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Loneliness, health, and mortality in old age: A national longitudinal study

Ye Luo [a,*], Louise C. Hawkley [b], Linda J. Waite [c], John T. Cacioppo [b]

[a] Department of Sociology & Anthropology, Clemson University, 130F Brackett Hall, Clemson, SC 29634, USA
[b] Department of Psychology and Center for Cognitive and Social Neuroscience, University of Chicago, Chicago, IL, USA
[c] Department of Sociology and Center on Aging, University of Chicago, Chicago, IL, USA

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ABSTRACT

This study examined the relationship between loneliness, health, and mortality using a U.S. nationally representative sample of 2101 adults aged 50 years and over from the 2002 to 2008 waves of the Health and Retirement Study. We estimated the effect of loneliness at one point on mortality over the subsequent six years, and investigated social relationships, health behaviors, and health outcomes as potential mechanisms through which loneliness affects mortality risk among older Americans. We operationalized health outcomes as depressive symptoms, self-rated health, and functional limitations, and we conceptualized the relationships between loneliness and each health outcome as reciprocal and dynamic. We found that feelings of loneliness were associated with increased mortality risk over a 6-year period, and that this effect was not explained by social relationships or health behaviors but was modestly explained by health outcomes. In cross-lagged panel models that tested the reciprocal prospective effects of loneliness and health, loneliness both affected and was affected by depressive symptoms and functional limitations over time, and had marginal effects on later self-rated health. These population-based data contribute to a growing literature indicating that loneliness is a risk factor for morbidity and mortality and point to potential mechanisms through which this process works.

Introduction

Loneliness is a prevalent and serious social and public health problem (Hawkley & Cacioppo, 2010). Research on loneliness, conducted mostly in Western countries, has shown that at any given time, twenty to forty percent of older adults report feeling lonely (De Jong Gierveld & Van Tilburg, 1999; Savikko, Routasalo, Tilvis, Strandberg, & Pitkälä, 2005; Theeke, 2009; Walker, 1993), and from five to seven percent report feeling intense or persistent loneliness (Steffick, 2000; Victor, Scambler, Bowling, & Bond, 2005). Socially isolated individuals tend to feel lonely, but loneliness is not synonymous with being socially isolated. Loneliness can be thought of as perceived isolation and is more accurately defined as the distressing feeling that accompanies discrepancies between one's desired and actual social relationships (Pinquart & Sorenson, 2003). Prospective studies have shown that feelings of loneliness predict depressive symptoms (Cacioppo, Hawkley, & Thisted, 2010), impaired sleep and daytime dysfunction (Hawkley, Preacher, & Cacioppo, 2010), reductions in physical activity (Hawkley, Thisted, & Cacioppo, 2009), and impaired mental health and cognition (Wilson et al., 2007). At the biological level, loneliness is associated with increased vascular resistance (Cacioppo et al., 2002; Hawkley, Berntson, Burleson, & Cacioppo, 2003), increased systolic blood pressure (SBP) (Hawkley, Thisted, Masi, & Cacioppo, 2010), increased hypothalamic pituitary adrenocortical activity (Adam, Hawkley, Kudielka, & Cacioppo, 2006; Steptoe, Owen, Kunz-Ebrecht, & Brydon, 2004), under-expression of genes bearing anti-inflammatory glucocorticoid response elements (GREs), over-expression of genes bearing response elements for pro-inflammatory NF-κB/Rel transcription factors (Cole et al., 2007, Cole, Hawkley, Arevalo, & Cacioppo, 2011), and altered immunity (Kiecolt-Glaser et al., 1984; Pressman et al., 2005). Moreover, an increasing body of research shows that feelings of isolation and loneliness predict mortality (Patterson & Veenstra, 2010; Shiovitz-Ezra & Ayalon, 2010; Tilvis, Laitala, Routasalo, & Pitkälä, 2011).

In this study, we specify a conceptual model that examines several mechanisms that might account for the effects of perceived isolation (i.e., loneliness) on mortality, and we test this model using a sample of U.S. older adults. Our model posits that health – emotional, physical, and functional – is a proximal predictor of mortality and we therefore test for longitudinal effects of loneliness on health to determine whether health variables are plausible mediators of the loneliness effect on mortality. Previous research has tended to focus on the link between loneliness and specific

* Tel.: +1 864 656 4209.
E-mail address: yel@clemson.edu (Y. Luo).

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diseases or health conditions, often in small, local samples. Most analyses have used cross-sectional data or examined changes in either loneliness or health, not their dynamic interactions. We add to this literature by (1) examining the link between loneliness and a number of general measures of health, (2) using a large, nationally representative sample, and (3) modeling the dynamic interactions between loneliness and health over time.

Loneliness and mortality

Our conceptual model posits that the influence of loneliness on mortality is attributable to the relationships between loneliness and social isolation, unhealthy behaviors, and poor health. Prospective epidemiological studies have shown that objectively indexed social isolation is a major risk factor for morbidity and mortality (House, Landis, & Umberson, 1988). Because feelings of loneliness are more prevalent and intense in socially isolated individuals, the mortality effects of loneliness may be explained, at least in part, by the higher likelihood of being more socially isolated among those feeling lonely. The effect of social isolation on health and mortality, in turn, has been attributed in part to the direct influence of friends and family on a person's health behaviors (e.g., exercise, adequate and regular rest) which influence physiology and health (House et al., 1988). To the extent that socially isolated individuals are more likely to engage in poor health behaviors, health behaviors may help explain their increased mortality risk. Two lines of evidence suggest otherwise, however. First, health behaviors in epidemiological and field studies have failed to explain the health effects of social isolation in humans (Hawkley, Thisted et al., 2010; Seeman, 2000). Second, non-human social animals subjected to social isolation are also at increased risk for early morbidity and mortality (reviewed in Cacioppo & Hawkley, 2009), suggesting that the effects of isolation extend beyond the social control of health behaviors exerted by concerned friends and family.

Health behaviors may help explain loneliness differences in mortality risk, however. Our theoretical model of loneliness holds that loneliness activates implicit hypervigilance for social threat in the environment (Cacioppo & Hawkley, 2009). Chronic activation of social threat surveillance diminishes executive functioning, and heightened impulsivity influences the tendency of individuals to engage in health behaviors that require self-control. Consistent with this notion, among middle- and older-age U.S. adults, loneliness was associated with a lower likelihood of engaging in physical activity and a faster decline in levels of physical activity participation over a two-year follow-up period (Hawkley et al., 2009).

Our conceptual model further posits that loneliness differences in mortality may be more directly explained by health, where health outcomes are the more proximal predictors of mortality. We therefore introduce emotional, physical, and functional health as additional mechanisms that may explain the association between loneliness and heightened risk of mortality. In this study, the emotional health outcome to be examined is depressive symptoms, the physical health outcome is self-rated health, and the functional health outcome is functional limitations. Justification for these outcomes as plausible mediators of loneliness differences in mortality is based on evidence showing that loneliness predicts these outcomes (as will be discussed below) and that these outcomes predict mortality (Ariyo et al., 2000; Everson, Roberts, Goldberg, & Kaplan, 1998; Idler & Benyamini, 1997; Okun, August, Rook, & Newsom, 2010).

Loneliness and emotional, physical, and functional health

Loneliness feels bad, as is evident by lower levels of well-being (Cacioppo et al., 2008) and higher levels of depressive symptoms (Nolen-Hoeksema & Ahrens, 2002) in lonelier individuals. Beyond cross-sectional associations between loneliness and depressive symptoms, loneliness leads to increases in depressive symptoms in longitudinal U.S. studies (Cacioppo et al., 2010; Hagerty & Williams, 1999; Wei, Russell, & Zakalik, 2005). Accordingly, we expect that loneliness will predict increases in depressive symptoms over time in our sample, and that this predictive role is necessary if depressive symptoms are to be considered plausible mechanisms through which loneliness affects mortality.

Loneliness is associated with poor physical health, and this relationship is effectively captured in the inverse association between loneliness and self-rated health (Segrin & Domschke, 2011; Stephens, Alpass, Towers, & Stevenson, 2011). Moreover, loneliness and increases in loneliness over time predict decrements in self-rated health (Nummela, Seppänen, & Uutela, 2011). We expect that loneliness will predict decreases in self-rated health over time in our sample, and that this predictive role is necessary if self-rated health is to be considered a plausible mechanism through which loneliness affects mortality.

Finally, we examine whether loneliness is related to functional limitations and increases in functional limitations over time. Physical activity is important in maintaining higher levels of physical functioning (Keysor, 2003; Lee & Park, 2006; Netuveli, Wiggins, Montgomery, Hildon, & Blane, 2008), and because lonely individuals are less likely to engage in physical activity than their non-lonely counterparts (Hawkley et al., 2009), they are more likely to experience the onset or worsening of limitations. Prior cross-sectional research has shown an association between loneliness and functional limitations (Greenfield & Russell, 2011; Prieto-Flores, Forjaz, Fernandez-Mayoralas, Rojo-Perez, & Martinez-Martin, 2011), but a plausible role for functional limitations in explaining loneliness differences in mortality would gain support if loneliness predicts increases in functional limitations while controlling for concurrent effects of functional limitations on loneliness.

Our analyses allow reciprocal relationships between loneliness and each health outcome, thus providing more rigorous assessments than previous studies of the causal directions between these variables. We hypothesize that loneliness negatively affects each later health outcome, even after accounting for the potential effects of poor health on later feelings of loneliness. All models linking loneliness and health take into account sociodemographic characteristics of the individual, including age, gender, race/ethnicity, education, and household income and assets, as well as measures of social isolation or, conversely, social relationships (marital status, the presence of relatives, and separately, friends in the neighborhood), and health behaviors (sleep quality, physical exercise, smoking history and current smoking).

Methods

Data mainly come from the 2002, 2004, 2006 waves of the Health and Retirement Study (HRS) although mortality data in 2008 were also used. The HRS is a U.S. nationally representative, longitudinal study of older adults composed of five birth cohorts that entered the study in different calendar years and the data are publicly available. The HRS began in 1992–93 as two separate samples: the original HRS focusing on 1931–41 birth cohorts and the Assets and Health Dynamics among the Oldest Old focusing on 1890–1923 birth cohorts. In 1998 the two samples were merged and two new samples, Cohort of Depression Age (1924–30 cohorts) and War Babies (1942–47 cohorts), were added, and in 2004, another new sample, Early Baby Boomers (1948–53 cohorts), was added, making the sample representative of those born in 1953 or before, approximately aged over 50 in 2004. Once they have