 1 scores, and clerkship honors as the top three ranked criteria in selecting residents. PDs endorse using USMLE Step 1 scores to screen candidates for interviews (70%) and rotations (43%). Opinions on USMLE Step 1 value vary: PDs practicing <10 years felt scores reflect resident quality, while those practicing >10 years felt that they reflect ability to pass the American Board of Orthopaedic Surgery (ABOS) exam. PD demographics affected how they rank other application components: PDs >66 years old emphasized academic honors and Dean's letters, PDs 46–55 emphasized conscientiousness, and PDs practicing >21 years emphasized dexterity. Without ABOS passing implications, 57% of PDs would consider placing less weight on USMLE Step 1 scores; however, program geographic locations are correlated with this attitude ( $p < 0.049$ ), with a majority of western and midwestern PDs willing to reconsider unlike in the northeast and southern programs. Most PDs (81%) acknowledge accepting applicants with low scores, often ascribed to performance on clinical rotations. PDs rank applicants' gender, age, and ethnicity as nearly last among characteristics to consider when accepting candidates with low USMLE Step 1 scores. A minority (8/63; 12.7%) of programs use formal assessment of intangible traits such as grit or teachability in candidate selection.

**Conclusions:** Resident selection practices are heterogenous among PDs and residency programs. The current willingness of PDs to look beyond the USMLE Step 1 score and the existing use of alternative characteristics, including the rare use of intangible trait assessments, may help ease the transition from the USMLE Step 1 score to a pass/fail system in the future. However, with the knowledge that PDs' personal characteristics influence their interpretation of a candidate's application, it is important to acknowledge and address potential sources of bias.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### COVID-19 Intubation Safety: A Multidisciplinary, Rapid-Cycle Model of Improvement

The COVID-19 pandemic has forced the health care industry to develop dynamic protocols to maximize provider safety as aerosolizing procedures, specifically intubation, increase the risk of contracting SARS-CoV-2. The authors sought to create a quality improvement framework to ensure safe practices for intubating providers, and describe a multidisciplinary model developed at an academic tertiary care facility centered on rapid-cycle improvements and real-time gap analysis to track adherence to COVID-19 intubation safety protocols. The model included an Intubation Safety Checklist, a standardized documentation template for intubations, obtaining real-time feedback, and weekly multidisciplinary team meetings to review data and implement improvements. This study captured 68 intubations in suspected COVID-19 patients and demonstrated high personal protective equipment compliance at the institution, but also identified areas for process improvement. Overall, the authors posit that an interdisciplinary workgroup and the integration of standardized processes can be used to enhance intubation safety among providers during the COVID-19 pandemic.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Quantifying the Accuracy of MRV Assessments in the Diagnosis of May- Thurner Syndrome

#### Purpose

May-Thurner Syndrome (MTS) is a venous anatomical abnormality where the right iliac artery compresses the left iliac vein. Magnetic resonance venography (MRV) is often used to diagnose stenosis associated with MTS. While previous studies have hypothesized that MRV may inaccurately estimate the extent of compression in MTS, there is need to clarify the role of MRV in the diagnosis of this disease.<sup>1,2</sup> The purpose of this study is to evaluate interobserver variability in diagnosis and classification of MTS by MRV.

#### Materials and Methods

An IRB approved retrospective analysis of 33 MRVs performed at The George Washington University Hospital between January 2012 and December 2015 for “left leg swelling” was performed. These studies were evaluated by three board certified Interventional Radiologists for iliac vein compression on a simple grading scale (“None”, “Mild” i.e. 25% stenosis, “Moderate” i.e. 50% stenosis, or “Severe” or 75% stenosis) in a blinded fashion. Physician ratings were compared to assess provider variation in MRV evaluation. An analysis was then performed to determine the interrater reliability for assessing the degree of compression.

#### Results

33 MRVs were reviewed in total. On average, the providers agreed 85.86% of the time on the presence of any stenosis. However, the interrater consensus dropped to 44.44% when reporting the degree of stenosis. Fleiss’ Kappa scores were calculated to quantify the interrater reliability on assessing the degree of stenosis. Interestingly, the grading of compression severity had a low interrater reliability (Fleiss’  $k = 0.24$ ) demonstrating only fair agreement between providers.

#### Conclusion

While MRV appears reliable in assessing the presence of any stenosis, Fleiss’ Kappa analysis indicates substantial variability in clinical judgement of the degree of stenosis of the left common iliac vein when diagnosing or ruling out MTS. Low interrater reliability of reading MRVs therefore suggests that more definitive diagnostic methods such as catheter venography supplemented with Intravascular Ultrasound (IVUS) may be more accurate to diagnose MTS.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### The Status and Future of Artificial Intelligence in Ultrasound Evaluation

Ultrasonography expedites the medical decision-making process by guiding testing and treatment, resulting in lower healthcare costs and improved outcomes for patients. Several key benefits support the use of ultrasound to augment clinical diagnostics. Ultrasound has been shown to be more sensitive and specific than physical exam alone in diagnosing a variety of common pathologies. Further, it is a relatively inexpensive imaging modality compared to computed tomography (CT) or magnetic resonance imaging (MRI) scans, does not expose the patient to radiation, and is adaptable to a variety of situations given the easy mobility of ultrasound devices and their real-time output, making ultrasound an incredibly attractive imaging technique for everyday use. The recent advancements in ultrasound, including imaging quality improvements, coupled with developments in integration of artificial intelligence (AI) into ultrasound interpretation, have the potential to transform patient care by optimizing both diagnostic accuracy and clinical workflow. Machine learning and deep learning are two modalities of AI increasingly being studied for application to the use of ultrasound. Machine learning relies on established pattern recognition algorithms that the programmer has taught to the algorithm, while deep learning both includes these established algorithms and adapts its criteria to new information based on its own mistakes, effectively improving diagnostic accuracy with increased use. AI modalities have been trained to help in classification of pathologies and aid in diagnosis across several fields of medical intervention including breast cancer, pancreaticobiliary disease, in-vitro fertilization, and point-of-care ultrasound in COVID-19. Although there is controversy in the medical literature regarding the accuracy of AI compared to human diagnosticians, these studies have repeatedly expressed that AI simplifies the interpretation of basic ultrasound imaging that typically requires the opinion of expert individuals prior to execution of management plans. AI frees these individuals to focus on more complex or critical tasks that may require the finer diagnostic judgements that currently humans only may be able to perceive. Given the benefits of artificial intelligence in ultrasound evaluation, it has become increasingly important to encourage physicians to adopt this novel technology into common practice. Distrust in algorithms is a common concern among implementers of machine learning decision-aids. We rely on the Unified Theory of Acceptance and Use of Technology (UTAUT) to provide recommendations for physicians and leaders in healthcare management who wish to implement new technologies in their practice, and encourage them to consider updating guidance for AI use with ultrasound through this review.

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RESEARCH SHOWCASE

# QUALITY IMPROVEMENT

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Efficacy of COVID-19 specific simulation training in improving intubator's experience during intubation of COVID-19 patients

**Introduction:** Since the start of the pandemic, approximately 3.2% of patients with COVID-19 required intubation and mechanical ventilation at some point during their treatment course.<sup>1</sup> Intubators are at particular risk of infection due to the aerosol generating nature of the procedure. Simulation training (ST) offers an opportunity for trainees to enhance knowledge and skills in airway management<sup>2,3</sup> and has been used as a training tool to prepare health providers for airway management of COVID-19 patients. The purpose of this study is to explore the demographics of providers participating in COVID-19 specific ST and the efficacy of ST in improving provider experience during the intubation of COVID-19 patients.

**Methods:** In this multicenter cross-sectional national study, electronic surveys were to intubators from 32 hospitals between 9/2020 and 12/2020. The survey assessed providers' comfort of intubating and fear of contracting COVID-19 during COVID-19 intubations using 1-10 scale. Various demographic and exposure factors were also collected. Simulation training group (ST) and no simulation training group (non-ST) were compared using the Mann-Whitney U test, Fisher's exact test, and Chi-square test of homogeneity. Statistical significance was declared at  $p < 0.05$ .

**Results:** A total of 186 surveys from 32 hospitals were analyzed after excluding surveys that reported no experiences with COVID-19 intubations. From 32 hospitals, 28 hospitals (87.5%) had providers participating in ST. Within those hospitals, the attendance of ST ranged from 44.4% to 100.0%. From 186 providers, 62 providers (33.3%) reported participating in a ST. Of those, 45 (72.6%) of them reported that the ST helped reduce their fear of intubating COVID-19 patients. More women participated in the ST compared to men ( $n=36, 58.1\%$  vs.  $n= 26, 41.9\%$ ;  $p=0.049$ ). There was no difference in the number of COVID-19 intubations and COVID-19 exposure factors between the two groups. Providers in the ST group reported a higher level of comfort level with intubating COVID-19 patients than providers in the non-ST group (median=9, IQR= 3-10 vs. 8, 1-10;  $p=0.021$ ).

**Conclusions:** Our study demonstrated that COVID-19 specific intubation simulation training improved providers' comfort level during COVID-19 intubations. Moreover, the majority of providers reported reduction in fear of intubating COVID-19 patients after participating in a simulation training. Simulation training on intubation may be implemented as part of airway management training for health care providers during the COVID-19 pandemic as well as in novel pandemic situations to help providers' comfort and fear.

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RESEARCH SHOWCASE

# REHABILITATION AND RECOVERY

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Comparing the NATA Position Statement and APTA Clinical Practice Guideline On Management of Patellofemoral Pain Syndrome

Patellofemoral pain (PFP) is a common musculoskeletal condition that is characterized by insidious onset of poorly defined pain. A rehab specialist should use an evidence-based approach for understanding the evolving PFP knowledge and for making clinical judgment with treatment options. The National Athletic Trainers' Association (NATA) created a position statement on management of patellofemoral pain in September 2018 and The Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association (APTA) created a clinical practice guideline (CPG) on PFP in September 2019. Both documents were qualitatively compared for their similarities and differences of recommendations given as well as the sources cited for each recommendation. In addition, the AGREE II assessment of practice guidelines was performed on both documents to evaluate guideline quality. The APTA's PFP clinical practice guideline scored higher in 5 of the 6 domains of the AGREE II tool compared to the NATA's PFP position statement, and both documents scored 100% in the domain of 'scope and purpose'. The qualitative comparison demonstrates that the two documents have large overlapping areas of recommendations on the treatment of PFP, but each document also has differing areas of recommendations on risk factors, diagnosis, and treatment. Understanding the methods used for different practice guidelines and position papers can help with interpretation of evidence leading to recommendations. Using a validated tool like the AGREE II to help with interpretation of similar practice guidelines may improve the clinician's choice for applicability. The AGREE II can also be used during the design and editing process of new CPGs to improve the overall quality of the end-product.

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## RESEARCH SHOWCASE

# REHABILITATION AND RECOVERY

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Early Experiences with a Primary Care Centered Long COVID-19 Clinic

Post-Acute Sequelae of COVID-19 (PASC) or “Long COVID” is defined by the presence of ongoing symptoms after resolution of an initial, acute infection with SARS-CoV-2. The prevalence, pathophysiology, phenotypes, and risk factors for PASC are poorly understood. In Washington D.C., approximately 6% (~40,000/700,000) of the population has tested positive for COVID-19, with disadvantaged communities disproportionately affected. In parallel to the emergence and recognition of PASC and the growth of the population affected in our region, our group has conducted a needs assessment, launched a clinic, and built-in systems of data collection and linkage to a research biorepository, aiming to better understand and serve the patients affected.

An initial needs assessment was conducted in summer 2020. Participants were contacted via telephone and completed a standardized survey assessing illness symptoms, duration, severity, medications taken, and medical history. At  $66.7 \pm 24.0$  days after the date of the initial positive PCR test for SARS-CoV-2, 22/92 (23.9%) participants reported  $\geq 1$  persistent symptom of COVID-19 and 5/92 (5.4%) reported  $\geq 3$  persistent symptoms. Fatigue (8/22), cough (5/22), dyspnea (4/22), and headache (4/22) were most common. Participants were 48.9% male and aged  $44.4 \pm 13.7$  years (range: 23-73 years).

Based on these findings we conducted informational meetings with physician specialty leaders, and in fall 2020 launched a patient-centered multidisciplinary clinic to care for patients experiencing PASC. Thus far,  $\geq 80$  patients have been seen with  $\geq 15$  enrolled in the biorepository. Patients commonly report dyspnea, chest pain, tachycardia, orthostasis, post-exertional fatigue, headaches, and neurocognitive impairment. Common laboratory abnormalities include slight elevations in D-dimer and ferritin, and low vitamin D. Standardized data collection tools include a comprehensive clinical assessment, scales (e.g. PHQ-9, GAD-7, PCL-C, QOL and fatigue scales), and lab evaluation. Data and research participation are tracked in a REDCap database.

A primary-care-centered clinic with strong linkages to subspecialties is an effective and easily adaptable model for the care of patients with PASC. There is a robust patient advocacy community in which many are keen to contribute to scientific understanding of the pathophysiology and treatment of their condition. The GW COVID-19 Recovery Clinic provides a model for how specialized care can be coupled with research via the development of a database and a linked biorepository. However, disparities in access to specialty services require pro-active engagement, and strategies are needed to better reach communities of color who face higher barriers in navigating healthcare systems and are at highest risk for COVID-19.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Transitions in Daylight Saving Time Negatively Affect Visual Search Performance

Visual search, looking for targets among distractors, underlies many critical professions (e.g., aviation security, radiology, various military operations) and often must be performed optimally regardless of the time of day, week, month, or year. However, external events can potentially disrupt the ability to perform, making it important to understand any systematic influences. The current study examined one such specific influence that can possibly affect an entire workforce at the same time: Daylight Saving Time (DST) transitions—when the clock shifts forward or backward by one hour. Performance on a complex visual search task was assessed using “big data” from the mobile gaming app Airport Scanner, wherein players take on the role of airport security officers searching simulated bags for targets. Performance was compared between individuals who played one specific level during the seven days leading up to a DST transition (pre-DST) and those who played the same level during the seven days following a transition (post-DST). Pre-registered comparisons revealed that, relative to the pre-DST group, the post-DST group was significantly slower, had more false alarms, was less likely to complete the level, and was more likely to fail due to running out of time. Gameplay on a control set of data (where performance was assessed between individuals who played the level before or after a Sunday without a DST transition), revealed no significant differences in performance. These results suggest that even minor, one-hour time shifts can create problems as they can adversely affect cognitive functioning; when an entire workforce undergoes a sudden time shift in unison (e.g., DST transition), the problems can be exacerbated for the broader system. The current study lends support to many existing efforts to end the archaic practice of DST.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### **A Different World: The Impact of Racial Trauma on Academic Success**

This study will examine how race-related trauma affects the mental health of older adolescents and coping response. Research indicates race-related trauma may manifest in individuals through five ways: internalized devaluation, assaulted sense of self, internalized voicelessness, rage and hopefulness. This study uses qualitative methods, specifically inductive coding, to examine race-related trauma and the impact that it has on an individual's mental health. Preliminary analysis revealed that trauma plays a role in the overall mental health of African/Black and Latina/Latino Americans. Many of the participants reported feelings of anger, depression, and voicelessness as a direct result of their experiences. The most prevalent manifestation of racial trauma proved to be internalized devaluation. Participants employed a myriad of coping methods, which proved to vary by gender. Participants demonstrated varied coping responses, however, projecting a future orientation was the most prevalent. These traumatic experiences and encounters manifest themselves through different behaviors and therefore should be addressed. The post effects of race-related trauma should focus on reassuring and healing the victim in order to properly process and manage associated emotions.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Intersectional Identity Exploration in Young Adults with Autism: An Art Therapy Informed Approach

**Objective:** To support individuals with Autism Spectrum Disorders (ASD), much contemporary literature highlights the benefits of co-modal treatment and holistic approaches, following decades of interventions rooted in behaviorism. Although highly structured and individualized plans are utilized in school settings, a deeper and more personalized exploration of self and other becomes essential to support their transition from being in school to living and working in communities. This study investigated how art therapy supports an exploratory process of one's identity development in order to inform a school-based transition curriculum.

**Methods:** This study utilized a qualitative multiple retrospective case study design. The participants were four students with ASD who had regular art therapy sessions and who were members of the transition community at their local non-public school. The art therapy as usual sessions aligned with individual needs based on presenting concerns and on social-emotional-behavioral goals determined by an educational team.

**Findings:** Through thematic analysis, the following five themes surfaced: intersectional identity exploration, body awareness, friendships, long term planning, and community. The students' participation in art therapy (via their artwork and relationship with the art therapist/intern) offered a unique opportunity for self-expression and exploration by centering their choices, perspectives, and voices.

**Implications:** The implications of this project support a need for development of a tangible method of exploring intersectional identity via art therapy as important next considerations. An art therapy informed curriculum to aid transition from school to community should include individual art directives to explore the self, community or group art projects in collaboration with others, a system for students to provide feedback about their experiences and make choices within the artmaking process, the development of a "this is me" social story that can be utilized as a tool in future social and vocational settings, and a culminating public display of the artwork created. This curriculum lends itself to the strengthening of an internal locus of self-awareness that can support these students as they transition to share the parts of their identities that they deem important.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### A Pilot Study Examining the Literature: The Use of 有 and Its Function in Verb Completion in Taiwanese Mandarin

Cornelius Kubler (1985) and Robert Cheng et al. (1985) have made extensive reports on the unique aspects of Taiwanese Mandarin compared to Beijing Mandarin, which ranges from pronunciation, tones, and grammar and syntax. One finding in particular has to do with 有 its use to express verb completion and replace the particle 了 le in affirmative answers to questions . However, these reports were published over three decades ago. This study presents the results of a pilot study, conducted to test whether Taiwanese still use 有 to complete verbs as described in those studies: participants were asked a number of questions to provoke a response similar to what Kubler and Cheng et al. described through the guise of a memory task in three stages: a visual memory task with images, an auditory recall task using a word list, and a recalling of events memory task through the use of two videos. Participants, both from Taiwan and Mainland China, were asked a series of questions regarding their memory recall, some of which were coded to illicit a response that uses 有 to indicate verb completion in the place of 了 . There were also questions to see if Taiwanese Mandarin speakers make a differentiation between the simple and perfective past. Taiwanese participants did indeed use this structure significantly, but rarely in complete sentences, and primarily in the simple past and not perfective past. A significant result of this experiment was that Taiwanese Mandarin speakers using 有 to answer in the affirmative to denote verb completion even when asked questions that were not expected to illicit that response. Some Mainland speakers did not significantly use this structure, though this may be due to their dialect background. This pilot study argues that Taiwanese speakers still retain certain aspects of those unique qualities when it comes to using 有 to answer questions.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Sex-Selective Abortion Bans: Reproductions of Harm

In recent years, there has been a growing trend of sex-selective abortion bans introduced by lawmakers across the United States. These laws uniquely harm Asian American women as evidenced by the convictions of Bei Bei Shuai and Purvi Patel. Previous analyses by Brian Citro, Sital Kalantry, and other scholars have argued how “the text of the laws and the statements made in support of the bans during legislative hearings make it clear that they are intended to place restrictions on abortion services generally” (Citro et al 27). My research examines these laws with attention to a history of anti-Asian sentiments that precedes them. Relying on a guided content analysis to critically examine past anti-Asian immigration laws and current legislative arguments, I compare the language of anti-Asian immigration laws to the language of legislators who support sex-selective abortion bans. I found familiar xenophobic ideas of Asians being immoral, intellectually inferior, sexually deviant, and diseased. In the late 19th and early 20th centuries, lawmakers, who supported anti-Asian immigration laws, espoused ideas of Asians being inferior and deviant and thus, incompatible with white American ideals. Proponents of sex-selective abortion bans use similar words to argue the danger of the “backward practice” of femicide. My analysis shows that sex-selective abortion bans harm Asian American women because they reflect the racist and sexist stereotypes about Asian cultures and femicide. These insights inform how reproductive rights advocates organize around abortion access and why we need to pay attention to the relationship between race, ethnicity, and reproductive justice.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Transformations in Disparities Research and Interventions: Reflections on the Importance of Intention and Role by a First-time Field Researcher

This exploratory study reflects on my experience as a first-time qualitative researcher and the data collected in my original research on Latinx immigrants in Aspen, Colorado in June of 2019. The research I conducted in Aspen, Colorado focused on the experiences and economic hardships of Latinx immigrants. In total, 17 interviews were conducted. I was part of a project that specifically investigated their views towards the cost of living and housing. I hope to use this experience to further understand the sociological issues present in society and within the Latinx immigrant community in the United States. This paper also highlights the importance of intention and role while conducting research. Here, I offer an exploration of two key principles for field research among vulnerable populations along with my experiences as a qualitative researcher. This highlights the purpose of research that deals with vulnerable populations and offers a programmatic statement to first-time field researchers and supervisors. Henry David Thoreau states, "to regret deeply is to live afresh." That being said, I bring a fresh vision as a first-time researcher and newly-charged energy as I reflect back on my experience and think about what I wish I had done differently. And it is because of those regrets, I offer two key principles for field research among vulnerable populations: (1) the need to frame intervention as part of your intention in field work and (2) the need to understand power dynamics that will shape your field work.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### **Sex Work is Work: An Examination of the Policies, Movements, and Barriers Surrounding the Decriminalization of Sex Work Across the U.S.**

The movement to decriminalize sex work has been gaining positive momentum in recent years, however, decriminalization legislation has yet to be successfully implemented anywhere in the U.S. This project will not debate if decriminalizing the sex trade is the best course of action, as much of the previous research on this topic has already proven that it is; rather, this work will build upon this body of literature and determine some of the barriers to decriminalizing the sex trade legislatively in the U.S. Understanding these legislative barriers will assist in better understanding how decriminalization legislation is constructed and if such legislation could potentially be passed and implemented. Through the frameworks of anti-carceral feminisms, harm reduction policy, and social constructivism in policy design, this research was conducted by examining bills, documents of official sex work decriminalization organizations, and news articles. These data were collected from five key jurisdictions: including DC, Maine, Massachusetts, New York, and Vermont. Through this analysis, it is evident that two major barriers prevent the implementation of legislation to decriminalize sex work: the target population of the bills, or the population that the bills are about, are sex workers and conflation of sex work and sex trafficking. These barriers are constructed through different characteristics of the bills, such as the language used to refer to sex workers, sex worker support for the bill, and discussions of sex trafficking. Therefore, decriminalization legislation and movements need to overcome these barriers through legislative adjustments and community and political engagement.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### What the WAP?: Moving Towards a Black Feminist Pleasure Politics

In the summer of 2020, a song and music video by Afro-Latina American female hip-hop artist, rapper Cardi B (Belcalis Marlenis Almánzar, b. 1992) featuring Black American female rapper Megan Thee Stallion (Megan Pete, b. 1995), became a target of debate and controversy, emerging as discourse for questions of race, gender, sexuality, and pleasure. WAP garnered intracommunal and intercommunal criticisms, claiming that sexual explicitness is an affront to feminism and that there is an agenda to degenerate Black women's sexual expression. Through the theoretical frameworks of Black Feminism and Hip Hop Feminism, this research will use a feminist media research analysis of the music video and song WAP to explore the ways in which Black women are constructing a gendered and sexualized subjectivity that allows Black women to (re) imagine their bodies and sexualities outside of the lens of white supremacist heteropatriarchy, and thus informing a Black feminist pleasure politics. Historically, Black feminist theory has struggled to theorize around Black women's sexualities in a way that centers pleasure, focusing entirely on injury. This paper argues that WAP is a complex performance of a liberated gendered and sexualized subjectivities of Black women that engages difference and pleasure and contributes to a Black feminist pleasure politics. This article finds that WAP displays a strategy deployed by Black women to reimagine a gendered and sexualized subjectivity outside of injury and silence. In doing this, the song engages a Black feminist politics of pleasure that honors the complexities of Black women's sexualities and desires. Overall, the results of this study emphasizes the need to draw on a variety of Black women's performances of liberated sexualized and gendered subjectivities to create a robust, complex Black feminist pleasure politics that decenters injury.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### White Women, White Power: Finding Hate

White power organizations have found comfort in the internet. The affordances online spaces provide, such as anonymity and the disruption of space and time, allows hateful discursive spaces like the white nationalist website, Stormfront.org, to flourish for over 25 years. While organized white power movements are primarily constituted of men, there has been an increase of women's support since the late 90s and early 2000s, which corresponds with the increase of available forums, chat networks, and webpages for white power as the internet gained popularity. Through meticulous scrutiny of The Women's Forum, a space on Stormfront dedicated solely to white women and topics of their concern, I seek to detail the Bakhtinian chronotopes of their induction into white power. These chronotopes describe how the emergence of narratives of genesis later become useful as recruitment tools. Looking at the specific ways in which white women situate their subjectivities over time and through space, I argue that the epics constructed of their lives and reproduced on Stormfront delineate two distinctive periods of self: one before white power marked by negative senses of self and society, and one beginning immediately after one's first encounter with white power ideologies marked by purpose and potential. Thinking critically about these narratives and their audiences, I offer possible interventions as well as outline potential directions for further inquiry.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### How Social Media Saved My Sex Life: Exploring the Effect of Social Media on Sex Education in Nigeria

Individuals are told to make the best of what life has to offer and with the right information, this is possible. This applies to all parts of life, even sex, which is seen as a taboo in most cultures across the world. Countries in Africa still see discussing sex as a taboo, thereby making it difficult to get information that would help in making right decisions. The effect of uninformed decision-making processes is problematic in Africa as earlier studies show that countries in South and Sub-Saharan Africa have higher HIV/AIDS rates, high rates of unwanted teenage pregnancy, and unsafe induced abortions. Many young people in Africa have inaccurate sexuality knowledge. Earlier research has stipulated that a platform or organization that aids in the education of individuals and parents on sex and sexuality needs to be created.

Nigeria, the most populous country in sub-Saharan Africa, has seen an increase in the number of sex educators and coaches on social media platforms, divulging much-needed information to those who need it. This information has been helping individuals, couples, and families, and it is important to understand this information-seeking process and its effects. My study investigates how individuals of Nigerian descent interact with sex education content on social media, using both quantitative and qualitative data. Data collection is ongoing, with 92 surveys completed. Preliminary analysis shows that 6.98% of participants trust the sex education content they see on social media to a large extent, while 20.93% of participants agree that they learn something new involving sex education most of the time on social media, with Instagram and Youtube ranking the highest as social media platform where they subscribe to sex education content. 10 in-depth interviews have been conducted to date. Thematic analysis of the interview data suggests that when most participants become parents, they would intentionally educate their children on sex, in contrast to their experience with their parents who avoided the topic or created family myths surrounding sex. Ultimately, the study helps us understand how young adults in Nigeria and the diaspora seek sex education on social media, to what extent they trust that information, and how they think it might affect them as parents in the future.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Mental Health Documentation in Pediatric Medical Records

The Early Growth and Development Study (EGDS), a prospective parent-offspring adoption study, has compiled hundreds of medical records for over a decade in order to obtain medical information on children's physical and mental health. These medical records are provided by pediatricians in varying formats and levels of information, with the primary focus being on physical health. However, it is not clear how medical professionals work to address other domains of children's well-being such as emotional or behavioral health as there is limited information on the development of these psychological issues within child medical records. This lack of reporting has created a gap in information that otherwise could assist pediatricians in caring for their patients, primarily children in the current study.

Pediatricians have the advantage of meeting with and examining their patients on a regular basis which provides the opportunity for the physician to ask brief questions about each child's mental health and behavioral development over time. Regular psychological assessments can create a comprehensive record of the child's mental health, allowing pediatricians to recognize and target any emotional or behavioral problems that may arise early on in the child's development. These findings have valuable implications for improving the overall evaluation, treatment, and continuity of care for children experiencing or at risk for mental health issues, thereby lessening the severity of psychological symptoms in the future. This project will present data on the review of 50 child medical records to determine the number of records that assesses behavioral and/or emotional health. The presentation will include suggestions for the medical community in addressing all domains of a child's health and well-being.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Political Humility: An Analysis of American College Students' Political Attitudes and Strengths of Mind in an Era of Pandemic

Political polarization in the United States has been an increasingly salient point of inquiry for pundits and academics since the 2016 presidential election—and presidency of Donald J. Trump that followed (Bansal and Weinschenk, 2020; Weeks et al., 2019). Moving beyond emphasizing strictly partisan and issue-based divides, scholars have identified more affective bases of polarization (Iyengar et al., 2012; Mason, 2018).

With more individual cognitive and emotional aspects of social behavior being considered in emerging theoretical and empirical frameworks, contributions from the field of psychology have become of paramount importance. However, the existing literature featuring collaboration across disciplines have yet to reach their full potential. Moreover, comprehensive measures of variables that emphasize self-awareness and openness to opposing viewpoints, like intellectual humility, have been limited to only a handful of previous studies (Porter and Schumann, 2018).

The present study employed a mixed methods approach to measure college students' strengths of mind (intellectual humility and growth mindset) via a quantitative survey and qualitative interviews. An Ordinary Least Squares (OLS) regression analysis was performed to measure the strength of relationships between students' strengths of mind and political attitudes and opinions.

This inquiry seeks to deepen understandings concerning the extent to which political attitudes and “non-cognitive” factors are related. Because lacking openness to disagreement and lowered respect for opinions that may be incongruent with one’s own are identified as key consequences of affective polarization (Huddy and Yair, 2017; Marcus et al, 2007), those same characteristics are key in the measurement of one’s intellectual humility. Thus, furthering the notion that the two may be correlates of one another. Those same factors that have yielded positive results in areas of human flourishing may be equally salient in healing political divides and contribute to a foundation for societal flourishing.

A weak predictive relationship was found between growth mindset and intellectual humility. While not a replication of previous research, this study sought to elaborate further on the role that personal psychological characteristics play in the arena of political polarization. Additionally, there were varying degrees of weak relationships found between both intellectual humility, growth mindset and attitudes toward controversial topics like “Black Lives Matter” and indicators of support for legislation that would effectively ban assault rifles. This work is an important start of an already growing body of literature that is seeking remedies for uncivil discourse and division in American society, particularly following the highly contentious 2020 United States Presidential Election.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Investigating the Impact of Deviations from Typical Sleep on Cognitive Performance

Sleep is essential to human survival but is often neglected, causing a variety of cognitive and health-related problems. This is a finding common in student populations (e.g., Orzech, Salafsky, & Hamilton, 2011; Williams, et al., 2019) and in professional search environments like aviation security screenings (e.g., Basner et al., 2008). As it stands, the vast majority of prior data on the relationship between sleep and cognition comes from some form of extreme sleep deprivation (e.g., 40 to 72 hours of forced wakefulness; Gennaro, Ferrara, Curcio, & Bertini, 2001; Mikulincer, Babkoff, Caspy, & Sing, 1989) or prolonged sleep restriction (e.g., multiple weeks of controlled adjustment to typical sleep patterns). While extensive work has explored the impact of sleep deprivation on cognitive functioning, relatively little is known about how cognitive functioning is impacted by seemingly minor deviations in sleep (e.g., 1-3 hours less than typical). This is a needed area of investigation given that it is much more likely that individuals will have a minor sleep deviation than an extreme sleep deprivation. Broadly across these various forms of sleep research, prior work on this subject is somewhat equivocal in outcomes with some finding accuracy deficits, others finding response time deficits, and still others finding both or neither. The current study examined this open issue using a variety of cognitive tasks, hypothesizing that students who slept less than their typical amount the night before participating in a psychology study would perform worse than those who got a typical or more than typical amount of sleep the night before. Initial analyses indicate that there is a potential relationship; for example, less sleep was related to worse performance in a visual search task.

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# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Moderating Effect of Political Affiliation on Ostracism Experiences, Anticipated Inclusion, Anticipated Exclusion, Need To Belong, and Social Media Use

**Introduction:** The current partisan political climate is marked by increased political social media (SM) use (Anderson et al., 2018), and 89% of American SM users reported ignoring political posts they disagree as 39% reported blocking or unfriending people over political posts (Anderson et al., 2018). Such actions are consistent with social exclusion (Williams, 2007), leading to threats to people's fundamental Need to Belong (NTB; Leary, 1990). Partisans also report anxiety over anticipated exclusion (Leary, 1990) and the impressions they give off to political outgroup members (Marder et al., 2016). Given the negative political tone online, those who interact on SM frequently may be more likely to anticipate exclusion. The current study examined differences between Democrats and Republicans in their NTB, exclusion experiences, anticipated inclusion and exclusion on SM, and SM use.

**Methods:** Young adults (N = 276; 63.8% Female; 63.4% White; Age M = 19.54) completed a cross-sectional survey between Fall 2019 and Summer 2020.

**Results:** Republicans reported more exclusion from friends and other students than Democrats ( $p = .000$ ). Democrats had higher NTB than Republicans ( $p = .002$ ). Republicans' (but not Democrats') SM use positively related to exclusion by family ( $r = .351, p < .01$ ) and friends ( $r = .205, p < .05$ ). Though Democrats' SM use and NTB positively related ( $r = .175, p < .05$ ), Republicans' correlation was not significant. Furthermore, Republicans showed a positive relation between expecting inclusion and SM use ( $r = .220, p < .05$ ). Democrats reported a positive relation between anticipated exclusion and NTB ( $r = .194, p < .05$ ).

**Discussion:** Republicans reported greater exclusion experiences among friends, family, and other students; those who used SM more also reported more exclusion by family and friends. This may suggest that Republicans turn to SM in response to exclusion to reinforce social connection. Republicans who use more SM expect positive reactions to posts. They may gain support due to regular posting as they build a "community" of followers. Democrats reported higher NTB, which was correlated with higher SM use. This suggests that Democrats may seek acceptance by their social group, influencing their SM use. Our study indicated the different uses of SM and political exclusion experiences between parties. Future studies should explore how different parties engage on SM, and with whom they interact. With the surge in the role of SM in politics, it is crucial to understand its use in political interactions.

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# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Impact of Individual Differences and Ostracism Experiences on Disordered Eating among College Women

**Introduction:** A healthy relationship with food is important for both mental and physical health. College women are at higher risk of developing eating disorders compared to other groups (Lowe & Thomas, 2009). Research shows that both social stressors and individual differences can affect the likelihood of disordered eating among college women (Kymanyika et al., 2008). Thus, it is important to understand factors at the individual level and in the social environment that may lead to disordered eating.

This study examined how dietary concern, importance of a healthy diet, and need to belong, as well as ostracism (exclusion, rejection) experiences affect college women's emotional eating, restrained eating, and eating in response to stress. The participants are 133 undergraduate female students at the George Washington University (Beekman et al., 2017).

**Results:** First, bivariate correlations were conducted between the independent variables (dietary concern, importance of a healthy diet, need to belong, and ostracism experiences) and dependent variables (emotional eating, restrained eating, and eating in response to stress). Significant relationships emerged between dietary concern and restrained eating ( $r = .675^{**}$ ), dietary concern and emotional eating ( $r = .489^{**}$ ), need to belong and emotional eating ( $r = .321^{**}$ ), dietary concern and eating in response to stress ( $r = .226^{*}$ ), ostracism and emotional eating ( $r = .269^{**}$ ), ostracism and eating in response to stress ( $r = .244^{*}$ ), and importance of healthy diet and restricted eating ( $r = .222^{*}$ ).

Multiple linear regressions then assessed the strength of the relationships between the four independent variables and each of the three dependent variables. Results showed that need to belong ( $\beta = .267$ ) and dietary concern ( $\beta = .488$ ) significantly predicted restrained eating ( $p < .0001$ ). A second regression revealed that dietary concern was the only significant predictor of emotional eating ( $\beta = .672$ ,  $p < .0001$ ). Finally, dietary concern was associated with eating in response to stress ( $\beta = .221$ ,  $p < .0017$ ), and, interestingly, valuing a healthy diet predicted less eating in response to stress ( $\beta = -.198$ ,  $p < .0029$ ).

These findings suggest college women with stronger concerns about diet and healthy eating, higher levels of needing to belong, and more ostracism experiences are more likely to engage in disordered eating behaviors. Thus, college campuses should foster inclusive social environments and seek to understand the extent to which excessive concerns with a healthy diet may lead to disordered eating, particularly when negative social factors are present.

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# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### E-cigarettes in the News

Electronic cigarette (e-cigarette) use (vaping) by college students has more than doubled from 2017 to 2019 (NIDA, 2020). Though vaping poses health risks, a wave of polarized and mixed media narratives about e-cigarettes having positive (e.g., successful quitting) and negative (e.g., increased risk of COVID-19, vaping hospitalizations) health effects have emerged. The current study explored how these different media narratives affected young adults' e-cigarette use cognitions within the prototype/willingness model (PWM). The PWM predicts substance use behaviors in young adults, via both a socially reactive (willingness) and reasoned (intentions) pathway mediated through norms, prototypes (images of e-cigarette users), and perceived vulnerability (PV) to the harmful effects of e-cigarette use (Gerrard et al., 2008).

Vapers (used e-cigarettes in the past 30 days;  $n = 120$ ), e-cigarette experimenters (used but not in the past 30 days;  $n = 120$ ), and e-cigarette abstainers ( $n = 119$ ) were exposed to a news article relating positive, negative, or COVID-19 related health outcomes of e-cigarettes; or no article control group. 4 (article condition)  $\times$  3 (user-type) ANCOVAs controlling for gender examined the effects on PWM cognitions. Overall, vapers reported lower PV, higher norms, more favorable prototypes, and more reactance compared to experimenters and abstainers ( $ps \leq .05$ ). For abstainers, exposure to the positive effects article or COVID-19 article led to significantly lower PV compared to the control condition ( $p \leq .01$ ), though not significantly different from the negative effects article. Furthermore, somewhat counterintuitively, the positive effects article led to more reactance relative to the other conditions for abstainers ( $ps \leq .001$ ). For experimenters, prototypes were most positive in the COVID-19 condition relative to the other conditions ( $ps \leq .01$ ), and norms were highest in the COVID-19 and positive effects conditions ( $ps \leq .05$ ). Vapers' prototypes were the only cognition impacted by the articles and indicated that their prototypes were more positive in the negative condition relative to the control condition ( $p = .008$ ). Notably, e-cigarette willingness was not impacted by the articles for any participants.

Results suggest that mixed narratives about e-cigarettes in media differentially impacted e-cigarette cognitions, and this largely depended on young adults' past experience with e-cigarettes. For current experimenters with e-cigarettes, COVID-19 and positive narratives about e-cigarettes may increase their use cognitions. Vapers' e-cigarette cognitions seem relatively unaffected by media narratives. Future research should compare the effect of single position and mixed position articles on e-cigarette cognitions.

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# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### “No Risk” Vs. “Low Risk” Messaging about HIV Transmission Risk when Undetectable: Reactions and Perceived Accuracy among US MSM

**BACKGROUND:** An overwhelming amount of scientific evidence indicates that people with HIV who are virally suppressed cannot sexually transmit the virus. In 2016, the Prevention Access Campaign launched the “Undetectable=Untransmittable” (U=U) messaging campaign to promote global awareness about this issue; however, many remain unaware of U=U, including men who have sex with men (MSM). This experimental online survey manipulated messaging about HIV sexual transmission risk. We analyzed the initial reactions and perceptions of message accuracy among HIV-negative/status unknown (HNSU) MSM and MSM with HIV.

**METHODS:** In 2019-2020, 351 HIV-negative/status-unknown MSM and 105 MSM with HIV were recruited in the US to participate in an online study (n=456). Survey participants were randomly assigned to one of three messaging conditions, which systematically varied by level of HIV sexual transmission risk specified in association with an undetectable viral load (no risk/low risk/risk level not specified). Participants reported their initial reactions to the message in an open-response format and then rated its accuracy. A second open-response item was presented to the subset of participants who perceived some level of inaccuracy asking what about the message seemed inaccurate. Responses to both open-response items were thematically analyzed.

**RESULTS:** Most participants were White (74%), gay-identified (83%), and had previously heard of U=U (96%). Across conditions, participants' initial reactions were primarily positive/affirming (68-84%). In the “no risk” (U=U) condition, the most common reactions were enthusiasm (35%) and agreement (16%) among participants with HIV. The most common reactions were enthusiasm (25%), agreement (11%), and disagreement (11%) among HNSU participants. There was a lower percentage of negative/questioning reactions to the “no risk” message among participants with HIV (15%) versus HNSU participants (38%). A higher percentage of participants with HIV (72%) versus HNSU participants (42%) rated the “no risk” message as completely accurate. Among participants who perceived some level of inaccuracy about the message, the most common responses related to misstatement of risk level (66%) and the absence of needed caveats (26%). There was no difference in the percentage of participants who rated “no risk,” “low risk,” or control message as completely accurate.

**CONCLUSION:** Most MSM had previously heard of U=U and responded favorably to U=U messaging. However, many participants—particularly HNSU MSM—perceive the message to be inaccurate and “no-risk” (U=U) messaging was rated as no more accurate than “low-risk” messaging. This suggests that more clarification is needed amongst the larger MSM population regarding U=U messaging and risk representation.

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# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Applying the Prototype Willingness Model to Examine E-Cigarette and Cigarette Use Cognitions among College Student Users, Dual-Users, and Non-Users

E-cigarettes have grown in popularity since their introduction into the U.S market, with recent studies indicating that 26% of college students are current users (Schulenberg et al., 2019). One concern with the rising popularity of e-cigarettes is that it is a gateway to smoking cigarettes (Spindle et al., 2017). Thus, there is a need to identify ways to reduce e-cigarette use in this population. One model that predicts substance use behaviors in young adults is the Prototype Willingness Model (PWM) (Gerrard et al., 2008). The PWM posits a social reaction (willingness) and reasoned (intentions) pathway to health behavior mediated through subjective norms (perceptions of how many people use e-cigarettes), prototypes (images of e-cigarette users), and perceived vulnerability (PV) to the harmful effects of e-cigarette use (Gibbons et al., 2015). The current study sought to examine if individuals who only use e-cigarettes, use both tobacco and cigarettes, or those who have never used either have different levels of PWM cognitions about cigarettes and e-cigarettes.

A cross-sectional sample of college students (age  $M = 19.47$ , 65.8% Female, 60.2% White) were recruited from a university in Texas ( $N = 276$ ) and in D.C. ( $N = 289$ ) to complete an online survey for course credit. Participants who indicated they co-used e-cigarettes and tobacco in the past 6 months ( $N = 60$ ), used only e-cigarettes in the past 6 months ( $N = 129$ ), or used neither in the past 6 months ( $N = 355$ ) were included in our analyses. Analyses of CoVariances (ANCOVAs) controlling for age, location, gender, and amount of use in the past 6 months examined differences between groups.

Co-users had more positive e-cigarette prototype perceptions than non-users ( $p < .05$ ), but e-cigarette users had similar prototype perceptions to both co-users and non-users. E-cigarette and co-users had similar levels of PV to e-cigarettes, but significantly lower PV than non-users ( $p = .002$ ). When looking at participants' comparative PV of tobacco and e-cigarettes, e-cigarette users and non-users reported higher levels than co-users ( $p = .007$ ), but e-cigarette users had similar levels as non-users. In terms of norms, co-users reported higher perceptions of friends who smoke than e-cigarette users and non-users ( $p = .001$ ). Lastly, e-cigarette willingness among co-users was higher than willingness among e-cigarette users and non-users ( $p < .01$ ). These results show differences in cognitions between co-users, e-cig users, and non-users with the riskiest cognitions being with co-users followed by e-cig users.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Summative Imitation as a Mechanism for Generative Learning & Innovation in both Preschoolers and Adults

A unique feature of human culture is that it evolves over time. Cultural evolution is driven by new ideas or innovations. Prior work has shown that such innovations are driven by spontaneously combining others' ideas, a process we've referred to as "intuitive invention by summative imitation." However, a key unanswered question is whether summative imitation only applies to what was learned or if it can be extended generatively to novel and related ideas.

To answer that question, in Experiment 1, adults ( $N=101$ ,  $Mean=23.27$ ,  $SD=7.63$ , females = 51) were tested in one of three independent conditions: Imitation, Emulation, and Independent Invention (Baseline). The imitation group saw a video of a model stacking two cubes and another model combining two squares. The emulation group was identical except that the video only showed the final products, 2 stacked cubes and 2 combined squares. The baseline group was not shown any videos. All groups were given 4 different colored cubes and 4 flat squares of two different colors and were asked to "build the tallest possible tower using all the pieces." In Experiment 2, children ( $N = 59$ ,  $Mean = 5.03$ ,  $SD = .12$ ; females = 32) were tested in either an imitation or independent invention condition. Procedures mirrored those used in Exp. 1 except that children observed live demonstrations. Results show evidence of imitation learning, where both children and adults in the imitation group copied the demonstrated tower elements more often than those in the baseline condition (All  $p$ 's  $< .05$ ). Participants in the imitation condition were also able to extend socially-learned responses to novel items and spontaneously combine these elements significantly more than those in the baseline groups (Generative Learning, all  $p$ 's  $< .05$ ; Summative Generative Learning, all  $p$ 's  $< 0.5$ ).

Results demonstrate that summative imitation leads to generative learning. This socially-driven combination of ideas allows individuals to apply observed responses to novel items that vary in number, size, and shape. The similarity between children and adults suggests that the mechanism(s) mediating these innovations appear early in development and are stable over time. It demonstrates that both the content and the processes resulting in new ideas are likely to be socially learned. But, the application of skills to specific contents occur intuitively, without any explicit instruction. Questions for future research include whether generative learning is domain specific and if it has signature limits or constraints.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Smoking Gun: Confirming Threats in the Art Industry

The lack of regulation in the Art Market is currently enabling foreign parties to evade economic sanctions. Moreover, disparities in the implementation of existing policies continually exacerbate economic and political corruption globally.

A recent Senatorial Staff Report titled “The Art Industry and U.S. Policies that Undermine Sanctions” released by the Permanent Subcommittee on Investigations revealed that weak policy in the U.S. art market has enabled enemies of the State to evade economic sanctions by laundering money through licit art sales. In light of recent election interference, human rights abuses, and Russia’s invasion of Ukraine, the United States placed sanctions on Russia in 2014. These limitations aimed to encourage change in foreign behavior. However, the report revealed that Russia’s elite have been using the Art Industry to undermine U.S. Sanctions for years. For sanctions to affect change, they have to be enforced universally. Yet, as of 2019, Russia still occupied Crimea and was expanding its military presence. In response, Senator Rob Portman and Senator Tom Carper created and led a joint subcommittee to investigate factors that might undermine U.S. sanctions on Russia and weaken their effectiveness. The subsequent findings signify that the U.S. government’s inability to regulate malpractice in the art industry has made the U.S. susceptible to financial crimes.

While the case study of the Rotenberg brothers may seem embellished, the paucity of legislation mitigating rampant money laundering through art and antiquities described in the 2020 Staff Report exemplifies enduring problems in the art industry today. This research highlights the saliency of the 2020 Senatorial Staff Report as an exemplar model of the extent to which the Art Industry’s weaknesses are enabling malpractice. Through an analysis of the Rotenberg brothers’ recent financial crimes, the report validates trends in the Art Industry and flaws in Anti-Money Laundering Legislation, specifically. The Rotenberg case proves that the Art Industry’s lack of regulation has severe economic and political consequences.

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# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Examining The Link Between Discrimination and Prosocial Behavior Among Latinx Adolescents: The Role of Internalizing and Externalizing Symptoms and Gender

**Introduction:** Many studies have examined the negative outcomes of discrimination among Latinx youth (e.g., Madubata et al., 2019), but few have examined links between discrimination and positive developmental outcomes. Prosocial behavior, the voluntary actions that are intended to help or benefit another individual or group (Eisenberg & Mussen, 1989), has been linked with Latinx youth's experiences of discrimination (Davis et al., 2016), however, mechanisms linking discrimination and prosocial behavior are largely unknown. Latinx youth's experiences with discrimination associated with internalizing (depressive symptoms and anxiety) and externalizing symptoms (aggressive behavior) (e.g., Loyd et al., 2019). Each has been associated with prosocial behavior (Memmott-Elison et al., 2020). Thus, depressive symptoms, aggression, and anxiety may mediate the association between discrimination and prosocial behavior. This study examines factors that may link discrimination with prosocial behavior in Latinx adolescents. Because the effects of discrimination may vary for female and male adolescents (Assari et al., 2017), we examine sex differences in these associations.

**Method:** Participants were 547 Latinx adolescents (55.4% female, Mage = 12.8, Range = 11-16) living in a new immigrant destination. Adolescents reported their experiences with discrimination in the community, from peers, and from teachers; prosocial behaviors; and internalizing (depressive symptoms and anxiety) and externalizing (aggressive behavior) symptoms at three time points, approximately 6 months apart. Path analyses were conducted to examine direct and indirect effects of discrimination on prosocial behavior.

**Results:** For female adolescents, discrimination had a significant positive association with anxious/depressed, withdrawn/depressed, and aggressive symptoms. Depressive/withdrawn symptoms were negatively associated with prosocial behavior, and anxiety/depressive symptoms were positively associated with prosocial behavior; aggressive symptoms were not associated with prosocial behavior. For male adolescents, discrimination was not associated with either internalizing or externalizing symptoms. There was a significant negative direct effect of discrimination on prosocial behavior.

**Conclusion:** The findings highlight the importance of discrimination for prosocial behavior among Latinx adolescents. In this sample findings suggest that there are indirect effects for females through internalizing symptoms but there are direct effects for males. Implications suggest working with female Latinx adolescents on their internalizing symptoms may improve their prosocial behavior. Future research is needed to understand the mechanisms linking discrimination with prosocial behavior in male Latinx adolescents.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Psychological Impact of Avatars: The Real-World Marketing & Persuasive Potential of Avatars in the Virtual World

This study investigates how avatars in the virtual world psychologically impact the player, in order to understand the use of avatars for marketing and persuasion purposes. Avatars in video games and virtual worlds are visual images that represent the player. Despite video game popularity, there is limited research on how the Proteus effect – the idea that peoples' actions in the virtual world conform to their avatar characteristics – can be extended to influence real-world human behavior and if these effects can be harnessed to influence consumer behavior. This study hypothesized that avatar customizability and avatar-player realism predict engagement level and emotional response; that avatar attractiveness predicts an increase in real-world confidence; and that product presence increases brand perception. Participants were asked to complete a survey answering questions on a 1-9 rating scale to test these predictions and to also test the effects of two experimental components, namely product presence and avatar attractiveness. Overall, the present study offers significant insight into the highly underused marketing channel of the virtual world, potentially extending the literature on the Proteus effect and the persuasive capabilities of avatars in altering real-world human behavior due to player-avatar embodiment.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### **Sleeping Stressed: the Association Between Increased Stress Levels and Poor Perceived Sleep Quality Levels Among Undergraduate College Students at George Washington University**

This research examined the relationship between sleep and stress in college students. In particular, this cross-sectional survey-based study investigated whether increased levels of stress are associated with increasingly poor levels of perceived sleep quality among undergraduate students at the George Washington University. In this study, all participants filled out a questionnaire about sleep and stress using Google Forms. All answers were obtained by using a Likert Scale with ratings between 0 and 4. Low scores/points for responses are associated with low stress and good perceived sleep quality (conversely, high scores are associated with high stress and poor sleep quality). The conducted Pearson correlation coefficient demonstrates a moderately positive correlative relationship between increased levels of stress and increasingly poor perceived sleep quality ( $r = 0.46$ ). The use of a directional hypothesis warranted a one-tailed probability value (p-value) test, to assess the statistical significance of the correlation coefficient. The calculated one-tailed probability ( $p = 0.00072$ ), is statistically significant. This supports the hypothesis that there is a positive correlation between increasing levels of stress and decreasing perceived sleep quality among undergraduate college students at the George Washington University.

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# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Can Trait Self-Compassion Protect against the Harmful Effects of Perceived Weight Stigma and COVID-19 Related Stress on Weight-Related Behavior?

There are many life stressors that contribute to unhealthy eating and make it difficult for people to maintain a healthy weight. For example, experiencing weight stigma has paradoxically been shown to increase unhealthy eating and even lead to weight gain (Puhl et al., 2020). Recently, stress due to the COVID-19 pandemic has also been identified as a contributor to unhealthy eating and weight gain (Mason, et al., 2021). However, self-compassion, which encourages people to treat themselves kindly during difficult times (Neff, 2007; Leary et al., 2007), may buffer these relationships. Past studies show that self-compassion is associated with healthier eating behavior (Rahimi-Ardabili et al., 2018) and can also protect against the harmful effects of stress on psychological wellbeing (Bluth et al., 2016). The current study examined whether self-compassion is protective against the associations of perceived weight stigma and COVID-19 related stress with weight management during the COVID-19 pandemic. The data comes from a cross-sectional survey of women ages 18-45 who self-identify as overweight or having obesity (N=220).

Multiple linear regressions examined the hypothesized relationships while controlling for Body Mass Index (BMI), which was a significant predictor of all outcomes ( $p < .05$ ) except for past unhealthy eating ( $p = .376$ ). Analyses revealed that COVID-19 related stress, but not perceived weight stigma, was associated with eating more unhealthy foods, eating fewer healthy foods, reporting more problems with diet during COVID-19, and engaging in less physical activity (all  $p < .05$ ). However, self-compassion was strongly associated with healthier outcomes on all measures (all  $p < .05$ ). Self-compassion also significantly moderated the relationship between COVID-19 related stress and all eating outcomes (all  $p < .05$ ). Simple slopes analysis showed that COVID-19 stress was not associated with diet issues, past healthy food consumption, and past unhealthy food consumption among participants with high self-compassion (+1 SD,  $p < .05$ ). Alternatively, COVID-19 stress was associated with more diet problems, less healthy food consumption, and more unhealthy food consumption among participants with low self-compassion (-1 SD,  $p < .05$ ). There were no significant interactions between self-compassion and weight stigma on any outcomes of interest. Results suggest that high levels of self-compassion acted as a protective factor against COVID-19 related stress and reduced its association with unhealthy eating. Encouraging self-compassion may improve weight management and may be imperative for buffering the negative health effects of pandemic-related stress, along with other types of stressors in the future.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Can Fame Be Predicted?

Fame and celebrities have been the spotlight of the media and a very hot topic for many years, and continue to make headlines daily. For many, fame is not an easy status to achieve, yet so many people desire to be famous. Success through fame has been a coveted goal for many humans throughout hundreds of years, however steps to fame have little been calculated. Are there personality differences and professional steps that can be taken to achieve fame? This study examines the paths that celebrities have taken and the big five personality traits (openness, conscientiousness, agreeableness, extraversion, and neuroticism) that are most commonly found in celebrities, while also examining the personalities of participants and what makes certain people intrigued by celebrities. Through use of archival data and a 1 to 5 point rating scale survey, conclusions have been inferred on how the specific personality traits, people/teams that celebrities have worked with, and their field of expertise has influenced their notoriety, their following, and ultimately how famous they are.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Situational Strength of COVID-19 Pandemic on Job Satisfaction and Individual-Organizational Outcomes At Workplace

Numerous studies have been conducted on job satisfaction and its influence on individual mental health outcomes and organizational performance (Lock, 1969; Brayfield & Rothe, 1951). Job satisfaction was first introduced in the 1930s, broadly defined as how happy the employees are with their jobs and aspects within their jobs. It was measured through individual earnings, relationships with co-workers, and career opportunities (Hoppock, 1937). Later, Industrial/Organizational psychologists identified a few factors to measure job satisfaction, including Perceived Autonomy, Relationship with Co-workers, and Growth Opportunities. Research on job satisfaction is mixed; nevertheless, it reveals that it directs the outcome of actions as appraised by the employees, primarily from job performance (Locke, 1970). Research has also found job satisfaction has an irreversible impact on individuals' physical and mental well-being (Faragher, 2005). Further, work intensity has been tested as a moderator of an individual's job satisfaction and overall psychological health (Boekhorst, 2017). Therefore, previous studies have established the relationship between individuals' job satisfaction and individual-organizational outcomes, naming individual psychological health and job performance in organizations. The current study aims to examine the influence of the COVID-19 pandemic on this relationship. The intensity of situational stressors caused by the COVID-19 pandemic has a moderating effect on individuals' work and personal lives. By focusing on the strength of the situational factors caused by the COVID-19 pandemic, this study will explore whether the relationship between job satisfaction and individual-organizational outcomes is modified. This study surveys 80 participants on their levels of Job Satisfaction (Perceived Autonomy, Relationship with Co-workers, and Growth Opportunities), Intensity of Work, Intensity of Situational Stressors, Job Performance, and Individual Overall Psychological Health. The results contribute to workplace applications and interactionism and suggest that workers and their relationships with their jobs are a joint function of their situations at work or beyond work. The study of situational strengths in Industrial/Organizational psychology will help us better understand how situational characteristics influence the criterion-validity of dispositional characteristics.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Persuasive Impact of Offensiveness in Animal Rights Messaging and the Mediating Role of Emotions

Animal rights groups such as People for the Ethical Treatment of Animals (PETA) advocate a radical position: that animals and humans should be treated as equals. Though this idea and its associated philosophies are viewed by many Americans as inherently offensive, PETA also consistently chooses deliberately offensive tactics in its advertising execution. Previous communication research has focused on defining and anticipating what may be considered offensive and controversial advertising, with some study of the persuasive effects of offense, controversy, and shock appeals. Additionally, despite major research gaps in this area, communication scholars have begun to research the role of multiple discrete emotions in persuasion. Little research, however, has been done on the mediating role of emotions in offensive advertising. This study aims to understand the persuasive impact of offense appeals in the context of animal rights messaging, and it also seeks to understand the role of emotion in mediating that offense and its effect.

A survey group of mostly college students is being recruited through convenience and snowball sampling to participate in the study. Stimuli consist of two short video advertisements produced by PETA, one of which contains an overt offense appeal. Participants will view one of these stimuli, then respond to a survey questionnaire measuring emotions of anger, discomfort, disgust, compassion, and guilt; attitudes about the video, PETA, and the animal rights movement at large; and behavioral intentions to support the animal rights cause. Hypotheses predict that pre-existing attitudes about the animal rights movement and/or vegetarian or vegan identities will moderate perceived offense and the persuasive effects of perceived offense. This research also tests the mediating role of emotions of disgust, anger, discomfort, guilt, and compassion on the dependent variables of (a) support for PETA, (b) support for the animal rights movement, and (c) willingness to become vegetarian or vegan. Hypotheses also predict that perceived offense will be positively associated with disgust, anger, and discomfort, and negatively associated with compassion and guilt. Further, hypotheses predict that emotions of anger, disgust, and discomfort will be negatively associated with the dependent variables, and emotions of guilt and compassion will be positively associated with the dependent variables. The data will be analyzed using multiple statistical analytical methods.

The results of this research will provide valuable insight into the links between offensive messaging, persuasion, and emotions. Understanding these links will aid future environmental and social groups in crafting effective messaging campaigns.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Supporting Children of Incarcerated Parents (CIP) and their Families through Bibliotherapy and Workshops

Children of incarcerated parents (CIP) are a vulnerable, unacknowledged, and hidden population of the criminal justice system. Although accurate numbers of affected children are almost impossible to count, according to the Annie E. Casey Foundation, in Washington, D.C. between 2011 and 2012, approximately 9,000 children experienced parental incarceration. Parental incarceration is particularly impactful in the District because compared to the other states, the District of Columbia has the highest rates of incarceration in the United States, and most people who are convicted of felonies in DC are sent to serve their sentences in federal prisons all over the country, further straining family ties.

My research has focused on developing practical means to support CIP in Washington. In the course of the research, I identified DC Project Connect (DCPC) as an organization that works with families affected by incarceration. One of their tools has been to develop and then use children's storybooks about children dealing with themes of parent's incarceration. This approach employs bibliotherapy, especially in conjunction with workshops for affected children and their families. Consistent with engaged scholarship and research in the service of social change, I am now working with DCPC to (i) expand identification of and support for children of incarcerated parents and their families, including parents who are incarcerated, to enhance children's coping skills despite trauma and stigma, and (ii) promote community empathy for and raise awareness of CIP and their families.

The research identifies four intended audiences for the storybooks and workshops: CIP, parents and caregivers, primary community contacts, and the broader public. Each community group requires distinct means of outreach and support. In regard to incarcerated parents, expert-led workshops and reading circles will be held in DC's Department of Corrections. Additionally, parents will be offered assisted communication with their child using DCPC's books, subsequent correspondence, and resources. In regard to primary community contacts (e.g. DC Public Schools, DC Public Charter Schools, DC Public Library) and the broader public, workshops will be held to expand awareness of and support for CIP. DCPC's storybooks will be provided for classrooms, libraries, and counselors' offices. The expected outcomes for this program are to increase direct support for CIP; increase indirect support of CIP through expanded community awareness and information; challenge the invisible needs of CIP; increase communication between IP and their children; and increase coordination with key DC stakeholders, with a focus on CIP needs.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Listening for Silence: A Rhetorical Analysis of Gordon Hempton's Ecological Sound Art

The field of ecological thinking has been applied to many spaces, such as activism, film and visual media, and sonic mediums. With ecological scholars emphasizing the need to deconstruct and redefine our relationship with nature, ecological sound art, an art medium that uses recordings of nature with human-composed instrumentation, offers a new perspective, using sonic rhetoric that affects one of our most overlooked senses: our hearing. That said, there is a significant lack of in-depth, rhetorical case studies on ecological sound art and artists, with much of the research landscape consisting of rhetorical overviews of the genre as a whole. Thus, there remains a research gap to be filled by rhetorical analysis of the communication tactics and techniques used in ecological sound art exhibitions, and how these exhibitions could contribute to ecological activist messages and cultural narratives surrounding nature. My research fills this gap by conducting a case study of Gordon Hempton's projects "One Square Inch of Silence" — in which Hempton works to protect one square inch of "silence" in the Hoh Rain Forest at Olympic National Park — and Quiet Parks International — the larger scale non-profit organization Hempton's One Square Inch project has developed into. The study is framed within the context of ecological thought and activism, investigating if, and how, Hempton's ecological sound art can be used as an alternative approach for up-and-coming climate activist groups. I gather data through rhetorical analyses of the One Square Inch website, the Quiet Parks International website, and various sound art pieces composed by Gordon Hempton on his One Square Inch of Silence – Companion Audio CD. Results are tentative, as I am still conducting my research, but I found that Hempton's projects assume the human-as-separate-from-nature dialectic, placing humans in a savior role and nature in a victim role. Additionally, Hempton's works describe "natural quiet" as a resource, implying that quiet is something that can be extracted and enjoyed by humans. These findings highlight the need to better understand nature's role in sound art projects like Hempton's and identify how sound artists could better acknowledge human interconnectedness with nature. I intend to define "natural quiet" for Hempton's organization, as no explicit definition is provided, and explore how this concept can be used to give nature a voice in rising ecological activism.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### An Exploration into the Experiences of Women of Color in Panhellenic Sororities at The George Washington University

As a Black woman who is a part of the Panhellenic community at George Washington University, I was interested in speaking to other women of color in my community to learn more about their experiences. As racism and issues of diversity became a very important focus of the American public in the summer of 2020, I felt that it was important to continue to investigate the way institutional racism affects these women in historically racist organizations. I had a hypothesis that being involved in a Panhellenic sorority at this particular school would yield a unique set of experiences for women involved in this community as opposed to past research done at other universities. Nine women who have been in Panhellenic chapters at GW were interviewed for this study over the Zoom virtual platform. The findings of the study found that overall, despite the overwhelming literature that would prove otherwise, these women of color have had positive experiences. These results have important implications on research surrounding diversity and inclusion in predominantly white spaces as well as better understanding these organizations' internal cultures.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Scripting Indian Matchmaking: A Discussion of Gender, Tradition, and Diaspora

A documentary series with all the theatrics of reality television, Indian Matchmaking recasts the Hindu tradition of “arranged marriage” as “matchmaking” to offer an alternative narrative to the stigmatization of arranged marriage in the U.S. The show follows matchmaker Sima Taparia in her quest to find prospective spouses for her clients based in India and the U.S. In an entertainment industry with limited Asian American representation, least to say South-Asian, the show immediately entered the realm of public discourse. As travel between the U.S. and India was completely shut down during the first few months of pandemic, Indian Matchmaking offered Indians in diaspora the opportunity to seek solace in a show about their culture and traditions.

According to the show’s director and executive producer, Smriti Mundhra, Indian Matchmaking presents an opportunity to convey the practice of arranged marriage through an “unabashedly, authentically Indian” perspective, showing the nuance and “breadth of the diaspora.” Thus, Indian Matchmaking presents a unique site for exploring how various subjectivities are realized, remade, and resisted through the show’s reimagining of the practice of arranged marriage. This research was particularly interested in how the show prescribes specific gender scripts for professional South Asian American women through the depiction of two cast-members, Nadia and Aparna. Through a survey conducted in the Little Brown Diary (LBD), a Facebook community created for South Asian millennial women living in the North American diaspora, this research explores how a group of millennial South Asian women react to Indian Matchmaking’s portrayal of Aparna and Nadia, and in the process, engage in the work of queering. Given the prevalence of arranged marriage and its influence in South Asian women’s lives in the North American diaspora, further research needs to be conducted on this topic. The relationship between diaspora and homeland continues to shift, creating opportunities to forge new connections and stake different claims for and against tradition. As the world emerges from the pandemic, scholarship should focus on marriage as a crucial site for understanding how South Asians in diaspora attempt to negotiate their ties with the homeland in response to the cultural, social, and political processes of their time.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Self Efficacy and Exercise-Specific Consideration of Future Consequences are Significant Predictors of Exercise

Many studies have shown the significant role of self-efficacy (SE) in predicting health behaviors. More recently, however, a domain-specific measure of Consideration of Future Consequences (CFC-exercise) has been utilized to evaluate predictors and correlates of physical activity. In this study, 127 university students took an online survey that measured their physical activity in the past seven days, CFC-exercise, and SE. I hypothesized that CFC-exercise and SE would be similarly predictive of physical activity behavior, and this hypothesis was supported by the data. These findings can inform future research in that CFC-exercise, a much newer and less used construct than SE, has also been shown to be significantly associated with physical activity. This research can be applied to intervention methods to promote physical activity, furthering our development of a healthier society.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Rethinking DC Youth and Policing Project

The Rethinking DC Youth and Policing Project is a collaborative partnership with the GW Black Student Union, Nashman Center, Sociology Department, and the Metropolitan Police Department. The cohort consists of ten federal work-study students and students within the sociology course (SOC 2189) who actively research ways to drive down youth arrests and develop ways to divert children from the justice system. The cohort develops research projects along with contributing to a police database of major cities and their responses to both the Black Lives Matter movement and the COVID-19 pandemic.

Each team has identified different areas of interest to spend a full academic year investigating, studying, and then creating a plan to implement their projects. Bishop Walton, Kylie Foster, and Kourtney Buckner work directly with the social media advocacy portion, which consists of dynamic storytelling of the Federal Work-Study cohort, policy issues, and conversations that engage the GW and DC community at large. The vision of this campaign is to bring to light how students are actively rethinking and researching in a new form of academic advocacy that is unparalleled on the campus. Additionally, the social media advocacy campaign's goal is to inspire other students to reimagine the dynamic between youth and police within their cities. This campaign provides content, webinars, and toolkits to expand from campus to campus throughout the nation.

Student researchers have also created projects to address all of the major components of the criminal justice system including law enforcement, the judicial courts, and the education system. In alignment with this focus, Camille Germinal and Melanie Mata have developed a project called "Talk it Out!", where they provide educators with toolkits to help them deal with conflict in a better fashion before involving law enforcement. As part of their efforts, Camille and Melanie are structuring a database for the District of Columbia Public Schools compiling information about restorative justice through the "Restorative Practices Implementation Rubric".

Ale and Grace will aim to lobby the implementation of The Youth Rehabilitation Act in D.C. allowing, for shorter sentences for some crimes and would actively decrease the instances of juveniles being sentenced as adults.

Jelly Bonilla, Betty Hailu, and Hanna Yalew are formulating a policy brief disclosing the various physical, psychological and sexual trauma that Black girls have faced within the District. Included in these briefs are recommendations on how the MPD can contextualize and recognize trauma against Black girls.

### Primary Presenter

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### The Impact of COVID-19 on Military-Affiliated Students' Mental Health and School Experiences

This project mainly focuses on how the COVID-19 pandemic is affecting the military-affiliated student population in comparison to the general student population. In this study, the military-affiliated student population is defined as veterans, active-duty servicemembers, dependents (children  $\geq 18$ ), and spouses currently enrolled in a degree program (undergraduate or graduate). Specifically, the project collects data on students' COVID stress, compliance with CDC COVID-19 guidelines, as well as their experiences of work-school conflicts and economic stress during the pandemic. The survey will primarily use the COVID Stress Scales which has been developed to identify those in need of pandemic-related mental health services. Under the assistance of the military student office, we expect to recruit a group of 200 military-affiliated students from several local universities in the D.C. area. Another group of 300 non-military-affiliated students will also be recruited using a mix of snow-balling method and convenience sampling method. Because many veteran students are older and more experienced, they may have a different perspective on school in general. Additionally, this experience may have enabled them to better adapt to the changes brought by COVID-19. As such, we hypothesize that the military-affiliated student will have higher levels of compliance to CDC-recommended guidelines. Additionally, military-students' anxiety- and stress-responses (i.e., COVID stress) will be lower than those of the general student group. Furthermore, given that studies commend military-affiliated community members on their resiliency and adaptability, this study also aims to reveal whether trait resiliency can mitigate the impacts of stressors associated with the COVID-19 pandemic. The research results will be used to better develop and create programming across university programs to better understand and serve their military-affiliated students, a sect of the population that is often overlooked. With this information, we can better prepare universities to support their military-affiliated student populations. This research project is ongoing and will hopefully conclude by the end of the spring 2021 semester.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

### Exploring the Impacts of For-Profit Strategies on a Nonprofit Organization's Success

This paper seeks to explore how for-profit strategies applied to nonprofits impact nonprofit organizational success. The literature review covers previous research on strategy development, fees for service model as a for-profit strategy, and nonprofit environmental factors to understand why nonprofit organizations tend not to use revenue-generating strategies. A case study of a national education-focused nonprofit organization called The New Teacher Project (TNTP) will be used to explore a fees for service model applied to a nonprofit. The research will examine internal and external stakeholder data to gain insight into TNTP's relationship with its stakeholders, for-profit strategies, and mission achievement. Content analysis coding and benchmarking to nonprofit standards of success will be used to gain an understanding of for-profit strategy influence on nonprofit organizations. Results may suggest that for-profit strategies impact organizational success.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## CORCORAN SCHOOL OF THE ARTS & DESIGN

### The Relationship between Minimum Wage and Earned Income Tax Credit Receipt

Two of the most effective poverty alleviation policies in the United States are the minimum wage and the Earned Income Tax Credit (EITC). Researchers have measured the efficacy of each of these policies with respect to earnings and quality of life, however, the interaction of these policies is rarely studied. Understanding this interaction is useful in assessing the net change in earnings of low income individuals. Using a difference in differences model on panel data of ZIP code tax returns, this paper will estimate the impact of increasing minimum wage on average EITC receipt. Preliminary results show that an increase in minimum wage causes a statistically significant decrease in average EITC receipt.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS

### Would You Pay To Stay?: An Analysis of Top Margin State Income Tax Rates and Interstate Migration

Income tax increases have historically faced backlash, especially from the wealthy. Consequently, this group has lobbied intensely against these tax changes, arguing that such measures would ultimately hurt the state as they and many others would simply leave and take their tax revenue with them. However, these threats are not necessarily founded as a small number of high income earners leaving does not outweigh the revenue benefits of higher rates. To analyze the impact of top margin income tax rates on domestic migration, this paper examines U.S. Census state-to-state migration flow data alongside the think tank Tax Foundation's top margin state income tax rates from 2008 to 2018. With this data, the study estimates a linear regression on panel data with time and state fixed effects, controlling for state living costs, employment prospects, income levels, and income tax burden. When these factors are accounted for, top tax rate does significantly negatively affect net state migration. Further, top tax rate exhibits a slightly positive relationship with net migration into the state such that a one percentage point increase in the top tax rate corresponds to nearly a 0.10% increase in state population through domestic migration. These results suggest that policymakers could likely raise taxes without fear of mass emigration or loss in overall tax revenue.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Invisible and Yet Hyper-Visible: The Gendered Experiences of Female Military Leaders

The rise in social awareness of the experiences women encounter in professional environments has included pressure within the military to address issues pertaining to sexual violence and discrimination. The proposed Combating Military Sexual Assault Act of 2019 was but one of many attempts from civilian and military leadership alike to address the continued prevalence and rise of sexual assault and harassment within the US armed forces. Attempts at eliminating such misconduct have been met with negligible success and the military continues to seek initiatives to prevent such misconduct contrary to good order and discipline. Such misconduct only highlights the particular challenges associated with the gender integration of the armed forces and has become ever more apparent with the repeal of combat exclusion policies as of 2013. Beyond efforts to raise awareness, little inquiry has been done to understand the many ways in which gender manifests itself in women's military service and the military environment. Gendered experiences extend beyond issues of misconduct and include the multitude of ways in which gender plays a role in the careers and experiences of women at all levels of military service. Specifically, gendered experiences incorporate those experiences, both formal and informal, reflecting or involving gender differences or stereotypical gender roles.

This purpose of this qualitative research study was to understand the gendered experiences of active-duty senior enlisted women in the US military. The study utilized the lenses of gendered organizations theory, feminist institutional theory, and social learning theory. In-depth interviews were conducted with twelve participants representing all three senior enlisted ranks of the four military branches within the Department of Defense. Findings included organizational structures, institutional culture, gendered misconduct, and learning to navigate as fundamental categories of the gendered experiences of the participants along with emergent themes of leadership, intersectionality, voice, and family planning.

From a theoretical perspective, consideration of the multitude of ways in which gender permeates professional environments and the subsequent experiences of their members facilitates a more comprehensive understanding of organizations and institutions and the ways in which members navigate them. Furthermore, insight into the uniquely gendered structures and culture of the US military enables a more conducive approach to high-profile issues such as sexual violence and discrimination as well as the transferability and applicability to other traditionally male-dominated professions.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Inclusion in the Intelligence Community: Experiences of African American Women

To counter threats to national security within an increasingly complex and unstable global arena, the Intelligence Community (IC) requires a highly skilled workforce with diversity at all organizational levels. African American women, a historically marginalized group within the IC, are underrepresented in the senior grades (senior executive, GS-15 and GS-14), which suggests inadequacies in creating and sustaining inclusive environments that provide opportunities for advancement to historically underrepresented populations. Given that the experience of inclusion of African American women civilian employees within the IC is unexplored in the literature, this basic qualitative study, informed by the theory of intersectionality, a conceptual framework of inclusion, and a model of inclusive organizations, explored how African American women civilian employees at a national intelligence agency describe the phenomenon and the experience of inclusion, and the meaning the participants assigned to inclusion in connection to their perception of opportunities for professional development.

The nine African American women who participated in this study described inclusion as a multi-dimensional construct including a sense of belonging, the opportunity to participate, and being valued as a contributor. The participants explained that having opportunities for development was integral to the experience of inclusion, and that they experienced inclusion when supervisors supported their participation in opportunities for development. However, experiences of “not inclusion,” as opposed to inclusion, were predominant in the participants’ narratives. Stereotype threat emerged as playing a negative role in the experience of inclusion, suggesting an area for further research and indicating the need for organizational interventions to disrupt organizational cues of stereotypes.

The participants’ perceptions of organizational change and their observations of senior leaders informed their views of the organization’s commitment to inclusion. The findings point to organizational initiatives to improve inclusion, such as enabling employees to inform themselves about and self-select for development opportunities and establishing and holding supervisors accountable for adhering to standards of inclusive leader behaviors.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

### Institutional Factors that Impact Managers' Attitude Towards the Value of Telework in the U.S. Federal Government: An Exploratory Study Using Latent Class Analysis

Telework is a strategic human resource development (HRD) practice many employers have adopted and implemented to remain agile, reduce work-life tensions faced by employees, and support performance at every level of the organization. For the U.S. Federal Government workforce, legislative law requires Federal agencies to implement telework to the maximum extent practicable. However, there is significant research indicating a high percentage of managers in the Federal Government do not support telework. The purpose of this quantitative study was to examine latent classes of institutional factors among managers in the Federal Government and determine their likelihood of attitudes towards the value of telework based on class membership.

The theoretical framework used in this study is institutional theory. Institutional theory explains how environmental and social factors influence individual attitudes and decision-making. Scott's (2001) institutional framework was used to explore how the normative and cognitive sub-constructs are conveyed or carried throughout time and space of an organizational system, taking on the form of various mediums that are classified as symbolic systems, relational systems, activities, and artifacts.

The methodology of this study is a secondary data analysis, examining a sub-set of data (n = 9510) from the U.S. Office of Personnel Management's Federal Work-Life Survey (2018). Latent Class Analysis (LCA) was the statistical method used to examine the likelihood of managers' attitudes towards the value of telework based on latent class membership of institutional factors. LCA is a person-centered method for describing how individuals differ based on responses to a set of manifest indicators (Lanza & Cooper, 2016).

A group comparison of managers' attitudes towards the value of telework to support employees to perform their work was used to explore measurement invariance and determine if items map onto the latent construct in the same way for each categorical indicator of attitude. The findings of this study confirmed that there are distinct latent classes of managers based on indicators of workplace telework culture, adequate supervisory training, and experienced benefits of telework. Likewise, the likelihood of managers' attitudes towards the value of telework can be determined based on the prevalence of each assigned latent class.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF BUSINESS

### The Relationship Between the Positive Attitude towards Hardships and the Perception of Hardships

Previous research has revealed that there are significant gender differences in resilience and psychological distress during hardships such as the 2008 financial crisis. Specifically, an alarming number of males in North America and Europe chose to end their lives due to the stress and depression caused by the crisis. The statistics brought researchers to examine the behaviors of males and females and the underlying biological mechanism in stressful situations. This research intends to investigate the gender-related attitudes and behaviors during the current COVID-19 global pandemic. While previous research might treat “sex differences” and “gender identity” interchangeably, this research paper separately discusses these two factors in a way that the sex and gender are important factors in determining how an individual responds to adversity. The social expectation is identified as another moderator that will influence the effect of independent variables on the outcomes. Because all human beings live in the social context, the effect of social expectation will twist people’s behaviors to some extent. People tend to act in different ways when they care about the images they generate in front of others, or when society poses certain pressure on them. Often times, the goal of fulfilling social expectations trigger the adaptive functions. The researcher has developed a strong framework of regression analysis in SPSS and an independent t-test to examine the correlation. The researcher also designed a survey by using the semantic differential scale. The research is currently under the stage of data collection while the IRB forms are in the process of being reviewed. Therefore, this research intends to examine the perception of hardships and positive attitudes towards hardships during the Covid-19 global pandemic, moderated by gender identity, sex differences, and social expectation. After reading the research, the audience knowledge of gender-related attitudes and behaviors during hardships should be increased.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF ENGINEERING AND APPLIED SCIENCE

### Content Analysis of Persian/Farsi Tweets during COVID-19 Pandemic in Iran Using NLP

Iran, along with China, South Korea, and Italy was among the countries that were hit hard in the first wave of the COVID-19 spread. Twitter is one of the widely-used online platforms by Iranians inside and abroad for sharing their opinion, thoughts, and feelings about a wide range of issues. In our study, using more than 530,000 original tweets in Persian/Farsi on COVID-19, we analyzed the topics discussed among users, who are mainly Iranians, to gauge and track the response to the pandemic and how it evolved over time. We applied a combination of manual annotation of a random sample of tweets and topic modeling tools to classify the contents and frequency of each category of topics. We identified the top 25 topics among which living experience under home quarantine emerged as a major talking point. We additionally categorized the broader content of tweets that shows satire, followed by news, is the dominant tweet type among Iranian users. While this framework and methodology can be used to track public response to ongoing developments related to COVID-19, a generalization of this framework can become a useful framework to gauge Iranian public reaction to ongoing policy measures or events locally and internationally.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF MEDIA & PUBLIC AFFAIRS

### Information Inequality and Impact of COVID-19 on Communities of Women of Color in the D.C., Maryland, and Virginia (DMV Area)

In the words of the one and only, Judge Ruth Bader Ginsburg: “We [women] should not be held back from pursuing our full talents, from contributing what we could contribute to the society, because we fit into a certain mold —because we belong to a group that historically has been the object of discrimination (Ginsburg, Hartnett, & Williams, 2018).”

The Idea of this thesis developed in the summer of 2020 in my Arlington, VA apartment, when faced with uncertainties of maintaining legal status as an international student in the U.S. as universities decide to conduct virtual learning for the upcoming semester. To ensure women’s voices are heard from both grassroots and institutional level, this thesis urges political leaders to provide an information inequality focused responsive economy recovery plan. Access of adequate information is unevenly distributed due to absence of equal technology and training in technology, ultimately creates information inequality. The cost of information acquisition by less advantaged groups is higher than elite social classes. Intersection of inherited social inequality overlaps with information inequality can only widen the gap between inequality among the disadvantaged groups.

The primary goal of the thesis is to understand how information acquisition is an inequality disparity that needs to be addressed at a local and institutional moving forward in the U.S. To understand communities of women of color are being left behind, once again as the society advances in technology and other modern ways of acquiring information. Such disparities showcase real urgency to be address as the U.S. combats the impact of COVID-19 beyond economic relief but structural changes.

This thesis will first introduce inherited inequalities for communities of women of color and explain an additional inequality disparity in the time of COVID-19: information inequality and the role of information as a commodity in a society that relies on technology from day to day life. To narrow down the geographic focus, a qualitative research then to showcase communities of women of color in the Greater Washington Area; D.C, Maryland, and Virginia. In the hope to understand how women have been facing high information acquisition cost and barriers to become knowledgeable during the COVID-19 pandemic, which is the foundation of empowerment to achieve sustainable gender equality.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF MEDIA & PUBLIC AFFAIRS

### **The Devil and America's Soul: How Lucifer Represents the Connection Between Secularism and Anti-Religious Television in America**

A long line of research in political communication has focused on the role of entertainment programming and its influence on social and political attitudes. Religion is a powerful element of society that can both shape and be shaped by entertainment programming. Previous research suggests that television networks are influenced by the religiosity of their target audiences, and religion is often co-opted into popular culture, which both reinforces and reflects our values. This is particularly important when considering the upward trend of secularism in the United States. This study adds to that work by looking at the Netflix hit show *Lucifer* – a program about the devil moving to Los Angeles, whose storylines feature religious themes and characters. By analyzing the show and speaking with viewers we can better understand how religious or anti-religious themes are presented and interpreted. This paper uses a close analysis of the show *Lucifer* to analyze how anti-religious themes are portrayed in this program. The study is furthered through a focus group of *Lucifer* fans, who discuss their views on religiosity in the show, their participation in the show's fandom, and their personal religious affiliations. Finally, the study acknowledges that the ways entertainment media portrays religion can differ between networks, as audience fragmentation makes certain religious or anti-religious themes more compelling to one audience rather than another. The study takes advantage of the fact that *Lucifer* aired on both network television and Netflix to examine how the themes and storylines of the program changed as the program moved from network television to a streaming service.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF MEDIA & PUBLIC AFFAIRS

### E-Free-ish Speech: The Rise of Twitter's Corporate Interference In The American Conversation

Given that a good deal of communication is now happening on private online platforms, Americans are growing skeptical that the First Amendment will protect their speech in this rapidly evolving landscape. S230, the primary legislation regarding online speech, grants social media companies legal immunity to platforms in exchange for their assistance in content moderation, often done through a set of rules known as the Terms of Service (ToS). However, there is no guarantee that a company's ToS will uphold the broad speech protections found offline. This uncertainty causes some citizens to want further government intervention to ensure free speech precedents from famous Supreme Court cases such as *Brandenburg v. Ohio* and *New York Times v. Sullivan* are upheld online. Nevertheless, Twitter continues to assert that its strict standards of conduct online should be the path forward. Additionally, the moderating variable—that the left-leaning majority of Twitter users are disproportionately reporting tweets that are not culturally congruent with the political correctness movement, therefore inviting this “censorship”—is also explored. While this paper finds some evidence to support this theory, overwhelming evidence points towards these two concurrent events being merely tangentially related. Thus, it is clear that Twitter is willingly altering the national dialogue by not upholding the traditional free speech standard that exists offline.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF MEDIA & PUBLIC AFFAIRS

### Media Framing of Terrorism: Emotional Frames, Public Opinion, and News Coverage in a Post 9-11 World

In the wake of 9/11, politicians called for a swift and mighty response from the United States military due to the perceived increase in terrorism risk. This threat of terrorism was used as a justification for the wars in Afghanistan and Iraq. Emotional frames were invoked to emphasize religious motives of terrorism and produced the most frightening and risk-inducing portrayals of the terrorist events. In their coverage of these events, journalists must navigate the tricky balance between needing to convey necessary information to the public and minimizing the emotional reaction that terrorists want. This study provides an update to the post-9/11 literature on public opinion and emotional narratives to a more contemporary context. It examines the role of emotions as frames, the factors that impact emotional responses, and explores how the coverage of terrorism has changed since 2001. This study conducts a deep dive content analysis into CNN and NBC news coverage of terrorist attacks on US soil with 5+ casualties since September 11, 2001. It empirically analyzes all day-of and up to four subsequent days of news coverage of these attacks. To better understand how to improve news coverage of terrorist events, there must be an in-depth analysis of past practices. This study provides insight into emotional trends and themes that exist in broadcast coverage of terrorism events.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF MEDIA & PUBLIC AFFAIRS

### Re-learning to Read: The Impacts of Digital Media Literacy on the Identification of Misinformation by Seniors

Countering the spread of fake news, misinformation and disinformation online, has recently become a top priority for governments and social media companies alike. Though misinformation presents a universal issue, this project will place a particular focus on older Americans. Despite making up a small portion of social media users, studies suggest that “non-digital natives,” senior social media users, are the most prominent sharers of posts containing misinformation (Guess, Nagler & Tucker, 2019; Brashier & Schacter, 2020).

There are a range of counter-misinformation remedies in existence, yet the effectiveness of these various remedies is either inconclusive or lacking altogether. One particularly promising but still understudied remedy is digital media literacy. This training is meant to teach users to critically and correctly evaluate information for themselves. By using a training designed by AARP, an organization that is known by and largely-trusted by older Americans, this project tested whether media literacy training can serve as an effective intervention to empower individuals to better recognize misinformation and thus diminish their likelihood to share and further aid the false content’s transmission.

To test this, an experiment was conducted, whereby some participants received the literacy treatment and others did not. All were then asked to review a series of unaltered screenshots of Facebook posts containing news; some posts contained articles with content deemed false by independent fact check organizations and others with independently-verified content. Participants were asked to share whether they perceived the headlines as accurate, as well as their likelihood to share the content and the reasoning to why they would or would not be likely to share.

To evaluate the effectiveness of this treatment, the proportion of Facebook posts that were correctly identified as accurate or inaccurate were compared between treatment and control groups. Additionally, average evaluation scores for the older participants were compared to the evaluation scores of the younger comparison group to see if the AARP treatment was particularly effective among the targeted older users. This research holds the potential to make an important contribution to existing understandings of how best to address misinformation and disinformation campaigns.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF MEDIA & PUBLIC AFFAIRS

### Door Knocking During Social Distancing

During the 2020 election cycle, the COVID-19 pandemic severely disrupted political campaigns' targeted turnout operations, also known as "Get Out the Vote" (GOTV). As social distancing guidelines advised against face-to-face contact, many campaigns curbed or altogether halted in-person canvassing, which is widely thought to be the most effective GOTV tactic. But so far, the discussion around this has been dominated by scattered anecdotes and arguments.

This study, through surveys and interviews of high-level staffers on campaigns and campaign-adjacent organizations, will provide a clearer understanding of how the pandemic affected the conduct of campaigns with a focus on how they adapted their GOTV strategies. Though the study is ongoing, pilot results indicate that campaigns were aware of the damage posed by the loss of canvassing and may have sought to compensate for it by making other traditionally impersonal methods of GOTV, such as phone and text banking or direct mailers, more personal. The greater aim of this study is to examine what the extreme conditions of 2020 mean for the wider discussion around GOTV tactics and to investigate the impact of unexpected externalities on the modern approach to campaigning.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF MEDIA & PUBLIC AFFAIRS

### **By Any Other Name: The Linguistic Implications of the Media's Characterization of the Black Lives Matter Movement**

J.L. Austen's speech act theory says the language we use does not only describe an objective state of being, but also performs an action and speaks a reality or connotation into being. Through this, he defines three components of language: Locutionary, illocutionary, and perlocutionary. The locutionary act is descriptive, the illocutionary act is performative, and the perlocutionary act is the consequence of the performance. This study explores how mainstream media outlets across the political spectrum characterize institutional culpability through their coverage of the Black Lives Matter movement. Based on Austen's theory, it not only studies how the media describe police brutality and the devaluing of Black lives, but also how it performs it and the consequence of that performance. This study specifically explores how outlets characterize the victim's death through specific use of the words "death," "killed," "murdered," or "shot" (when applicable) to investigate not only how the language describes the incident (i.e., the locutionary act), but also how it implicates or makes culpable institutional actors through the illocutionary and perlocutionary acts. These words imply varying levels of culpability, with "death" implying the weakest--as it is spoken in the passive voice and portrayed as independent from the police's act of killing--and "murder" implying the strongest--as it directly links the police with killing and generally appends a moral dimension along side the legal one. This study also measures whether the article explicitly references police brutality, the role of the State, and left-wing media bias, as well as how it characterizes the constitutionality of demonstrations, the victim's character, or engages in "one bad apple" rhetoric. To investigate these measures, this study coded news articles from 10 sources across the political spectrum: Mother Jones, CNN, Politico, NBC News, Bloomberg News, The Washington Post, The New York Times, The Wall Street Journal, Fox News, and Breitbart. This study identified victims from 2012 to 2020, the relative start of the Black Lives Matter movement to present day, respectively, and coded seven high-profile victims: Trayvon Martin (2012), Michael Brown (2014), Eric Garner (2014), Freddie Gray (2015), Philando Castile (2016), George Floyd (2020), and Breonna Taylor (2020). This study investigates the language used to describe the Black Lives Matter movement, the extent to which it holds institutions accountable, and the consequences on institutions and public opinion.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## SCHOOL OF MEDIA & PUBLIC AFFAIRS

### Visual framing of the Catalan Independence Movement in Spanish and Catalan Newspapers

In October 2017, Catalonia, one of seventeen autonomous communities within Spain, hosted an illegal referendum on secession from the Spanish state. In an attempt to stop the referendum, the Spanish government deployed 6,000 militarized police, leading to violent clashes with citizens that left 800 people severely injured. Catalan independence continues to be a highly contentious topic within Spain, with both its supporters and opposition turning to the media to express their opinions. This project examines the portrayal of the independence movement in both Spanish and Catalan media. Specifically, this study analyzes media coverage through the lens of visual framing, looking at the portrayal of protests and political actions in the years leading up to and following the referendum. While existing research has looked at the October 2017 referendum through the lens of political or social movements, the influence of media coverage remains unexamined. This research project examines photos published between January 1, 2012 and March 1, 2021 from the two Spanish and two Catalan newspapers with the highest circulation rates (El País and El Mundo from Madrid, La Vanguardia and El Periódico from Catalonia). The findings of this study aim to shed light on the ways that photos are used to frame protest movements by eliciting specific emotional responses and forming moral evaluations in the minds of the audience. Additionally, this study illustrates biases in coverage that are found within polarized pluralistic media systems where political parallelism is high. This variation in coverage between news sources underscores the importance of informed public decision-making regarding news consumption. When different news sources present the facts of a situation differently, their readers develop varying political and legal consciousnesses which will inform their approach to future news and events.

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RESEARCH SHOWCASE

# SOCIAL SCIENCES

## TRACHTENBERG SCHOOL OF PUBLIC POLICY AND PUBLIC ADMINISTRATION

### Living Like We're Dead: Existential Anxiety, Climate Change Perceptions, and Pro-Environmental Behavior

Terror Management Theory (TMT), rooted in the existential philosophies of Ernest Becker and developed by Jeffrey Greenberg and colleagues, provides an empirical model systematically identifying the human psychological mechanisms and cultural constructs used to buffer humanities' anxiety associated with the constant threat of death. Climate Change arguably presents the most significant collective challenge of our time, as it simultaneously threatens both our societies' survival and the consumer-centric values of western culture. The current "doom and gloom" framing of the climate crisis may exacerbate and trigger these mechanisms and result in counter-productive behaviors. Through our review of the TMT literature, this paper aims to outline existential anxieties' applicability to the construction of climate change outreach strategies pertinent to outreach efforts in public policy, sustainable marketing, and environmental education.

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RESEARCH SHOWCASE

# WOMEN/CHILD HEALTH

## DUAL PA/MPH PROGRAM

### Association between the Vaginal Microbiome and Preterm Birth: A Systematic Literature Review

Background: Preterm birth (PTB) is a major cause globally of neonatal mortality causing financial and emotional costs to families and the healthcare system. Infants born prematurely are more likely to suffer from respiratory syndromes and experience developmental delays. The vaginal microbiome may be related to preterm birth and has the potential to be an important screening tool. Studies have characterized and described the association of the maternal vaginal microbiome and PTB.

Objective: To assess the evidence since the Peelen et al, review systematically to determine if the vaginal microbiome plays a role in the adverse pregnancy outcomes including preterm birth, preterm premature rupture of membranes (PPROM), and miscarriage.

Methods: Using the navigation guide created by Johnson, et al the study question was specified. Ovid Medline, Scopus, and Cochrane central databases were searched. Studies that met inclusion criteria were first individually assessed for risk of bias across domains and then the body of evidence as a whole was rated for quality and strength.

Results: 941 unique studies initially screened. Of those, 18 studies met the inclusion requirements. Studies varied in design, sample size, ethnicities included, exposure assessment, and molecular technique. Despite these variations 11 of the 18 studies found increased diversity and richness to be associated with preterm birth. Lactobacillus was also found to be protective and associated with term births. Prevotella was a putative pathogen discussed in 6 studies and fewer studies found Streptococcus, Snethia, Peptoniphilus, Ureaplasma, and Dialaster to be putative pathogens as well.

Conclusions: Using the navigation guide methodology the current evidence of the associations of the vaginal microbiome and the adverse birth outcomes of preterm birth, PPRM, and miscarriage was assessed. Clear associations such as richness, diversity, and the protective nature of Lactobacillus emerged, yet future studies need to focus on specific methodology and analysis to make the body of evidence more homogenous.

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RESEARCH SHOWCASE

# WOMEN/CHILD HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### The Impact of Sickle Cell Disease on the Antenatal Experiences of Women in the United States

Sickle Cell Disease is a genetic hematologic disorder characterized by a deficiency of red blood cells in the body. Approximately 300,000 babies are born with the disease globally each year, with 70,000 to 100,00 babies currently diagnosed in the United States, and it is most common among men and women of African descent (American Society of Hematology, 2020; Jain et al., 2019). Sickle Cell Disease is associated with numerous complications including pain crisis, anemia, increased risk of vaso-occlusive crises, stroke, blood clots, and many more (Centers for Disease Control and Prevention, 2020). Current research shows that women with Sickle Cell Disease are at greater risk of experiencing health complications throughout their pregnancy that affect the mother or unborn baby than any other women (March of Dimes, 2013). This includes increased vaso-occlusive crises, high blood pressures, preeclampsia, eclampsia, stroke, preterm labor, miscarriage, and sometimes maternal death (Jain et al., 2019). Yet little is known about the antenatal experiences of women with Sickle Cell Disease in the United States from the perspective of the women who gave birth. The purpose of this study is to address two major public health concerns from the perspective of women previously giving birth: (1) antenatal complications among women diagnosed with Sickle Cell Disease in the United States, and (2) pregnancy risks among African American women in the United States that have the potential to lead to maternal death or infant death. This study will seek to answer the research question, "how does a preexisting diagnosis of Sickle Cell Disease influence the experiences of women in the United States during the antenatal period?". The following hypotheses will be considered:

- Women diagnosed with Sickle Cell Disease will be significantly more likely to report antenatal complications compared to African American women without a history of hematologic disorders.
- Women diagnosed with Sickle Cell Disease will be significantly more likely to report anxiety and depression throughout their pregnancy compared to African American women without Sickle Cell Disease.
- Women diagnosed with Sickle Cell Disease will be significantly more likely to report lower quality of prenatal care compared to African American women without Sickle Cell Disease.

While this is clearly a topic of importance, there is limited research conducted within the United States, and even more limited research using primary sources such as surveys or interviews. This study will expand knowledge that directly assesses women's own experiences with Sickle Cell Disease and pregnancy.

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RESEARCH SHOWCASE

# WOMEN/CHILD HEALTH

## MILKEN INSTITUTE SCHOOL OF PUBLIC HEALTH

### Characterizing The Metabolite- Microbiome Dynamics Between Breastmilk and Infant Health Outcomes

Previous studies have shown that certain specialized metabolites and microbiome associations are linked to several health outcomes. However, the specific associations and underlying health outcomes that exist between mothers and their infants remain unclear. Recent advances in multi-omics research have enabled us to investigate the complex interactions between the mother and child's microbiome and metabolome during gestation and beyond. In this study, we seek to combine metagenomic and metabolomic data to probe the associations between these features in mothers and their infants. To do so, we employ shotgun metagenomic sequencing to study the correlation between the breast milk microbiome of mothers and infants' stool microbiomes. We also measured metabolite concentrations. This study involves breast milk samples from 32 women (mothers and donors) and stool samples from 32 infants. Breast milk serves as one of the primary links between the mother and the infant after delivery and the main source of nutrition and antibodies. We analyze the possible associations and outline the microorganisms that have an effect on various clinical outcomes of the infant. Advanced computational and statistical approaches are used to discern the convoluted relationship between the mother's breast milk microbiome and the development of the newborn infant. In addition, we build a supervised prediction system to prognosticate the health outcome of the infant based on the metagenomics of the mother. We also outline the descriptive interactions between the various metabolites and metagenomics that directly or indirectly affect the health status of the infant. This work identifies and highlights the metabolite and microbial pathways that are significantly associated with pregnancy and early childhood health outcomes.

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RESEARCH SHOWCASE

# WOMEN/CHILD HEALTH

## SCHOOL OF MEDICINE AND HEALTH SCIENCES

### Qualitative Experiences of Person- centered Maternity Care among Mexican and Chinese Immigrants in California

Improving high quality, respectful maternity care is a global priority to advance maternal and neonatal health. Recent data from the United States (US) suggest that one in six women reported experiencing mistreatment in maternity care. Despite lower access to prenatal care and increased reports of discrimination, stigma, and infringements on reproductive rights, the maternity care experiences of immigrant women remain understudied. This article extends the literature of person-centered maternity care (PCMC) by applying recently validated frameworks to a US context.

The Research on Immigrant Health and State Policy Study is a convergent parallel mixed methods study. Semi-structured, in-depth interviews were conducted from August 2018 to August 2019 with Mexican and Chinese women living in Los Angeles or Orange County who gave birth within the past two years. Interviews (n=18) were conducted by bilingual interviewers, transcribed, and coded. Coded data were mapped onto the domains of PCMC.

Women described several preferences when establishing prenatal care, including provider qualifications, linguistic, and ethnic concordance. Most Chinese women cited linguistic and ethnic concordance as their main criteria in provider selection. Across ethnicity, county, and immigration status, women shared the expectation that more difficulties arose for those who did not speak English. Despite overall positive experiences, all participants pinpointed instances of mistreatment. Negative experiences ranged from long wait times to denial of necessary medical care. Translation services were often quoted as unavailable or flawed. However, Mexican women, overall, reported greater ease of accessing translation services or bilingual providers compared to Chinese participants. For women who spoke English, or attended clinics with bilingual staff or adequate translation services, language and cultural concordance were not defining features in their perception of care. Some women utilized informal support systems to enhance communication such as enlisting a family member or using available technology to translate. Chinese women were more likely to utilize these strategies.

This study is the first to apply concepts of PCMC to a US context among immigrant women. There is significant overlap with our study findings and the experiences of lower status women in international contexts and among communities of color in the US. However, areas unique to US immigrant context include . These include judgements related to fertility, language challenges, and preferences for provider cultural concordance with providers. Understanding immigrant experiences of respectful maternity care can offer insight to clinicians and policymakers, contextualizing the future of patient-centered care research and immigrant life in the US.

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