Transitions in loneliness among older adults: A five-year follow-up in the National Social Life, Health, and Aging Project

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Social relationships play an essential role in survival, health, and well-being, and may be particularly important during older age (Holt-Lunstad, Smith, & Layton, 2010). Yet older age is a vulnerable period of the lifespan for social isolation and feelings of loneliness. Loneliness has been associated with adverse health outcomes and greater mortality in older age (Hawkley & Cacioppo, 2010; Holt-Lunstad et al., 2015), which has implications for a rapidly growing proportion of the population. In 2010, about 13% of the population was over age 65; by 2030, this figure is expected to increase to 20%, or over 70 million individuals (Ortman, Velkoff, & Hogan, 2014).

Social isolation and *loneliness* are related but correlations between them are small (Coyle & Dugan, 2012), a reflection of their distinct conceptualizations. Social isolation is an objective circumstance characterized by few social contacts and/or infrequent social interactions (Havens, Hall, Sylvestre, & Jivan, 2004). Loneliness corresponds to subjective or perceived isolation and is defined as a distressing feeling that accompanies a perceived discrepancy between one's desired and actual social relationships (Peplau & Perlman, 1982). Poor quality social relationships are typically more highly correlated with loneliness than are objective measures of network size, for example (Pinquart & Sörensen, 2003).

About 20 to 35 percent of adults between the ages of 65 and 79 years report frequent feelings of loneliness, a figure that increases to 50 percent of those over the age of 80 (reviewed in Dykstra, 2009). However, these statistics also indicate that a large proportion of the older adult population remains relatively unscathed by loneliness with increasing age. With few exceptions (e.g., Victor, Scambler, Bowling, & Bond, 2005; Wenger & Burholt, 2004), research to date has not explicitly examined both protective and risk factors for loneliness in older age. Most research in this area has been conducted in European countries, and the few nationally representative studies in the U.S. have either focused on measurement validation, as was done in the Health and Retirement Study (Hughes, Waite, Hawkley, & Cacioppo, 2004), extended old age to as young as 45 years old (Wilson & Moulton, 2010), or have considered only a limited range of loneliness risk factors (e.g., Shiovitz-Ezra &

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Leitsch, 2010). Moreover, none of the U.S. studies have examined changes or transitions in loneliness.

A national study of the development and resolution of loneliness in the United States is needed as an important step in addressing the social and health challenges of a rapidly growing older adult population. We use two waves of data from the National Social Life, Health and Aging Project (NSHAP), a large, population-based sample of older adults in the U.S., to examine protective and risk factors for changes in loneliness.

Background

Risk and protective factors for loneliness: Prior research.

Sociodemographic, structural, and functional characteristics have been associated with loneliness. Among *sociodemographic* characteristics, education, income, and wealth have been associated with loneliness (Hawkley et al., 2008; Victor et al., 2005). Age is associated with loneliness, but this association appears to be largely attributable to age-related risk factors that limit social activity (e.g., spousal loss, mobility limitations), not to age *per se* (Tijhuis, De Jong Gierveld, Feskens, & Kromhout, 1999).

Gender differences in loneliness are inconsistently found but, on balance, older women tend to be lonelier than older men (Pinquart & Sörenson, 2003). Older women are much more likely than their male counterparts to be widowed, and widowhood is related to greater loneliness. Widowhood does not, however, account for greater loneliness in women; only among married respondents have women been found to be lonelier than men (Pinquart & Sörenson, 2003). In another study (Tornstam, 1992), the gender difference among married respondents has been found to be limited to younger adults (20–49 years of age). Greater morbidity among women than men may contribute to greater loneliness in women because of the restrictions morbidity places on social life (Jette, 1996). Alternatively, men and women may differ in loneliness if a given risk factor is more influential for one than the other sex (Dong & Chen, 2015). This possibility has been inadequately explored in older adults to date and is addressed in sub-group analyses described below.

Very little research has systematically examined racial-ethnic differences in loneliness. A study of over 1,800 older adults in southern U.S. found that "affective isolation" (vs. objective isolation) was significantly higher in Black than White respondents (Adams, Kaufman, & Dressler, 1989). However, a recent study using the NSHAP data found no significant loneliness differences between Whites and non-Whites (Shiovitz-Ezra & Leitsch, 2010).

Structural characteristics pertain to relatively objective aspects of individuals' living arrangements, social roles, network structure, and social activity, whereas *functional* characteristics pertain to individuals' abilities to avail themselves of social opportunities in their environment and their subjective perceptions of relationship quality. The same structural factors are often experienced differently by different people and therefore function differently to influence feelings of loneliness. In a study of middle- to older-age adults,

functional factors were more robustly related than structural factors to individual differences in loneliness (Hawkley et al., 2008).

Few studies, however, have directly compared the relative potency of structural and functional factors in older adults. In older adults, loneliness is typically associated with age-related losses in health and social relationships (e.g., widowhood). These prevalent structural changes are typically assumed to be responsible for increased loneliness in older age. Yet many older adults manage to navigate their social lives to ensure continued social involvement in spite of losses. Indeed, older adults often choose to prune their social networks to focus on important and meaningful relationships (Carstensen, Fung, & Charles, 2003), suggesting that functional factors such as social relationship quality may take precedence in staving off feelings of loneliness. The studies reviewed below support our decision to consider structural and functional factors simultaneously.

Living alone is a risk factor for loneliness (Greenfield & Russell, 2011). However, in one study, 70% of a sample of 65–93 year-olds living alone was not lonely; this group had higher levels of social integration, better mental health, and less frailty than the lonely group (Zebhauser, Baumert, Emeny, Ronel, Peters, & Ladwig, 2015). Thus, living alone may be a structural risk factor for loneliness only to the extent that it is associated with functional factors that are more proximally related to loneliness.

Decreasing social activity (frequency of participation during the last 12 months in family events, library visit, religious services, and travel to a foreign country) has been prospectively associated with increased loneliness (Aartsen & Jylhä, 2011), whereas a large or growing social network was shown to protect against loneliness (Dykstra, Van Tilburg, & De Jong Gierveld, 2005). Functionally, the quality of social contacts has a significant effect on loneliness (Pinquart & Sörensen, 2003). Other research underscores the value of heterogeneous networks over primarily kin networks in staving off loneliness (De Jong Gierveld, Van Tilburg, & Dykstra, 2006).

Marriage is widely accepted to protect against loneliness (Stack, 1998; Victor & Bowling, 2012), but functionally, marital quality plays a critical role. In one study, marriage was found to have no protective effect at all if the spouse was not identified as the respondent's confidant (Hawkley et al., 2008). Warner & Kelley-Moore (2012) found that the positive association between disability and loneliness was attenuated by the degree of positivity in the quality of the marriage.

The transition to retirement is initially associated with improved well-being and reduced loneliness, but this effect appears to wane over time; depressive symptoms increase after about two years in retirement (Kim & Moen, 2002). Other data indicate that the transition from employment to retirement is unrelated to loneliness after adjusting for age and changes in health and partner status (Nicolaisen & Thorsen, 2014), suggesting that retirement is a structural risk factor that influences loneliness only to the extent it is related to functional factors that are more directly related to loneliness.

Transitions in Loneliness Status.—Several studies have directly examined whether factors that predict the resolution or reduction of loneliness are distinct from those that prevent the onset of or increase in loneliness. In one such study, a group identified to be persistently lonely over a 5-year period was more likely to have been widowed, in poor health, living alone, and to have perceived a low degree of control over multiple aspects of life at baseline than the persistently non-lonely group. Moreover, those who transitioned to living alone and who perceived a loss of control over the 5-year period became lonely (Newall, Chipperfield, & Bailis, 2014). These data revealed that changes in structural and functional factors can exert independent effects on loneliness.

On the other hand, older adults who recovered from loneliness versus stayed lonely over a 3.5 year follow-up were more likely to be men and married individuals, and to receive higher levels of emotional support at baseline (Cohen-Mansfield, Shmotkin, & Goldberg, 2009). Conversely, those who became lonely were more likely to be women and less well off financially. Other research has identified a potent role for health status, a functional factor, in explaining loneliness changes; an increase in loneliness was associated with deterioration in health, and an improvement in health was associated with a decrease in loneliness (Victor and Bowling, 2012).

In sum, prior research has identified a range of sociodemographic, structural, and functional features of people's lives that are associated with changes in loneliness level and transitions into and out of the state of loneliness. To date, however, the many risk factors associated with loneliness have not been simultaneously examined in a nationally representative sample of older adults in the United States.

The current study.

We used two waves of data from the National Social Life, Health, and Aging Project (NSHAP) to examine sociodemographic, structural, and functional features of older adults' lives, and changes in these features, as they relate to loneliness and changes in loneliness over a 5-year period. We first sought to replicate loneliness risk factors identified in prior studies, but in a large nationally representative U.S. sample of older adults. Second, we examined the unique effects of structural and functional risk factors for loneliness in older adults. Third, we determined whether transitions into and out of loneliness are differentially associated with loneliness risk factors. We extended prior research by also exploring whether associations with loneliness differ between men and women, or between married and not married individuals.

Method

Participants

NSHAP is a nationally-representative study of community residing adults born between 1920 and 1947, and includes an oversampling of African-Americans, Hispanics and the oldest old. NSHAP uses a complex, multi-stage area probability sample with post-stratification. Sample design details are reported by O'Muircheartaigh and colleagues (O'Muircheartaigh, Eckman, & Smith, 2009; O'Muircheartaigh, English, Pedlow, & Kwok,

2014). Wave 1 (W1) data were obtained from 3,005 respondents between 2005 and 2006. For the longitudinal analyses reported in this paper, we were interested in the 2,261 respondents who also participated in Wave 2 (2010–2011). Sample characteristics are provided in Table 1. Institutional Review Board approval was granted from two IRBs: the Social and Behavioral Sciences IRB at the University of Chicago and the NORC IRB.

Measures

Loneliness.—A validated 3-item (lack companionship, feel left out, feel isolated) version of the UCLA Loneliness scale (Hughes, Waite, Hawkley, & Cacioppo, 2004) was administered in the LBQ in both waves. Scale reliability was 0.80 in W1 and 0.79 in W2. Mean loneliness scores (range=1–3) corresponded to frequency options in the response scale (1=never, 2=occasionally/some of the time, 3=often). Loneliness status categories were defined as low/nonlonely and high/lonely using a cut point of 1.5. Mean values greater than 1.5 (i.e., lonely status) correspond to a frequency of "occasionally/some of the time" for at least two items or "often" for at least one item, a criterion that roughly parallels what other researchers have used for single item loneliness measures (Newall et al., 2014; Sundström, Fransson, Malmberg, & Davey, 2009). Correspondingly, those who experience loneliness occasionally/some of the time for only one item are considered non-lonely for the purposes of our analyses.

Protective and Risk Factors.—Descriptive statistics for the sociodemographic, structural and functional predictor variables are provided in Table 1 and are described below. See Supplementary files online for additional information.

(1) Sociodemographic variables: Respondents were asked their *age*, *gender*, and *race-ethnicity*. Education contrasted all levels of attainment with *less than high school*. Open-ended questions asked about *assets* and *household income*. Respondents who did not report exact amounts were asked a series of "unfolding bracket" questions in an attempt to place the amounts into categories (see Table 1). An *income-to-needs ratio* was calculated as income relative to poverty thresholds for a household of a particular size and number of related children under 18 years of age in the household.[1]

(2) Structural Factors

Living arrangements: Living alone was contrasted with all other living arrangement types. Twenty-three percent of respondents live alone; 68 percent live with a spouse or partner with or without others in the household. The remaining 9 percent of the population live with people other than a spouse or partner.

Social roles: For marital status, *being married or living with a partner* was compared with all other marital status groups. For *employment status*, responses were collapsed into four categories: working; retired and working; retired; all other categories.

For the definition of income-to-needs ratio, see http://www.census.gov/population/www/cps/cpsdef.html; for tables of poverty thresholds by family size and number of children, see https://www.census.gov/hhes/www/poverty/data/threshld/

Social network features: The social network instrument has been described in detail elsewhere (Cornwell, Schumm, Laumann, & Graber, 2009) and the data used as previously recommended (Cornwell, Schumm, Laumann, Kim, & Kim, 2014) to derive a measure of *social network size* and *proportion kin*. Respondents' numbers of *close relatives* and *friends* were obtained from the main interview; categorical responses ranged from 0 (none) to 5 (>20).

Social activity: *Frequencies of socializing* with close friends and relatives, *group meeting attendance*, and *church service attendance* ranged from 0 (never) to 6 (several times a week), with intervening categories of less than once a year, about once or twice a year, several times a year, about once a month, and every week.

(3) Functional Factors

Health: A single item for *self-rated physical health* ranged from poor to excellent (1–5). *Functional limitations* were summed across seven activities of daily living, where activities for which respondents reported at least some difficulty were coded as limited activity domains.

Social relationship quality: For (a) family and (b) friend relationships, two items asked how often respondents feel they can be open with and rely on [family/friends] (1=hardly ever or never, 2=some of the time, 3=often), and another two items asked how often respondents feel [family/friends] are demanding and critical of them. Responses were averaged to generate mean values of *family support, family strain, friend support*, and *friend strain*. Similar items were used to calculate *spousal support* and *spousal strain* for married respondents. *Relationship closeness* was the mean closeness across non-spousal individuals listed in the social network, and *spousal closeness* was the closeness rating given the spouse during the social network interview. Both closeness variables range from 1 to 4 (not very close to extremely close).

Statistical Analyses.

Multivariate linear regression models identified sociodemographic, structural, and functional predictors of loneliness in Wave 1, and predictors of changes in loneliness during the 5-year interval between Waves 1 and 2. Logistic regression models identified predictors of becoming lonely vs. staying nonlonely, using Wave 1 variables to predict shifts in loneliness status between waves. Interaction terms were used to examine whether predictors differed between (1) males and females, and (2) married/partnered and not married/not partnered respondents. In addition, a separate model for married respondents assessed the impact of spousal support and strain on subsequent loneliness. To examine the effect of attrition, logistic regression models identified whether lonelier respondents were more likely to die or to become too sick to interview prior to Wave 2. In addition, analyses examined whether baseline loneliness levels differed among Wave 1 respondents who in Wave 2 were interviewed, not interviewed, and deceased/too sick to interview.

Multiple Imputation.

Overall, NSHAP has low rates of missing data (Hawkley, Kocherginsky, Wong, Kim, & Cagney, 2014). However, because the two waves of data were combined and because many of the loneliness and social isolation questions were asked in the leave-behind questionnaire (LBQ), which had a higher missingness rate than the in-person interview, the overall sample size was greatly reduced for many models (*N*=1,030 for the most complex model). Therefore, in order to increase power, we imputed missing values using the multiple imputation using chained equations (MICE) approach with ten imputations (White, Royston, & Wood, 2011).

Items of the UCLA loneliness scale; household assets and income; numbers of close relatives and friends; frequency of socializing with close friends and relatives, group meeting attendance, and church service attendance; items corresponding to support and strain from family and friends; and the number of comorbidities were imputed jointly, using variables from both waves. The imputation model also included completely observed demographic variables (age, gender, education, and marital status). Variables with less than five percent missingness were not imputed. Reported household assets and income were log10-transformed and missing values were imputed on the logarithmic scale using interval regression. Upper and lower bounds were set to the reported values or brackets for respondents with available unfolding bracketing questions, or to $1 and $20M (the largest reported household assets value in the subset of W1/W2 responders) and to $1 or 1.8M (largest reported income) when data were missing. Other variables were imputed either using predictive mean matching or ordinal logistic regression. Analyses were conducted on the multiply imputed data which were based on anywhere from 2,228 cases (a model that included all predictors) to 2,244 cases (a model that included only sociodemographic predictors). Imputation models included NSHAP survey weights.

Regression models were estimated using imputed data, and used Wave 1 weights to account for the complex survey design. Analyses were restricted to the subpopulation of respondents who participated in both waves. The residuals from the linear regression models were reasonably normally distributed.

Statistical analyses were done in Stata 14.

Results

Participant Characteristics

Baseline characteristics of the NSHAP sample are shown in Table 1. On average, loneliness levels (*M*=1.32) are at the low end of the scale range (1–3) and correspond well with the mean loneliness value of 1.30 observed among a somewhat younger sample of 50–67 year-olds in the HRS in 2002 (Hughes et al., 2004). Based on the categorical measure of loneliness, 30% of the sample is lonely. Loneliness is more prevalent in women (34%) than men (25%), and more prevalent among 57–64 year-olds (34%) than 65–74 year-olds (25%) and even 75–85 year-olds (30%). Similar age and gender differences are evident in mean loneliness values (see Table S1). Half of the sample was fully retired (50%), and the majority were married or living with a partner (72%). The mean network size is 4.3

individuals, and, on average, 71% of network members are kin. Mean attendance frequency at group meetings is 2.8, which approximates several times a year; modal group participation rate is "never." Mean rate of church attendance is 3.4, which approximates a frequency between several times a year and almost monthly. The mean rate of 4.5 for socializing with friends and relatives approximates a frequency between monthly and weekly. Modal rates of church attendance and socializing frequency are weekly.

Cross-sectional analyses (Tables S2a and S2b) showed that baseline loneliness was associated with sociodemographic, structural and functional variables in expected ways that largely replicated prior research. A multivariate linear regression analysis (Table S3) showed that baseline levels of loneliness were uniquely and inversely associated with age; being married; number of friends; socializing frequency; self-rated health; and family support; and positively associated with living alone and higher levels of family strain. Thus, baseline variables independently associated with loneliness included age (protective) as well as structural and functional protective and risk factors consistent with theory and prior empirical research.

Predicting changes in loneliness level between waves.

Loneliness increased between waves, from 1.32 (SD=0.44) in W1, to 1.37 (SD=0.47) in W2, p<.0001. Table 2 displays coefficients (SEs) for a series of linear regression models predicting changes in loneliness level between Waves 1 and 2.

Sociodemographic predictors.—Only age had a small positive association with increases in loneliness (B=0.04, p=0.02) after adjusting for other sociodemographic variables (Model 1). This coefficient translates to a difference of 0.11 (0.25 SDs) on the loneliness scale across the range of ages in this sample.

Structural predictors.—None of the Wave 1 structural factors were associated with changes in loneliness (Model 2; p's > 0.1). Age, although no longer a statistically significant predictor of loneliness, showed only a small diminution in the magnitude of the coefficient relative to Model 1 (B=0.03, p=0.058). Thus, structural factors explain very little of the age effect.

Functional predictors.—Wave 1 functional factors related to an increase in loneliness between waves were more functional limitations, less support from the family, and more strain in friendships (Model 3). A final model (Model 4) that included all three groups of predictors showed persistent significant effects for the same functional predictors seen in Model 3.

Transitions in loneliness status.

Seventy percent of the sample (N=1,586) was not lonely in Wave 1, but 338 of these individuals became lonely by Wave 2. Relative to those who remained nonlonely, those who became lonely had fewer assets and a lower income-needs ratio, were less likely to be married, had more functional limitations, less family support, and more friend strain (see left panel of Table S3). Only functional limitations and family support at baseline were

associated with greater odds of becoming lonely after adjusting for all other covariates (Table 3, left column).

Thirty percent of the sample (N=675) was lonely in Wave 1, but 269 of these individuals recovered from loneliness by Wave 2. Relative to those who remained lonely, those who recovered from loneliness had better self-rated health and less family strain at baseline (see right panel of Table S3). One structural factor – socializing frequency, and two functional factors – self-rated health and family strain at baseline - were associated with greater odds of recovering from loneliness after adjusting for all other covariates (Table 3, right column).

Sub-group Analyses: Gender and Marital Status.

Associations between loneliness and sociodemographic, structural, and functional factors did not differ between men and women (*p*'s >.08 for all gender interaction terms), or by marital status (*p*'s >.09 for all marital status interaction terms). Among married respondents, spousal support was inversely associated with loneliness (*B*=−0.08, *p*=.025) over and above the effects of all other baseline covariates. Spousal strain was unrelated to loneliness (*B*=0.03, *p*=.197). Associations between baseline covariates and transitions in loneliness did not differ by gender (*p*'s>.1) or marital status (*p*'s>.1).

Attrition Analyses.

Wave 1 loneliness scores differed significantly between respondents who were interviewed (*M*=1.32), deceased/too sick to interview (*M*=1.42), or not interviewed (*M*=1.31) in Wave 2 (*p*=0.003). Those who were interviewed in Wave 2 had significantly lower Wave 1 loneliness levels than those who were deceased/too sick to interview (p=.001), and similar to the non-interviewed group (p>.99).

Discussion

This study systematically examines, for the first time to our knowledge, predictors of loneliness improvement and deterioration in a nationally representative sample of older adults in the United States. Our findings show that among 57–85 year-old men and women, the average loneliness level is low. Moreover, loneliness scores are positively skewed; most older adults report never or hardly ever experiencing lonely feelings. However, about 30 percent of this population could be classified as lonely because they experience two or three of the loneliness-related feelings some of the time or often. This prevalence falls somewhat below the midpoint of prevalences in European countries (25–50 percent) (Sundström et al., 2009). In NSHAP, 15% of the sample became lonely across the 5-year interval; 12% recovered from loneliness; and 18% were consistently lonely across waves. Changes in loneliness status in our nationally representative U.S. sample resemble changes seen in other countries (Newall et al., 2014; Victor & Bowling, 2012), where the rate of incident or worsening loneliness ranges from 13–25% and approximately 15% recover from loneliness over follow-up periods ranging from seven to 20 years or more. Such cross-study comparisons are not straightforward, however, because of different measures and thresholds for what constitutes loneliness. The field of loneliness research would benefit from work that helps to establish a standard threshold that defines loneliness for different measures.

Our preliminary cross-sectional analyses were consistent with the filtration model described in prior research (Hawkley et al., 2008). Although both structural and functional factors were associated with loneliness, functional factors exhibited unique associations over and above the relatively sizeable effects of structural differences in marital status and living arrangements. These results provide preliminary evidence that functional factors continue to play an important role in explaining loneliness in older adults.

Longitudinal analyses demonstrated the relatively greater impact of functional than structural factors on loneliness. The results indicate that loneliness interventions have potential value for social well-being to the extent that they help older adults maintain functional independence, foster supportive family relationships, mend strained friendships, and increase levels of social engagement. At least one additional wave of data is needed to test whether changes in predictive factors precede changes in loneliness and might therefore be ascribed a causal role.

A focus on loneliness frequency or intensity masks an equally important issue: what protects people from loneliness in the first place? Analyses revealed that those with fewer functional limitations and higher levels of family support at baseline were less likely to become lonely, even after controlling for age.

People can and do recover from loneliness, and knowledge of factors that ameliorate loneliness in old age are valuable for the design of loneliness interventions. Consistent with our hypothesis, factors that predicted transitioning out of loneliness differed from those that predicted transitioning into loneliness. Two functional factors - more frequent socializing and less family strain at baseline – were associated with recovery from loneliness independent of background, structural, and remaining functional factors. We note, however, that lonelier respondents were more likely to attrite between waves in NSHAP, indicating that our data may not capture the full extent or accurate magnitude of odds for loneliness recovery.

Effects varied in size. For instance, a one point increase in family strain between waves was associated with a 0.09 point increase in loneliness (0.2 *SD*). Getting married had a larger effect, reducing loneliness by 0.15 points (0.34 *SD*). A difference of one point on the family support scale at baseline reduced the odds of becoming lonely by nearly 40% (OR=0.61). An improvement in self-rated health between waves reduced the odds of becoming lonely by 25% (OR=0.75). In combination, the effects of all unique predictors of loneliness changes could have a marked influence on transitions into and out of loneliness.

Neither living alone nor changes in living arrangements were associated with changes in loneliness level or status in adjusted models. Consistent with Zebhauser et al. (2015), these findings imply that living alone increases risk for loneliness only to the extent that living alone is associated with other risk factors that are more proximally related to loneliness. Living alone was positively associated with more frequent attendance at group meetings, more frequent socializing, and higher levels of support from family and friends at baseline, suggesting that older adults who live alone actively maintain a fulfilling social life that at least partially counteracts any detrimental effect of living alone on loneliness.

Age was inversely associated with loneliness in multivariate cross-sectional analyses. Notably, age exhibited no association or, at most, a small positive association with changes in loneliness, suggesting that age differences at baseline might be cohort differences. This possibility will be examined further using Wave 3 data in which a representative sample of the Baby Boomer cohort was added to the original NSHAP sample. Alternatively, the lack of an increase in loneliness with age could be attributable to attrition of lonelier subjects from the sample.

The relative impact of the risk factors for loneliness did not differ by gender or marital status. To the extent that these factors can be demonstrated to play a causal role, this suggests that loneliness interventions can be uniformly implemented in these groups, at least as far as interventions that target risk factors addressed in the present study. However, among the married, spousal support offered protection against loneliness over and above the effects of the other risk factors. Interestingly, marital strain did not exacerbate loneliness or changes in loneliness, suggesting that loneliness interventions among the married would do well do ensure that partners optimize the positive features of their marriage, and that this may be more effective than intervening to reduce the negative features of the marriage. Indeed, prior research has shown that "capitalization" (e.g., sharing good news) can decrease loneliness (Gable & Reis, 2010).

Conclusion

The structural and functional predictors of loneliness observed in the present study are amenable to intervention and have shown effects in prior research (Masi, Chen, Hawkley, & Cacioppo, 2011). Recently, a social cognitive intervention that included training to improve perspective-taking abilities and increase empathy - skills that would be expected to minimize strain in relationships and increase the likelihood of eliciting the support of others - was shown to decrease loneliness in a young adult sample of Army troops (Cacioppo et al., 2015). Maladaptive social cognitions have been addressed in only one intervention conducted in an older adult sample, and the effect in this study was large (Chiang et al., 2009). In addition, interventions to maintain functional independence have helped to reduce loneliness in older adults (Ollonqvist et al., 2008) as have efforts to provide group educational and social activities (Cattan, White, Bond, & Learmouth, 2005). The present study adds to a body of research that may lead to the design of better targeted loneliness interventions for a growing population of older adults at risk for loneliness and its impact on health and well-being.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Author Biographies

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Table 1.

Baseline characteristics of returning NSHAP respondents in Wave 2 (survey-weighted data)[1]

Characteristic	N	Mean (SD) or Percent
Loneliness	1,896	1.32 (0.44)
Sociodemographic Variables		
Age (mean)	2,261	67.1 (7.2)
Female (%)	2,261	52.2
Race-ethnicity (%)	2,251	
White		81.1
African American		9.6
Hispanic		6.9
Other		2.3
Education (%)	2,261	
<High school		15.8
High school		25.5
Some college		32.0
College or more		26.8
Household assets[2]	1,959	
<$10K		6.1
$10K < 50K		11.8
$50K < 100K		8.9
$100K < 500K		39.1
$500K		34.1
Income:Needs Ratio (mean)	1,744	4.72 (6.09)
Structural Factors		
Living arrangements: live alone (%)	2,254	23.5
Employment status (%)	2,260	
Working		31.0
Working & retired		7.4
Retired		50.0
Other		11.6
Married/partnered (%)	2,261	71.8
Network size (mean)	2,254	4.34 (1.55)
% kin in network (mean)	2,254	70.6
# of close relatives (category mean)	2,137	2.93 (0.98)
# of friends (category mean)	2,142	3.38 (1.21)
Attendance at group meetings (category mean)	1,909	2.80 (2.09)
Attendance at church services (category mean)	2,253	3.40 (2.06)
Socializing frequency (category mean)	1,926	4.46 (1.17)
Functional Factors		
Self-reported physical health (mean)	2,252	3.39 (1.04)
Functional limitations (mean)	2,252	0.68 (1.39)

Characteristic	N	Mean (SD) or Percent
Family support (mean)	2,139	2.47 (0.56)
Family strain (mean)	2,139	1.33 (0.45)
Friend support (mean)	2,067	2.19 (0.60)
Friend strain (mean)	2,067	1.14 (0.29)
Overall relationship closeness (mean)	2,253	3.02 (0.52)

[1] All estimates were weighted to account for differential probabilities of selection and differential nonresponse.

[2] Bracketed asset categories were used.

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Table 2.

Linear regression models (unstandardized coefficients and standard errors) predicting loneliness levels in Wave 2 (multiply imputed survey-weighted data).

Characteristic	Model 1: Sociodemographics	Model 2: Structural Factors	Model 3: Functional Factors	Model 4: All
Loneliness, W1	0.52 (0.03) [**]	0.50 (0.03) [**]	0.48 (0.03) [**]	0.47 (0.03) [**]
Sociodemographic Variables				
Age in decades, mean-centered	0.04 (0.02) [*]	0.03 (0.02)	0.04 (0.01) [*]	0.03 (0.02)
Female	0.01 (0.02)	−0.00 (0.02)	0.02 (0.03)	0.01 (0.03)
Race-ethnicity (ref: white)	*p = 0.12*	*p = 0.22*	*p = 0.09*	*p = 0.16*
African American	−0.01 (0.04)	−0.00 (0.04)	−0.02 (0.04)	−0.01 (0.04)
Hispanic	−0.09 (0.04) [*]	−0.08 (0.04) [*]	−0.10 (0.04) [**]	−0.09 (0.04) [*]
Other	−0.003 (0.07)	0.01 (0.07)	−0.03 (0.08)	−0.02 (0.08)
Education (ref: <high school)	*p = 0.53*	*p = 0.41*	*p = 0.33*	*p = 0.31*
High school	0.03 (0.03)	0.04 (0.03)	0.05 (0.03)	0.05 (0.03)
Some college	−0.001 (0.04)	−0.00 (0.04)	0.01 (0.04)	0.01 (0.04)
College or more	0.02 (0.04)	0.02 (0.04)	0.04 (0.04)	0.03 (0.04)
Household assets	−0.02 (0.01)	−0.02 (0.01)	−0.01 (0.01)	−0.01 (0.01)
Income:Needs Ratio	−0.05 (0.04)	−0.05 (0.04)	−0.04 (0.04)	−0.04 (0.04)
Structural Factors				
Live alone		0.00 (0.04)		0.02 (0.04)
Employment status (ref: working)		*p = 0.35*		*p = 0.62*
Working & retired		0.01 (0.05)		0.00 (0.04)
Retired		0.04 (0.03)		0.04 (0.03)
Other		0.07 (0.04)		0.03 (0.04)
Marital status (% married-partnered)		−0.02 (0.04)		−0.00 (0.04)
Network size		−0.00 (.01)		0.00 (0.01)
% kin in network		−0.05 (0.04)		−0.02 (0.04)
# of close relatives		−0.01 (0.01)		−0.01 (0.01)
# of friends		−0.00 (0.01)		−0.00 (0.01)
Attendance at group meetings		0.00 (0.01)		0.003 (0.01)
Attendance at church services		−0.01 (0.01)		−0.01 (0.01)
Socializing frequency		−0.01 (0.01)		−0.00 (0.01)
Functional Factors				
Self-reported physical health			−0.02 (0.01)	−0.02 (0.01)
Functional limitations			0.02 (0.01) [*]	0.02 (0.01) [*]
Family support			−0.08 (0.02) [**]	−0.07 (0.02) [**]
Family strain			0.03 (0.02)	0.03 (0.03)
Friend support			0.00 (0.02)	−0.00 (0.02)
Friend strain			0.09 (0.04) [*]	0.09 (0.04) [*]
Overall relationship closeness			0.01 (0.02)	0.01 (0.02)

*
p<.05;

**
p<.01

Table 3.

Logistic regression models (odds ratios & 95% confidence intervals) predicting loneliness transitions from 2005–2010 (multiply imputed survey-weighted data).

Characteristic	Became lonely	Recovered from loneliness
Sociodemographic Variables		
Age (mean)	1.01 (0.99, 1.04)	1.00 (0.97, 1.04)
Female	1.19 (0.79, 1.79)	0.91 (0.53, 1.56)
Race-ethnicity (ref: white)	*p = 0.15*	*p = 0.05*
African American	1.13 (0.52, 2.49)	1.26 (0.63, 2.52)
Hispanic	0.50 (0.26, 0.98) [*]	2.10 (1.01, 4.39) [*]
Other	0.84 (0.33, 2.16)	1.23 (0.30, 4.99)
Education (ref: < high school)	*p = 0.64*	*p = 0.25*
High school	1.34 (0.79, 2.27)	0.73 (0.37, 1.44)
Some college	1.09 (0.58, 2.06)	1.00 (0.51, 1.97)
College or more	1.26 (0.65, 2.44)	0.91 (0.39, 2.14)
Household assets ($1,000's)	0.77 (0.67, 1.04)	0.93 (0.74, 1.16)
Income:Needs Ratio	0.87 (0.41, 1.45)	1.43 (0.71, 2.88)
Structural Factors		
Live alone	0.87 (0.47, 1.62)	0.71 (0.38, 1.31)
Employment status (ref: working)	*p = 0.88*	*p = 0.37*
Working & retired	0.76 (0.35, 1.67)	1.14 (0.34, 3.82)
Retired	0.98 (0.62, 1.56)	0.66 (0.36, 1.21)
Other	1.08 (0.59, 1.97)	1.08 (0.50, 2.34)
Married-partnered	0.66 (0.36, 1.21)	0.88 (0.44, 1.75)
Network size	1.04 (0.92, 1.19)	0.98 (0.83, 1.16)
% kin in network	0.92 (0.42, 2.00)	1.37 (0.55, 3.43)
# of close relatives	0.90 (0.73, 1.10)	1.06 (0.82, 1.36)
# of friends	1.01 (0.85, 1.19)	1.09 (0.87, 1.36)
Attendance at group meetings	0.98 (0.90, 1.06)	0.96 (0.85, 1.08)
Attendance at church services	0.98 (0.90, 1.06)	1.00 (0.87, 1.16)
Socializing frequency	1.05 (0.88, 1.26)	1.21 (1.01, 1.46) [*]
Functional Factors		
Self-reported physical health	1.02 (0.84, 1.23)	1.36 (1.07, 1.72) [*]
Functional limitations	1.26 (1.07, 1.49) [**]	1.01 (0.87, 1.16)
Family support	0.61 (0.43, 0.85) [**]	1.08 (0.72, 1.63)
Family strain	1.14 (0.77, 1.70)	0.60 (0.38, 0.95) [*]
Friend support	0.90 (0.64, 1.26)	0.88 (0.58, 1.33)
Friend strain	1.63 (0.88, 2.99)	0.85 (0.36, 2.02)
Overall relationship closeness	0.87 (0.65, 1.16)	1.01 (0.70, 1.46)

[*] p<.05;

[**] p<.01