

Understanding



Loneliness

By Andrew Eng

Hunger and drowsiness arise from our basic instinct to eat and sleep; in a similar fashion, loneliness stems from our need to feel socially connected and maintain emotional bonds. While loneliness may have initially served to encourage our ancestors to cooperate and form communities (hence increasing individual odds for survival), it is now increasingly being recognized as a growing social and public health concern (Hawkley & Cacioppo 2010).

Perhaps the most troubling observation is that stress caused by loneliness can have significant adverse effects on individual health (Hawkley & Cacioppo 2010). Even with the advent of social networking, core social networks continue to decline (McPherson 2006).

What is loneliness?

Loneliness is an emotional state, not necessarily the objective state of being alone—it is dissatisfaction with social relationships, regardless of how few or numerous, infrequent or active (Hawkley & Cacioppo 2010). This feature of loneliness distinguishes it from social isolation and introversion: a solitary individual, content with the quality of the relationships he or she does have, might not feel lonely. In consideration of this, cross-sectional and longitudinal studies often treat loneliness (subjective loneliness), social network size (objective loneliness), and introversion/

With core social networks declining in size (McPherson 2006), and loneliness incidence rates doubling over the last 30 years (AARP 2010), loneliness associated health care costs can be expected to rise.

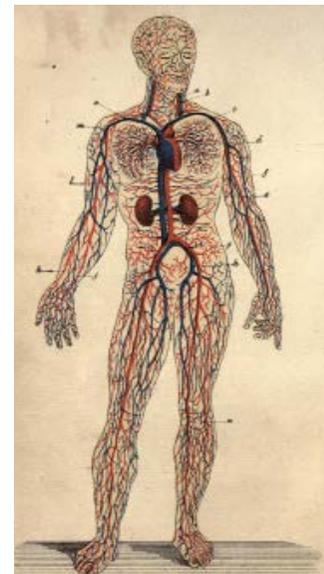
Although data regarding the financial cost of loneliness is sparse (campaigntoendloneliness.org scoping report, 2014), the variety of health issues arising across all age groups is expected to generate a significant financial burden. Consequently, here I address the question: what is our current understanding of the public health challenge of loneliness, and how is it being addressed?

extroversion as separate parameters with potentially different degrees of impact on health. The subjective nature of loneliness therefore creates challenges in standardizing measurement and necessitates a novel method and panel of survey parameters. Social isolation is sometimes used as a proxy for loneliness, despite being a separate concept. One reason for this is practical—in animal studies, for example, feelings of loneliness cannot be reproducibly created nor readily measured. For experimental studies on loneliness, animal models comprise social isolation under controlled and repeatable conditions in

order to yield mechanistic insights or identify molecular or even neuroanatomical substrates of loneliness. The social isolation stress (SIS), a commonly-used social isolation model, has been used to investigate persistent alterations in brain chemistry and neurotransmission in specific brain structures implicated in a broad spectrum of emotional processing such as the amygdala and nucleus accumbens (Lapiz 2003). Experimental models such as these could be helpful in further understanding and developing novel, perhaps pharmaceutical, approaches to manage loneliness.

In human studies, measuring loneliness often entails self-reporting through questionnaires such as the UCLA loneliness scale, which in earlier

iterations raised concerns regarding bias. On the other hand, the social isolation model provides a useful tool to gain insights into the physiological mechanisms related to loneliness.



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Lonely middle-aged adults: an under-served age group

The traditional view has been that loneliness is more prevalent among the young or among the elderly, due to a variety of stressors affecting social integration (Heinrich 2006), however, there is surprisingly little consensus on the relationship between loneliness and age. Some cross-sectional studies have indeed reported higher incidence in the young and old; for example, analysis of a subset of data (2,393 participants) from the 2006 European Social Survey revealed a nonlinear relationship between loneliness and age: 9% of respondents younger than 25 years of age were in the most severe loneliness category, compared to 9% of those older than 55 and 5% of individuals between 25 and 44 (Victor and Yang, 2012). A separate nation-wide life course, generation and gender (LOGG) study



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conducted in Norway (14,743 respondents) reported slightly lower levels of loneliness among 30-49 and 50-64 year olds (18.7% and 20.0%, respectively, reporting feelings of loneliness sometimes or often) compared to 18-29 and 65-81 year olds (22.9% and

25.6%, respectively) (Nicolaisen and Thorsen 2014). While these studies indicate higher incidence rates among children and young adults or the elderly, there is only slightly less loneliness among middle-aged adults between 25 and 64.

Contentious results were obtained through a 2010 survey of 4,610 individuals commissioned by the American Association of Retired Persons (AARP), which found the highest prevalence of loneliness among the middle-aged adults. In this study, the prevalence of loneliness actually decreased with advanced age: 43% of respondents aged 45-49 were lonely, compared to 41% of respondents aged 50-59, 32% of respondents aged 60-69, and 25% of respondents aged 70 or older. A study conducted in Portugal (n = 1174) found 11% of adults aged 50-64 to be often or always lonely, while 8-16% of the older cohorts reported the same (Ferreira-Alves 2014). Thus, disagreement regarding the relationship between age and loneliness remains to be resolved, and no consensus might be reached without controlling or standardizing differences in methods to determine loneliness, delineation of age groups and cultural, or individualism-related influence. However, these data provide a crude estimation of approximately one in four middle aged-adults feeling lonely at least some of the time, with about 5-10% feeling lonely most or all of the time—a proportion which calls for additional consideration for this age group.

What are factors that are strongly associated with loneliness?

Many quality of life-related factors have been found to be strongly linked to loneliness, although in many studies it remains unclear whether loneliness is a causative factor. Marital status, living arrangement, education, professional status, income, health status, and mental disposition are all related to loneliness and social integration in the older adult cohort (Ferreira-Alves, 2014, Tilves 2011, Shankar 2013, Victor 2005), and some may affect the middle-aged more strongly.

Although it was not determined whether loneliness predated development of these ailments, in the US, a high percentage of lonely adults also suffer from:

- diabetes (42%)
- obesity (43%)
- sleep disorders (45%)
- chronic pain conditions (47%)
- anxiety (56%)
- depression (60%)
- drug or alcohol abuse (63%)

Interestingly, however, internet, email, and social media use do not appear to be linked to loneliness despite their possible implications for social network size (AARP 2010). On the other hand, individuals with more opportunities for social integration (e.g., through volunteer work, church attendance, having hobbies) were less likely to be lonely (AARP 2010). These results suggest that the mode of social connectivity might play a role in whether loneliness is experienced and that the sense of integration and social support is important in alleviating loneliness, but further investigation is warranted in this area as well.

Loneliness has also been assessed among communities at higher risk of being marginalized by society, and in cases where minority stress might be more prominently felt. In young, college-age adults, traits associated with autism are also associated with higher rates of self-reported loneliness (Jobe and White, 2007). This link is expected to persist in the middle-aged adult group, although little data was found in support of this; however, recognition of a possible linkage

between loneliness and social isolation with autism spectrum disorders has prompted efforts to assess the effectiveness of specialized interventions (Mazurek, 2014). In addition, loneliness and social network size in various lesbian, gay, and bisexual (LGB) communities have been examined, and the general consensus is that more LGB individuals experience loneliness (Chaney 2008, Erosheva 2015, Kim and Fredriksen 2014, Kuyper 2010, Westefeld 2001). Accordingly, groups that struggle with acceptance or integration with larger social units are likely to be higher risk, and this is expected to persist across gender and age groups.

Loneliness is an emotional state and is related to health and cognitive well-being, so some of the associated health-related factors are thought to resemble a persistently painful and stressful emotional state. Accordingly, a number of investigations in the laboratory and longitudinal studies provide some understanding of how loneliness might contribute to poor physical health.



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How does loneliness contribute to declining physical health?

Loneliness is associated with poor health (House, 1988, Hawkey & Cacioppo 2010), but how exactly might loneliness lead to health issues? One possibility is that lonely individuals are more susceptible to circulatory dysfunction, perturbed sleep, immune dysregulation, and inflammation. Dysfunction of the inflammatory candidate “pre-disease pathway” could then contribute to worsening health (Hawkey & Cacioppo 2003). In support of this, one human research study found that lonely (but otherwise healthy) participants aged 28-76 who underwent an acute, mildly-stressful social stress test produced significantly higher levels of the inflammatory markers IL-6 and tumor necrosis factor alpha (TNF-alpha), which are cytokines well-established to be linked to age-related diseases (Ershler & Keller 2000, Hansson 2005, Jeremka 2013). Subjects that had previously experienced acute stress as post-treatment breast cancer survivors and were also lonely had higher blood levels of inflammatory cytokines in response to the social stress test (Jeremka 2013). A similar set of experiments yielded results in which lonely subjects aged 53-76 who had taken a standardized mental stress test produced more cytokine IL-6, interleukin-1 receptor antagonist (IL-1Ra), and monocyte chemoattractant protein-1, the latter of which is linked to rheumatoid arthritis and atherosclerosis (Hackett 2012, Deshmane 2009).

A possible link between loneliness and metabolic syndrome (defined as a cluster of conditions pertaining to cardiovascular disease or diabetes) has also been explored. Interestingly, in this study lonely older adults (52-79 years of age) had a higher incidence of metabolic syndrome than the control group, although prevalence did not appear



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to be influenced by age (Whisman 2010). That nearly one out of every two lonely adults is also obese and/or diabetic strongly suggests that loneliness and risk of developing metabolic syndrome should be studied in greater detail (AARP 2010). Loneliness also appears to predict development of cardiovascular issues such as hypertension, as supported by data collected in landmark longitudinal studies in middle-aged and older adults (Cho 2015, Hawkey 2010).

Together, these reports indicate that loneliness can exert stress-related effects on multiple biological systems. It must be acknowledged that loneliness could interact with and exacerbate mental health issues, especially depressive symptoms and possibly obsessive-compulsive behaviors, and so there are still yet other possibilities by which loneliness can affect overall health. Within the scope of this perspective, however, multiple pre-disease pathways contribute to the development of diverse health complications that are associated with loneliness and they underscore the need to identify effective methods of intervention for the lonely.

Treating, managing, or living with loneliness

With many individuals reporting feelings of loneliness and a growing body showing how loneliness could be detrimental to health, the identification of potential treatments for loneliness should be recognized as a critical aspect of this public health issue. Efforts to reduce the prevalence of loneliness have been primarily directed towards alleviating feelings of loneliness (particularly among those suffering from



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chronic, long-term loneliness) or by identifying the best possible opportunities to prevent chronic loneliness from developing (Masi 2010, Windle 2014).

According to a meta-analysis of six major reviews, treatment strategies employed since the 1930's have typically focused on 1) improving social skills, 2) addressing issues with maladaptive social cognition (a term which describes how individuals may have strongly negative views on their self-worth or how they are viewed by others), 3) providing individuals with more opportunities for social integration and involvement, or 4) by directly providing social support (Masi 2010). In their analysis, the authors determined that emphasis on reversing maladaptive social cognition was most successful. For example, experimenters focusing on improving social skills have tried to help individuals improve verbal and nonverbal communication skills and etiquette and coaching individuals to cope with periods of isolation (Masi 2010); skills and etiquette and coaching individuals to cope with periods of isolation (Masi 2010). This strategy of intervention had significant effect on reducing loneliness among college-aged young adults (Jones 1982), and might also be effective in an older age group. Providing increased social support to perceived "higher risk" populations such as those who recently lost a loved one or who have recently relocated was also found to be beneficial, although these studies did not typically examine the effect on loneliness (Jones 1982, Varchon 1980, Wallerstein & Kelly 1977, Kowalski 1981).

Research therefore suggests multiple methods of intervention. Again, their effectiveness in treating the middle-aged remains largely unaddressed, likely owing to disproportionate focus on the young and elderly. However, based on the social problems middle-aged adults are likely to encounter, which bear strong similarity to those which are thought to affect the elderly, approaches that are effective in



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treating loneliness or improving emotional health among the elderly could be successful. Additionally, identification of high-risk groups or otherwise subdividing the population by root cause or concomitant physical or mental health issues is likely to be a prerequisite step in developing or implementing effective treatment strategies.

With alarming prevalence among men and women of all age groups and a significant financial burden that has been suggested but not shown, long-term loneliness should be treated as a broad public health concern and carefully differentiated from momentary feelings associated with being alone. However, loneliness raises issues of objective measurement that indicate that social isolation, social network size, and other parameters relating to an individual's social integration and opportunities to receive social support must also be considered, either in managing loneliness or in further understanding loneliness as a psychosocial issue. Population-level research and intervention could benefit greatly from more refined identification of high-risk groups and individuals, and from clinical research on the biological mechanisms that translate the emotional stress of loneliness to medical issues.

The first step to managing loneliness is understanding loneliness. Despite immense advancements in communication technology and "social networking", loneliness remains a clear and present personal and collective public health challenge. The tragedy of loneliness is how personal it is. Still, as we better understand loneliness, we may develop new tools to help improve both mental health and public health.

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References

1. Hawkey, L.C. and J.T. Cacioppo, Loneliness matters. *Ann Behav Med*, 2010. 40(2): p. 218-27.
2. Heinrich, L.A., The clinical significance of loneliness. *Clinical Psychology Review*, 2006. 26(6): p. 695-718.
3. McPherson, M., Social isolation in America. *American Sociological Review*, 2006. 71(3): p. 353-375.
4. Wilson, C. and B. Moulton, Loneliness among older adults: A national survey of adults 45+. Prepared by Knowledge Networks and Insight Policy Research. Washington, DC: AAR Retrieved from: http://assets.aarp.org/rgcenter/general/loneliness_2010.pdf, 2010.
5. The Cost of Loneliness. This report summarises research and consultation work for the Campaign to End Loneliness. Retrieved from: <http://www.campaigntoendloneliness.org/wp-content/uploads/downloads/2014/01/Campaign-to-End-Loneliness-Costs-of-Loneliness-scoping-report-January-2014.pdf>, 2014.
6. Jones, W.H., Loneliness and social contact. *The Journal of Social Psychology*, 1981. 113(2): p. 295-296.
7. Cacioppo, S., Toward a Neurology of Loneliness. *Psychological Bulletin*, 2014. 140(6): p. 1464-1504.
8. Lapid, M.D., et al., Influence of postweaning social isolation in the rat on brain development, conditioned behavior, and neurotransmission. *Neurosci Behav Physiol*, 2003. 33(1): p. 13-29.
9. Victor, C.R., The Prevalence of Loneliness Among Adults: UK. *Journal of Psychology*, 2012. 146(1-2): p. 85-104.
10. Nicolaisen, M. and K. Thorsen, Who Are Lonely? Loneliness in Different Age Groups (18-81 Years Old), Using Two Measures of Loneliness. *International Journal of Aging & Human Development*, 2014. 78(3): p. 229-257.
11. Ferreira-Alves, J., et al., Loneliness in middle and old age: Demographics, perceived health, and social satisfaction as predictors. *Archives of Gerontology and Geriatrics*, 2014. 59(3): p. 613-623.
12. Savikko, Predictors and subjective causes of [...]. *Archives of Gerontology and Geriatrics*, 2005. 41(3): p. 223-233.
13. Steptoe, A., et al., Social isolation, loneliness, and all-cause mortality in older men and women. *Proceedings of the National Academy of Sciences of the United States of America*, 2013. 110(15): p. 5797-5801.
14. Victor, C.R., et al., The prevalence of and risk factors for [...] *Ageing & Society*, 2005. 25: p. 357-375.
15. Franzen, A., Does the Internet make us lonely? *European Sociological Review*, 2000. 16(4): p. 427-438.
16. Jobe, L.E. and S.W. White, Loneliness, social relationships, and a broader autism phenotype in college students. *Personality and Individual Differences*, 2007. 42(8): p. 1479-1489.
17. Mazurek, M.O., Loneliness, friendship, and well-being. *Autism*, 2014. 18(3): p. 223-232.
18. Erosheva, E.A., et al., Social Networks of Lesbian, Gay [...] *Research on aging*, 2015: p. 0164027515581859.
19. Kim, H.-J. and K.I. Fredriksen-Goldsen, Living Arrangement and Loneliness Among Lesbian, Gay, and Bisexual Older Adults. *The Gerontologist*, 2014: p. gnu083.
20. Kuyper, L. , Loneliness among older lesbian [...], *Archives of sexual behavior*, 2010. 39(5): p. 1171-1180.
21. Westefeld, J.S., et al., Gay, lesbian, and [...]. *Journal of College Student Psychotherapy*, 2001. 15(3): p. 71-82.
22. House, J.S., K.R. Landis, and D. Umberson, Social relationships and health. *Science*, 1988. 241(4865): p. 540-545.
23. Hawkey, L.C. and J.T. Cacioppo, Loneliness and pathways to disease. *Brain Beh and Imm*, 2003. 17: p. S98-S105.
24. Hawkey, L.C., et al., 5 Loneliness, Dysphoria. *Cytokines: Stress and immunity*, 2006: p. 67.
25. Bruunsgaard, Ageing, tumour necrosis factor-alpha (TNF- α) *Clin & Exp Immun*, 2000. 121(2): p. 255-260.
26. Ershler, W.B. Age-associated increased interleukin-6 [...]. *Annual review of medicine*, 2000. 51(1): p. 245-270.
27. Jaremka, L.M., et al., Loneliness promotes inflammation during acute stress. *Psych sci*, 2013. 24(7): p. 1089-1097.
28. Deshmane, S.L., et al., Monocyte chemoattractant protein-1 (MCP-1): an overview. *Journal of interferon & cytokine research*, 2009. 29(6): p. 313-326.
29. Hackett, R.A., et al., Loneliness and stress-related inflammatory and neuroendocrine responses in older men and women. *Psychoneuroendocrinology*, 2012. 37(11): p. 1801-1809.
30. Whisman, M.A., Loneliness and the metabolic syndrome in a population-based sample of middle-aged and older adults. *Health Psychology*, 2010. 29(5): p. 550.
31. Cho, H.J., et al., Sleep disturbance and longitudinal risk of inflammation: Moderating influences of social integration and social isolation in the Coronary Artery Risk Development in Young Adults (CARDIA) study. *Brain, behavior, and immunity*, 2015. 46: p. 319-326.
32. Hawkey, L.C., et al., Loneliness predicts increased blood pressure: 5-year cross-lagged analyses in middle-aged and older adults. *Psychology and aging*, 2010. 25(1): p. 132.
33. Cattán, M., Preventing social isolation and loneliness among older people. *Ageing and Society*, 2005. 25: p. 41-67.
34. Masi, et al., A meta-analysis of interventions to reduce loneliness. *Pers Soc Psychol Rev*, 2011. 15(3): p. 219-66.
35. Windle, K., et al. Preventing loneliness and social isolation. London: Social Care Inst. for Excellence, 2011: p. 16.
36. Jones, W.H., Loneliness and social skill deficits. *Jour of pers and soc psych*, 1982. 42(4): p. 682.
37. Vachon, et al., A controlled study of self-help intervention [...]. *Amer jour of Psych*, 1980. 137(11): p. 1380-1384.
38. Wallerstein, J.S, Divorce counseling. *American Journal of Orthopsychiatry*, 1977. 47(1): p. 4.