Loneliness in Older Persons: A predictor of functional decline and death

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Abstract

Background—Loneliness is a common source of distress, suffering, and impaired quality of life in older persons. We examined the relationship between loneliness, functional decline and death in adults over age 60 in the United States.

Methods—This is a longitudinal cohort study of 1604 participants in the psychosocial module of the Health and Retirement Study (HRS), a nationally representative study of older persons. Baseline assessment was in 2002 and follow-up occurred every two years until 2008. Subjects were asked if they feel 1) Left Out 2) Isolated or 3) Lack Companionship. Subjects were categorized as not lonely if they responded hardly ever to all three questions and lonely if they responded some of the time or often to any of the three questions. The primary outcomes were time to death over 6 years, and functional decline over 6 years on 4 measures: difficulty on an increased number of activities of daily living (ADL), difficulty in an increased number of upper extremity tasks, decline in mobility, or increased difficulty in stair climbing. Multivariate analyses adjusted for demographic variables, socioeconomic status, living situation, depression, and various medical conditions.

Results—The mean age of subjects was 71 years, 59% were women, 81% White, 11% Black, 6% Hispanic, and 18% lived alone. 43% of elders reported feeling lonely. Loneliness was associated with all outcome measures. Lonely subjects were more likely to experience decline in ADLs, (24.8% vs. 12.5%, Adjusted Risk Ratio 1.59, 1.23-2.07); develop difficulties with upper extremity tasks (41.5% vs. 28.3%, ARR 1.28, 1.08-1.52); decline in mobility (38.1% v. 29.4%, ARR 1.18, 0.99-1.41); or difficulty in climbing (40.8% vs. 27.9%, ARR 1.31, 1.10-1.57). Loneliness was associated with an increased risk of death (22.8% vs. 14.2%, AHR 1.45, 1.11-1.88).

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Conclusions—Among participants who were older than 60, loneliness was a predictor of functional decline and death.

Introduction

In older persons, health outcomes, such as worsening disability and death, are influenced not just by biomedical factors, but also by psychosocial distress.[1] The hypothesis that loneliness may be a risk factor for adverse health outcomes in older persons is supported by previous studies that show that other forms of psychosocial distress lead to adverse health outcomes. For example, several studies link depression to higher risks of disability and mortality[2–3]. Other studies have shown that measures of social isolation--the number of social contacts and the amount of social engagement—are associated with poor health outcomes. Yet, these quantitative measures of relationships may not adequately capture the distress that an individual may subjectively feel. The concept of loneliness is only starting to be recognized as a separate entity from social isolation and depression and therefore few studies have examined it as an independent risk factor.

Loneliness is an important contributor to human suffering, especially in the elderly, where prevalence rates may be higher.[4] Loneliness is the subjective feeling of isolation, not belonging, or lacking companionship. While persons who are lonely are more likely to experience depressive symptoms, feelings of loneliness are only weakly associated with enjoyment, energy and motivation—emotions that are central to a diagnosis of depression.[5–6] Loneliness is also distinct from several quantitative measures of social isolation such as living alone, marital status and number of relationships. For example, it is possible for persons who live alone to not feel lonely, while some who are married or living with others will still experience loneliness. Loneliness can be explained as the discrepancy between one's desired relationships and one's actual relationships.

The subjective distress of loneliness may be a more important measure of suffering and quality of life rather than objective measures of social isolation. Given the number of health and social issues that health care providers must prioritize, the identification and amelioration of loneliness may seem to be outside of the scope of medical practice. Yet, by separating suffering and distress into medical and non-medical spheres, providers may be missing a key risk factor for poor health.

To quantify the prevalence of loneliness and determine whether older persons who are lonely are at risk for poor health outcomes, we used the Health and Retirement Study (HRS), a national, population-based study of community living older adults. After adjusting for common measures of medical risk, we examined the impact of loneliness on mortality and several measures of worsening disability that are of particular importance in older persons.

Methods

Participants

This is a 6 year prospective study using participants in the 2002 Health and Retirement Study (HRS). The HRS is a population-based longitudinal study examining the relationships

between health and wealth changes as people age. In addition to the primary survey, the HRS administers modules on additional topics to randomly selected participants. The Loneliness, Stress, and Social Support/Burden module was one of twelve modules administered in 2002.

Our analytic cohort was limited to participants over the age of 60. In 2002, 14,568 (80.2%) HRS participants were over the age of 60. 1,792(12.3%) participants were not eligible to participate in the modules because their interviews were either partial or were completed by a proxy. Of the remaining 12,776 eligible participants, 1963(15.4%) were randomly selected to participate in the psychosocial module; 347 of the subjects declined to participate in the module; 10 participants did not complete the three loneliness questions and 2 participants were lost to follow up. Our final sample included 1604 participants (82% of eligible participants). The 359 subjects who were excluded were significantly older (72.3 vs 70.9), and were more likely to have a variety of health conditions including diabetes (22% vs 17%), and ADL difficulty (20% vs 12%)(all p <.05).

Measures

Loneliness—The primary predictor variable consisted of a 3-item loneliness questionnaire which measures three components of loneliness: whether subjects feel left out, isolated, or lack companionship. The 3-item questionnaire[5] was adapted from the Revised UCLA Loneliness Scale (R-UCLA), after exploratory and confirmatory factor analysis. Both the 3-item loneliness scales and the R-UCLA have been validated and are able to be self-administered.

For each component, subjects are asked if they feel that way hardly ever (or never), some of the time, or often. We classified subjects as 'lonely' if they responded "some of the time" or "often" to any of the three components. We classified subjects as "not lonely" if they responded "hardly ever (or never)" to all three components. Our primary analysis used a dichotomous measure of loneliness because we believed each item in the scale better represented different ways a person might express loneliness rather than additive components of loneliness. However, we performed sensitivity analyses examining alternative definitions for the outcome. First, we classified the participants as "moderately lonely" if they responded "some of the time" to any component, and "severely lonely" if they responded "often" to any component. Next, participants were classified as "moderately lonely" if they responded at least "some of the time" to one component only, and they were classified as "severely lonely" if the responded at least "some of the time" to two or three components. Third, we analyzed the items as a continuous scale, giving one point for each component answered some of the time and two points for each item answered often.

Outcomes

Outcomes studied included time to death, and among survivors, functional decline over 6 years on 4 measures.

Time to death was determined from interviews with family members and the national death index. We used four measures of functional decline: 1) difficulty in increased number of

ADLs, 2) difficulty in increased number of upper extremity tasks, 3) decline in walking, 4) and increased difficulty in stair climbing.

For ADL function, participants were asked if they had difficulty in any of the 5 ADLs: bathing, dressing, transferring, toileting, and eating. A decline in ADL function was defined as difficulty in more ADLs in 2008 compared to 2002.

For upper extremity tasks, subjects were asked whether they had difficulty extending their arms above their shoulders, pushing or pulling large objects or lifting or carrying weights heavier than 10 pounds. A decline was defined as difficulty in more tasks in 2008 compared to 2002.

For mobility, participants were asked about difficulty with 4 tasks: running or jogging a mile, walking several blocks, or walking one block. A decline was defined as a decrease in the distance able to jog or walk over the 6 years.

Lastly, for stair climbing, participants were asked whether they had difficulty climbing several flights of stairs, or one flight of stairs. A decline was defined as a decrease in the number of flights of stairs able to climb.

Other Measures

Demographic characteristic such as age, race and education level were obtained by self report. Income was measured by asking the subject to report the total household income in the previous calendar year. Net worth was measured by asking the subject to report assets and debts. Living arrangements were measured by assessing whether the subject lives in urban or rural area, and whether the subject lives alone. Comorbid conditions, including hypertension, diabetes, cancer, chronic lung disease, cardiac disease, and stroke were assessed by asking the subjects if a physician had ever told them that they had the condition. Previous work with the HRS has provided evidence of the validity of these comorbidity questions by demonstrating that they strongly predict mortality.[7–8] Depression was assessed with the 8-item CES-D scale[9] with depression defined as 3 or more symptomatic items. BMI was calculated from subjects' self-reports of current height and weight. Frequent physical activity was defined as engaging in light or vigorous exercise three or more times per week. If subjects reported ever smoking they were classified as smokers, and if they reported currently drinking any quantity of alcohol they were classified as drinking alcohol. Subjects were also asked to rate their hearing and vision, and those who rated the measure as fair or poor were classified as having an impairment.

Analysis—The characteristics of subjects classified as "lonely" and "not lonely" were compared using chi-square tests for categorical variables and t-tests for continuous variables.

To determine whether loneliness was associated with a higher risk for death, we used proportional hazards model. The primary predictor was whether or not the subject was lonely and the outcome was time to death. To examine the association between six-year functional decline and loneliness modified Poisson regression analyses were conducted for

each of the 4 functional decline outcomes. Our outcome for the functional measures was whether or not the subject declined rather than time to decline because functional measures were assessed every 2 years, creating only 3 time points.

Multivariate analyses for both the mortality and functional outcomes were adjusted for demographic variables (age, race, gender, marital status), socioeconomic status (education, income, and net worth), working status, living arrangement, depression, the number of baseline ADL difficulties and each of the medical conditions in Table 1. Our mortality analysis also adjusted for baseline upper extremity tasks, mobility, and stair climbing difficulties. We tested interactions for age, gender, and depression, but these were not significant. We also repeated our analyses excluding subjects with depression. These results were similar to our original analyses.

Results

Characteristics of Participants

Baseline characteristics of the 1,604 study participants are presented in Table 1. The mean age of the participants in the study was 70.9 years, 81.7% were white, 74.7% were married and 59.4% were women. 43.2% participants reported feeling lonely defined as reporting one of the loneliness items at least some of the time. In the 3-item loneliness questionnaire, 32% reported lacking companionship, 25% reported feeling left out, and 18% reported feeling isolated at least some of the time. Of the 43% classified as lonely, 30% reported feeling at least one of these symptoms some of the time, while 13% reported at least one of these items often. 21% reported feeling one of these symptoms at least some of the time, while 22% reported feeling two or three of these symptoms at least some of the time.

Subjects who were lonely were slightly older (71.3 vs. 70.5) and were less likely to be white. Subjects were also more likely to be female, had lower SES across all measures, were more likely to smoke, have most comorbid conditions, have greater baseline functional impairment, have sensory impairments, and were less likely drink alcohol, engage in frequent physical activity . While lonely subjects were more likely to live alone, the majority of lonely persons lived with someone. Moreover, while lonely subjects were more likely to be depressed, most lonely subjects were not depressed.

Relationship between Loneliness and Death

Loneliness was associated with increased risk of death over the 6 year follow-up period (22.8% vs. 17.9% (HR 1.70, 95% CI(1.35,2.15)) (Figure 2). The association between loneliness and death remained significant even after adjusting for demographics, SES, depression and other health and functional measures (HR 1.45, 95% CI(1.11,1.88)).

Relationship between Loneliness and Functional Decline

Loneliness was associated with all measures of functional decline in unadjusted analysis and after adjusting for potential confounders including demographic variables, SES measures, depression, comorbidities and other baseline health and functional measures (table 2). For ADL decline 24.8% vs. 17.5%, adjusted RR 1.59(95% CI 1.23,2.07); for difficulties with

upper extremity tasks 41.5% vs. 33.5, adjusted RR 1.28(1.08,1.52); for difficulty in stair climbing 40.8% vs. 33.0%, adjusted RR 1.31(1.10,1.57). The association between loneliness and decline in mobility (38.1% vs. 32.8%, adjusted RR 1.18(0.99,1.41) was nearly statistically significant after adjustment.

Additional Analyses

We conducted additional analyses in which we used different definitions of loneliness. First, we classified subjects as moderately lonely if they reported having at least one of the loneliness items at least some of the time and severely lonely if they reported having at least one of the loneliness items often. The adjusted risk of mortality and of functional decline across all 4 measures was similar for those moderately or severely lonely. Second, we classified subjects as moderately lonely if they reported one symptom at least some of the time, and severely lonely if they reported two or more symptoms at least some of the time. In adjusted analyses, there was a stepwise increase in the risk of ADL decline with increasing loneliness. For the remaining outcomes, the adjusted risk for moderately and severely lonely were similar. When we scored loneliness as a continuous scale, stepwise increases in loneliness were associated with a higher risk on each outcome except mobility.

Discussion

Loneliness is a common source of suffering in older persons. We demonstrated that it is also a risk factor for poor health outcomes including death and multiple measures of functional decline. It persisted after accounting for a large number of confounders including illness severity and depression.[10–11] With the increasingly large number of Americans aging and the high costs associated with disability ($26 billion annually for those who lose their ability to live independently over the course of a year),[12] it is necessary to identify and if possible, modify the factors that place the elderly at risk for functional decline and death.

This is one of the first studies in a nationally representative population to examine the relationship between loneliness and functional decline and death. There have been few studies examining loneliness as a predictor of specific health outcomes. Several smaller studies are consistent with our findings that loneliness in older persons is associated with poor health outcomes and may even be linked to nursing home admission.[13]

The mechanisms outlining the association between loneliness and health outcomes are not entirely clear although several studies have aimed to further delineate potential mechanisms. Cacioppo[14] suggests that perceived isolation, or loneliness results in increased sympathetic tone, decreased inflammatory control, and decreased sleep. Other studies have also suggested a correlation between cardiovascular disease and depression and loneliness.[15–16] More recent studies by Buchman[17–18] examined the correlation between loneliness and worse motor function, linking the relationship between loneliness and functional decline identified in our study. Additional studies have similarly found that those who are lonely have worse sleep, and poor health behaviors (including poor medication adherence), suggesting that these behaviors may be accounting for their poor health outcomes.[19–20–21–22] While these findings are intriguing, the mechanisms are still not entirely clear and more investigations must be undertaken.

Reducing the risk of adverse health outcomes is dependent on much more than medical care. This study demonstrates that loneliness is an identifiable and measurable risk factor for morbidity and mortality. Because loneliness is a subjective feeling of social distress that encompasses lacking companionship and a sense of not belonging, it is not adequately captured by quantitative measures of social isolation. This distinction between social isolation and loneliness is of importance because a significant number of participants who reported feeling lonely were married, or did not live alone. Further, adjustment for these factors did not explain the association between loneliness and functional decline and death. Based on our findings, we hypothesize that health outcomes in older people may be improved by focusing on policies that promote social engagement and more importantly, by helping elders develop and maintain satisfying interpersonal relationships. These findings suggest a need to look into interventions that explore strategies of mitigating loneliness, such as diverse living arrangements and telephone support.[23–24–25–26]

There are several limitations to this study. First, our functional outcome measures were based on self-report. Also, those excluded in the study had worse baseline health than those included; potentially affecting the generalizability of our results. In addition, while we adjusted for many confounders, our study does not prove loneliness is the cause of adverse outcomes. It is possible these outcomes are explained by an unmeasured confounder. In addition, we did not have repeated measurements of loneliness after the baseline measurement. Thus, it is possible the relationship between loneliness and functional decline is bidirectional, with poor functional status and disability leading to increased loneliness. Some may also question whether loneliness is just a proxy for depression. While symptoms of depression may overlap with feelings of loneliness, our study demonstrated that loneliness strongly predicted the outcomes even after adjusting for depression. Most persons who were lonely were not depressed. In addition, although we controlled for living situation and marital status, more comprehensive data on social relationships would have enhanced our analysis. Lastly, the mechanisms explaining the relationship between loneliness and morbidity and mortality are still in need of further investigation.

Our study may have important public health implications as nearly one in three subjects reported loneliness and the association between loneliness and disability and death was strong. Assessment of loneliness is not routine in clinical practice, it may be viewed as beyond the scope of medical practice. However, loneliness may be as an important of a predictor of adverse health outcomes as many traditional medical risk factors. Our results suggest that questioning older persons about loneliness may be a useful way of identifying elders at risk of disability and poor health outcomes. While future work needs to study potential interventions, primary care providers may wish to consider referral of high risk patients to social workers or community agencies for consideration of social programs such as group meals, senior center activities, and volunteerism which may ameliorate loneliness. Admittedly, with rising health care costs, and limited time in primary care offices, it seems challenging to add one more item for health care providers to assess. Yet for many older patients, loneliness may be more distressing than their medical diagnoses.

The use of a brief loneliness screen may add value to the clinical encounter. Loneliness may be amenable to psychosocial interventions and it is possible that it is more treatable than

other determinants of functional decline such as age-associated chronic disease. Ultimately, by asking about psychosocial concerns important to patients, our treatment focus may shift, and we will likely enhance the doctor-patient relationship. By identifying loneliness we will be better able to target interventions intended to prevent functional decline and disability.

Acknowledgments

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Table 1

Characteristics of Lonely and Not Lonely Subjects (N=1,604)

Characteristic		Lonely (N = 693)	Not Lonely (N= 911)	P-value*
Demographics	Age (mean, SD)	71.3 ± 7.9	70.5 ± 7.2	0.041
	Age Category, %			
	60–65	29.0	30.5	0.062
	65–75	42.0	45.7	
	>75	29.0	23.8	
	Female, %	67.1	53.5	<0.001
	Ethnicity, %			
	White	76.2	85.8	<0.001
	Black	14.7	8.6	
	Hispanic	7.8	4.8	
	Other	1.3	0.8	
	Married or Partnered	62.5	83.9	<0.001
SES Measures	<HS education, %	26.8	19.0	<0.001
	Income, median (IQR)	28K (16K – 46K)	39K (24K – 65K)	<0.001**
	Net worth, median (IQR)	147K (46K – 375K)	245K (88K – 554K)	<0.001**
	Working for pay, %	19.1	28.4	<0.001
Living Arrangements	Living in Urban Area, %	66.6	70.9	0.065
	Living Alone, %	26.7	10.5	<0.001
Comorbidities	Hypertension, %	55.6	52.5	0.219
	Diabetes, %	18.8	16.4	0.208
	Cancer, %	15.2	14.1	0.528
	Chronic lung disease, %	7.7	6.2	0.234
	Heart condition, %	27.6	22.3	0.014
	Stroke, %	7.5	6.5	0.417
Other health	Depression	37.5	10.8	<0.001
	Current smoker, %	12.0	9.0	0.052
	Currently drinks alcohol, %	43.4	50.4	0.006
	BMI, mean (SD)	27.0 ± 4.8	27.3 ± 5.4	0.235
	Vigorous activity 3x/week, %	38.7	49.1	<0.001
	Hearing impairment, %	22.8	17.2	0.005
	Vision impairment, %	24.6	13.9	<0.001
	Currently driving, %	80.8	90.0	<0.001

Abbreviations: ADLs, Activities of Daily Living.

Table 2

Incidence of Outcomes in Lonely vs Not Lonely Subjects

Functional Measure	Eligible for outcome	Outcome Frequency		Unadjusted RR/HR (95% CI)	Adjusted[a] RR/HR (95% CI)
		Lonely	Not Lonely		
ADLs	1233	24.8%	12.5%	1.98 (1.55, 2.53)	1.59 (1.23, 2.07)
Upper Extremities Tasks	1166	41.5%	28.3%	1.47 (1.25, 1.72)	1.28 (1.08, 1.52)
Mobility	1114	38.1%	29.4%	1.30 (1.10, 1.53)	1.18 (0.99, 1.41)
Climbing	1062	40.8%	27.9%	1.46 (1.23, 1.73)	1.31 (1.10, 1.57)
Death[b]	1604	22.8%	14.2%	1.70 (1.35, 2.15)	1.45 (1.11, 1.88)

Abbreviations: RR, Risk Ratio; HR, Hazard Ratio; ADLs, Activities of Daily Living.

[a] Adjusted for age, gender, race/ethnicity, education level, income, net worth, working status, living arrangement, comorbid conditions (hypertension, diabetes, cancer, chronic lung disease, cardiac disease, and stroke), smoking and drinking habits, BMI (body mass index), physical activity, hearing and vision problems, depression and baseline ADL status. Adjusted analysis for death was also adjusted for baseline upper extremities tasks, mobility and climbing.

[b] Association of loneliness with death reported as Hazard Ratios.

Table 3

Adjusted Association between Loneliness and Adverse Health Outcomes in Analyses considering alternative definitions of loneliness

Alternative Loneliness Definitions		Hazard Ratios and Risk Ratio (95% CI)				
		Death	ADL	UE	Mobility	Climbing
Severity Definition: Considering severity of each item [*]	Not Lonely	1	1	1	1	1
	Moderately lonely	1.35 (1.02, 1.78)	1.57 (1.20, 2.07)	1.34 (1.12, 1.59)	1.20 (0.99, 1.45)	1.34 (1.11, 1.62)
	Severely lonely	1.76 (1.23, 2.52)	1.65 (1.15, 2.37)	1.10 (0.82, 1.46)	1.12 (0.84, 1.49)	1.20 (0.91, 1.59)
Multi-item Definition: Considering lonely on more than one component [**]	Not Lonely	1	1	1	1	1
	Moderate	1.45 (1.08, 1.94)	1.44 (1.06, 1.96)	1.35 (1.12, 1.64)	1.22 (0.98, 1.50)	1.38 (1.13, 1.68)
	Severe	1.45 (1.04, 2.02)	1.78 (1.32, 2.40)	1.20 (0.96, 1.49)	1.14 (0.91, 1.42)	1.23 (0.98, 1.54)
Continuous Score [***]		1.22 (1.05, 1.43)	1.33 (1.15, 1.54)	1.11 (1.00, 1.22)	1.08 (0.98, 1.20)	1.14 (1.02, 1.26)

[*] **Severity Definition:** Loneliness was classified as a three level variable, in which those not lonely answered never to all 3 items, those moderately lonely answered some of the time to at least one item, and those severely lonely answered often to at least one item

[**] **Multi-item Definition:** Loneliness was classified as a three level variable, in which those not lonely answered never to all 3 items, those moderately lonely answered "some of the time" or "often" to one item, and those severely lonely answered "some of the time or often" to at least 2 items

[***] **Continuous Score:** Subjects were given one point for each loneliness item answered "some of the time" and 2 points for each item answered "often." Effect sizes are per point increase. Scores are truncated at 3 or more points as few subjects had higher scores