Integrative Propositional Analysis for Understanding and Reducing Poverty

ABSTRACT

With the collapsing trust in science for understanding and solving highly complex problems such as poverty, the need arises for a new understanding of how to assess knowledge and make it useful for communication and practical application. Integrative propositional analysis (IPA) provides a way for social researchers to overcome limitations of existing approaches for understanding and addressing complex issues. For this study, we applied IPA to rigorously integrate understandings from five academic disciplines and five national organizations on reducing poverty in the U.S. The process and resulting map shows a new path for integrating knowledge across disciplines and research designs, and for evaluating the potential effectiveness of that knowledge in practical application. This process also illuminates a path for developing more effective computer models and simulations.

KEYWORDS

Poverty, Systems Theory, Cybernetics, Integrative Propositional Analysis, causal knowledge mapping, conceptual systems science

BACKGROUND

Despite decades of research on poverty in the U.S., conservatives and progressives, academics, and think tanks continue to debate potential solutions, with each side referring to competing studies to back up their positions. This is not only a debate over poverty policies but also about many inter-related issues, such as the relationships between poverty and personal behavior, social welfare programs, racism, gender discrimination, and many other factors. In this “post-truth” era, in which conspiracy theories and fake news dominate politics in the U.S., decision-makers and the public need a new approach to assess the facts and to make effective decisions about important issues (Schaller, 2017).

Part of the problem is that much policy analysis, from the origin of that discipline to the present, has been based on simple, linear conceptual systems—the assumption or expectation that a single action will cause a single and predictable result (Dennard, Richardson, & Morçöl, 2008; Sabatier, 1999; Shackelford, 2014). Limited by the assumption of simple conceptual systems, we have been unable to successfully address our complex problems – our collective efforts instead leading to arguments between partisan groups and other significant unanticipated consequences.

In response, researchers are recognizing the need for interconnected, systemic models for understanding the complex social systems of the world we live in. Often, this has involved mathematical modeling and simulation. However, those approaches are limited to variables with available quantified data.

The science of conceptual systems investigates how well people and organizations understand their situations and so their ability to plan effective action by evaluating their knowledge maps using tools such as Integrative Complexity (cf. Suedfeld, Tetlock, & Streufert, 1992; Wong, Ormiston, & Tetlock, 2011), causal knowledge mapping (Axelrod, 1976), and Integrative propositional analysis (IPA) (cf. Wallis, 2014a; Wallis, 2016a). Unlike other methods, these approaches incorporate understandings from both quantitative and qualitative data.

IPA adds the ability to quantify the extent to which a theoretical model represents a simple or complex understanding of the issue at hand (Wallis, 2016a). While, "Explicit attention to conceptual systems, or to beliefs and values, is not a new development within the social sciences…" (Umpleby, 1997), IPA provides new ability to measure those systems with some level of objectivity.

Studies have shown that conceptual systems with greater complexity and systemic structure are more useful for understanding situations and contexts. Individuals, teams, and organizations with more systemic understandings have shown greater effectiveness in reaching their stated goals. Conceptual systems with greater complexity also includes assumptions of non-linearity, where multiple causes and effects impact one another, leading to dramatic and unexpected changes. Research also suggests that conceptual systems showing more feedback loops will be more useful for understanding how the world works and so for resolving the wicked complex problems such as poverty. Feedback loops are commonly understood in the field of cybernetics to represent a deeper understanding of a context, situation, or system (Dent & Umpleby, 1998).

Using IPA, the present study shows that existing theories of poverty do not provide a highly systemic view of the problem thus providing empirical support for an important assumption of systems thinking and cybernetics – that our problems persist because we lack more systemic knowledge. This paper also supports an idea common in the interdisciplinary studies, that integrating theories from many sources can improve our collective understanding to better address a problem (Wright & Wallis, 2014). The present paper continues by applying IPA to integrate and evaluate theories of poverty in the U.S. from multiple disciplines to facilitate the advancement of knowledge that is more systemic and so more useful for solving the problem.

DATA

The data for this study were written statements of various positions (causal propositions) found in recent (2007 – 2017) articles from academics and national organizations from across the political spectrum that are active on poverty issues in the United States. An exhaustive literature review is beyond the scope of this paper. Instead, we chose a broad sweep to test and demonstrate the usefulness of the IPA for advancing actionable knowledge across interdisciplinary boundaries.

To find relevant materials, we conducted an internet search (Google and Google Scholar), using search phrases such as "reducing poverty in United States," and "fighting poverty in the U.S." Our general focus was to find articles about reducing or ending poverty in the United States.

From those we chose a purposeful sample to represent a broad range of perspectives across the political spectrum and academic disciplines. The analysis included five articles from national organizations, detailed in Table 1. To represent a broad range of academic disciplines, we found an interdisciplinary paper presenting theories on poverty as they have been developed in five disciplines: economics, sociology, psychology, anthropology, and political science (Vu, 2010).

Table 1 – Organizational Sources of Data

Organization	Description	Article Title	Year	Web Link
Center for American Progress	Liberal / progressive policy research and advocacy group	The top ten solutions to reduce poverty and grow the middle class	2014	https://www.americanprogress.org/issues/poverty/news/2014/09/17/97287/the-top-10-solutions-to-cut-poverty-and-grow-the-middle-class

Bread for the World Institute	Faith-based policy research and advocacy group	Setting a goal to end poverty and hunger in the U.S.	2011	http://www.hungerfreecommunities.org/wp-content/uploads/2011/09/briefing-paper-6.pdf
The Brookings Institution	Non-partisan think tank	Fighting poverty the American way	2016	https://www.brookings.edu/wp-content/uploads/2016/06/0620_fighting_poverty_haskins.pdf
Cato Institute	Libertarian think tank	The American welfare state: How we spend nearly $1 trillion a year fighting poverty – and fail	2012	https://object.cato.org/pubs/pas/PA694.pdf
Heritage Foundation	Conservative think tank	Understanding poverty in the United States: Surprising facts about America's poor	2011	http://econ.tu.ac.th/archan/chawin/TU.124/(1)Inequalities%20and%20Social%20Problems/understand%20us%20poverty%20bg2607.pdf

ANALYTICAL METHODS

All of the sources for theories presented data, sometimes extensive, to support their views. However, if we have learned one thing from the sluggish advance of data-based social sciences, it is that solving complex issues requires more than data. It also requires a systemic understanding of the causal propositions within theories.

Integrative Propositional Analysis (IPA) has shown effectiveness for analyzing, comparing, and synthesizing theoretical models to develop more sustainable theory (Wallis & Valentinov, 2017) from a wide variety of sources and disciplines. Examples include evaluating theories of physics (Wallis, 2010), evaluating social programs (Houston, Wright, & Wallis, 2017), comparing and synthesizing economic policies of presidential candidates (Wallis, Wright, & Nash, 2016), and other policies (Wallis, 2011a). IPA has also been used for examining the effectiveness of laws (Wallis & Wright, 2016) and synthesizing and improving theories of psychology (Wallis, 2015b), sociology (Wallis, 2015a), complexity theory (Wallis, 2011b), complex adaptive systems theory (Wallis, 2008), and many other topics. Importantly, IPA is very useful for integrating theories within and between disciplines (Wallis, 2014b).

From "The Science of Conceptual Systems: A Progress Report" (Wallis, 2016a, p. 585), IPA is a six step process:

IPA Step 1: Identify propositions within one or more conceptual systems (models, etc.).

The first step in applying IPA to the selected theories of poverty was to identify propositions within each of the articles. For example, a paper by the CATO Institute (Tanner, 2012) included the causal statement: "And we actually have a pretty solid idea of the keys to getting out of and staying out of poverty: (1) finish school; (2) do not get pregnant outside marriage; and (3) get a job, any job, and stick with it." In that statement, we identified three propositions:

1. Education causes less poverty
2. Single parenthood causes more poverty

3 Employment causes less poverty

IPA Step 2: Diagram the propositions.

The next IPA step is to diagram the propositions from Step 1, with one circle for each concept (each cause or effect) and arrows indicating direction of causal effects (causes more or causes less). The example propositions from step one resulted in a diagram showing four concepts (circles) and three causal relationships (arrows) (Figure 1).

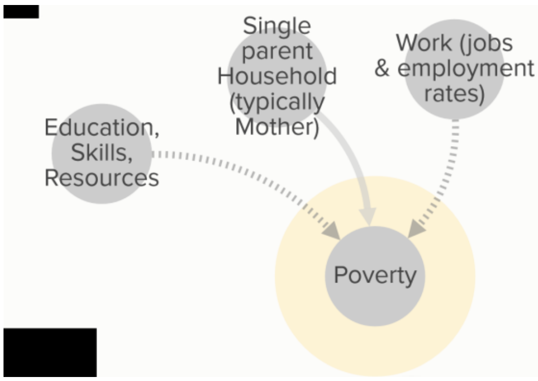

Figure 1: Example diagrams of propositions (dashed arrow=causes less, solid arrow=causes more, yellow halo = concatenated)

IPA Step 3: Find linkages between concepts and relationships across propositions.

For the third IPA step, we looked for linkages between concepts and relationships as we diagrammed propositions from all the included articles. For example, all of the included theories included statements about what causes more and/or less poverty. Figure 2 shows the structure of the model integrating all 10 theories from the six studies. For more detail, see the online version at https://kumu.io/Steve/caps2018

IPA Step 4: Identify the total number of concepts (to find the "simple" Complexity).

Step 4 of applying IPA was the count the total number of concepts (circles) in the model from each study and the integrated model, to determine the complexity. Complexity is a measure of the breadth of understanding that a model shows. The integrated map shown in Figure 2, for example, depicts 38 concepts (circles), for a complexity score of 38 (the number of concepts).

IPA Step 5: Identify concatenated concepts (any circle with more than one arrow pointing at it).

For the fifth IPA step, we identified concepts with more than one arrow pointing to them, called "concatenated" concepts in the IPA literature. These concepts are important because they are better explained or understood than concepts that are not connected to anything or that only have one arrow pointing to them (another way to understand this is as a kind of "dual description" Bateson, 1979). In the integrated map shown in Figure 3 four of the concepts have two or more arrows pointing to them: poverty, wages, single parent households, and participation in labor unions. In Figure 2, yellow halos indicate the four concatenated concepts.

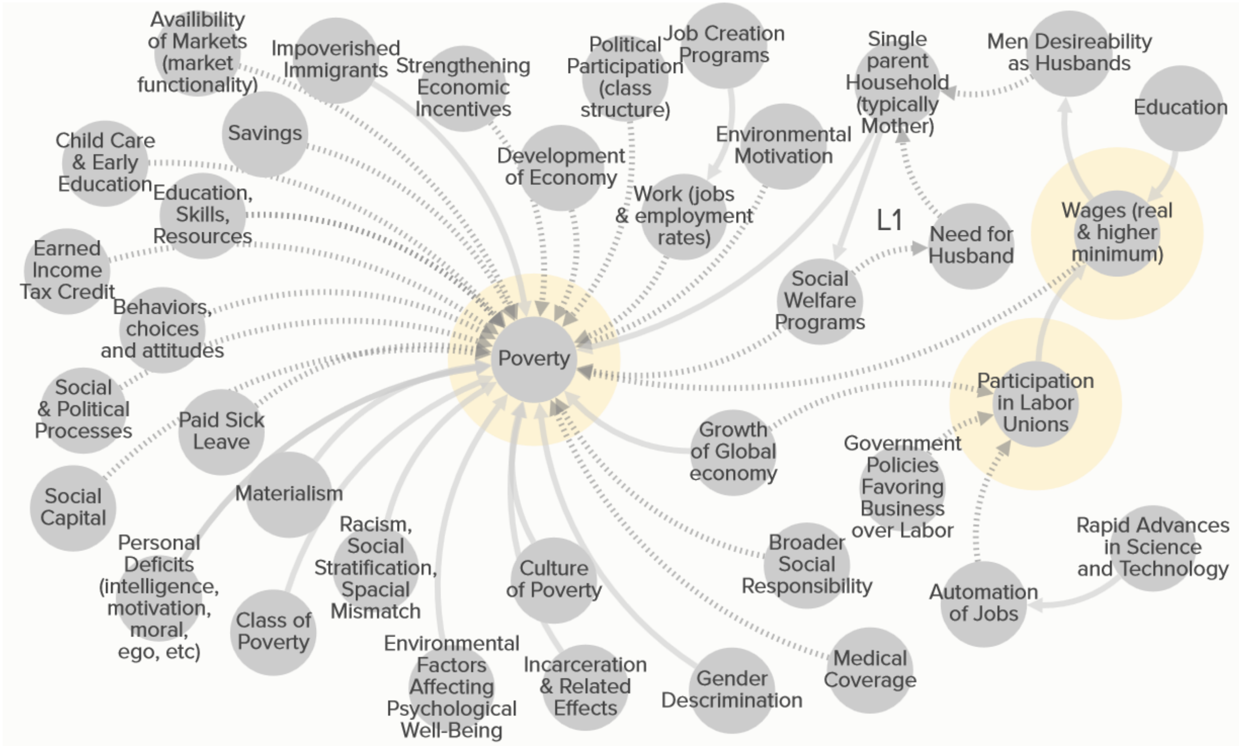

Figure 2: (yellow halo= concatenated concepts, solid arrow=causes more, dashed arrow=causes less, L1 = Loop). Full map available at: https://kumu.io/Steve/caps2018

IPA Step 6: Divide the number of concatenated concepts by the total number of concepts in the model (to find the Systemicity).

The sixth and final IPA step was to divide the number of concatenated concepts by the total number of concepts in each model, to find the Systemicity. Systemicity is a measure of the inter-connectedness of the map. It is a number between zero and one, in which a higher systemicity shows a higher level of connectedness between the concepts in the model. In the model shown in Figure 3, the Systemicity is 0.011 (four concatenated concepts divided by 38 total concepts).

Finding Loops

Going beyond the basic six steps of IPA, we also looked for any positive or negative feedback loops within the map. A loop is any set of two or more causal relationships that are all connected to each other by arrows that all point in the same direction. Despite the fairly large number of concepts, the map included one loop (Figure 4).

RESULTS

Table 2 and Figure 3 show the Complexity and Systemicity scores for the models from each academic discipline, each organization, all academic disciplines, and all disciplines and organizations (Wallis, 2016b).

Among the individual maps (one per theory developed for each of the 5 organizations and 5 disciplines), the level of Complexity ranged from a low of two concepts in the theory (political science) to a high of 14 concepts (from Bread for the World Institute). Compared with the individual maps, the integrated map showed a much greater depth, with 18 concepts in the map from all disciplines and 38 concepts in the map from all disciplines and organizations. That shows some level of improvement in our collective understanding.

The number of concatenated concepts in the individual maps ranged from zero concatenated concepts in two of the maps (political science and Heritage) to three concatenated concepts in one map (Bread for the World Institute). The integrated map from all disciplines and organizations had four concatenated concepts. Thus, integrating the maps increased the number of concatenated concepts by one more concatenated concept than any of the individual maps.

The Systemicity across the individual theories ranged from a low of 0 (political science) to a high of 0.33 (sociology). The integrated maps provided a low level of Systemicity, because while they contained more concatenated concepts as any of the individual maps, they also contained a greater number of total concepts - the greater Breadth lowered the overall Systemicity score.

Table 2 – IPA scores of individual and integrated theories

Source	Complexity	Concatenated Concepts	Systemicity
Academic Disciplines			
Psychology	4	1	0.25
Sociology	3	1	0.33
Economics	7	1	0.14
Political Science	2	0	0
Anthropology	6	1	0.17
Organizations			
CATO	5	1	0.2
Brookings	6	1	0.17
Bread for the World Institute	14	3	0.21
CAP	9	1	0.11
Heritage	6	0	0
Integrated/Synthesized			
All Disciplines	18	1	0.06
All Disciplines and Organizations	38	4	0.11

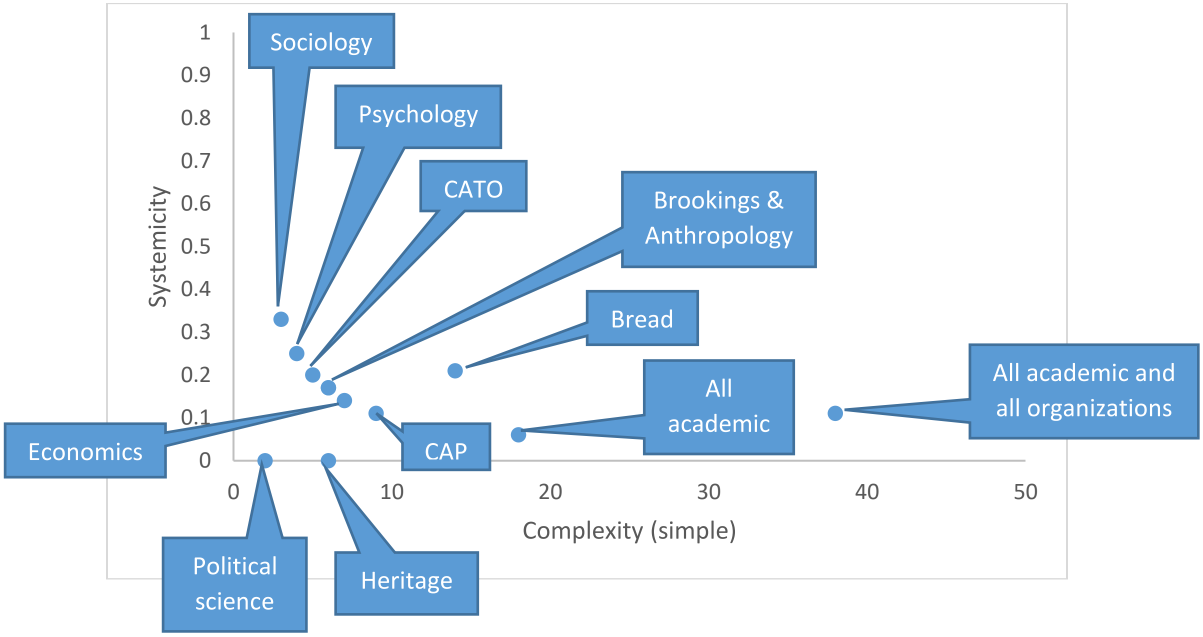

Figure 3 - IPA scores of individual and integrated theories

The integrated map contained one feedback loop (L1), (Figure 4).

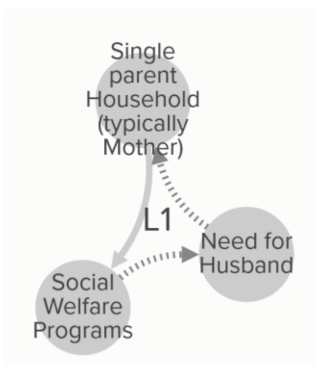

Figure 4: Feedback loop

DISCUSSION

The present study shows by the low scores of Systemicity, Complexity, and loops that our collective understanding of poverty does not reach a very useful level of systemic structure. Therefore, computer models and simulations based on those understandings are likely to be hampered in their usefulness. More importantly, public policies based on those understandings are unlikely to work as expected and so are more likely to result in unanticipated consequences (Wallis & Wright, 2016; Wallis et al., 2016). The present analysis provided an integrated theory from across several disciplines and organizations that improved upon the individual theories by a greater number of concepts and causal relationships than any of the individual theories.

To improve our collective theory, future studies could expand on the integrated model developed for this analysis to incorporate more of the vast trove of additional academic studies and organizational publications on poverty. That would increase the number of concepts, causal relationships, and feedback loops in the model and hence its usefulness for developing better computer models, planning effective research, and making better decisions to take more effective action. In addition, future primary research could gain insights from conversations with more stakeholder groups, including people living in poverty, service providers who help people living in poverty, elected officials, and others (Houston et al., 2017). Those understandings would increase the structure and usefulness of the theory.

The low scores found in this study provide a new reason based on systems thinking and cybernetics for why past efforts to win the war on poverty have failed. We do not understand the enemy. The creation of causal maps, especially those with higher levels of Complexity and Systemicity may be useful in developing better models and simulations (Wallis & Johnson, 2018).

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