

# From Social Structural Factors to Perceptions of Relationship Quality and Loneliness: The Chicago Health, Aging, and Social Relations Study

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**Objectives.** The objective of this study was to test a conceptual model of loneliness in which social structural factors are posited to operate through proximal factors to influence perceptions of relationship quality and loneliness.

**Methods.** We used a population-based sample of 225 White, Black, and Hispanic men and women aged 50 through 68 from the Chicago Health, Aging, and Social Relations Study to examine the extent to which associations between sociodemographic factors and loneliness were explained by socioeconomic status, physical health, social roles, stress exposure, and, ultimately, by network size and subjective relationship quality.

**Results.** Education and income were negatively associated with loneliness and explained racial/ethnic differences in loneliness. Being married largely explained the association between income and loneliness, with positive marital relationships offering the greatest degree of protection against loneliness. Independent risk factors for loneliness included male gender, physical health symptoms, chronic work and/or social stress, small social network, lack of a spousal confidant, and poor-quality social relationships.

**Discussion.** Longitudinal research is needed to evaluate the causal role of social structural and proximal factors in explaining changes in loneliness.

**Key Words:** Loneliness risk factors—Health—Chronic stress—Social network—Relationship quality.

LONELINESS is the painful feeling of social isolation that accompanies perceived deficiencies in the number or quality of one's social relationships (Peplau & Perlman, 1982). Perceptions are critical to this definition: People can live rather solitary lives and not feel lonely, or they can have many social relationships and nevertheless feel lonely. Consequently, loneliness is more closely related to the perceived quality than the quantity of social relationships (Pinquart & Sörensen, 2003).

Feelings of loneliness have serious consequences for health outcomes. Prospective studies have shown that loneliness predicts depressive symptoms (Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006; Heikkinen & Kauppinen, 2004), mental health and cognition (Wilson et al., 2007), nursing home admission (Russell, Cutrona, de la Mora, & Wallace, 1997), and mortality in older adults (Penninx et al., 1997). Loneliness is also a potent risk factor for suicidal ideation (Stravynski & Boyer, 2001) and alcoholism (Akerlind & Hörnquist, 1992).

Loneliness is sometimes confused with depression (i.e., depressive symptoms) and poor social support. It is clear, however, that these related constructs are theoretically and empirically distinct (Cacioppo, Hawkley, et al., 2006; Cacioppo, Hughes, et al., 2006; Rook, 1987; Russell, 1996). Furthermore, loneliness, rather than depressive symptomatology or social support, uniquely predicts elevated blood pressure (Hawkley,

Masi, Berry, & Cacioppo, 2006), a number of risk factors for cardiovascular disease (Caspi, Harrington, Moffitt, Milne, & Poulton, 2006), poor sleep (Cacioppo et al., 2002), greater morning rise in cortisol (Adam, Hawkley, Kudielka, & Cacioppo, 2006), and alterations in gene transcription control pathways that favor heightened inflammation (Cole et al., 2007). Moreover, prior research on loneliness suggests it is related to faster aging and physiological decline (Hawkley & Cacioppo, 2007). Loneliness thus appears to be a unique and underappreciated psychosocial risk factor of clear relevance for those concerned about age-related health problems. Given the importance of loneliness for health, the goal of the present study was to develop a more thorough understanding of risk factors for loneliness in a middle-aged population. A parallel goal was to assess the extent to which relationship quality is the final determinant of feelings of loneliness.

Our conceptual model is a filtration model in which distal socially ascribed characteristics operate through more proximal factors to influence loneliness (cf. Berkman & Glass, 2000). Distal factors do not "cause" proximal factors but are shaped by those factors to impact outcomes. In our model, distal demographic factors (age, gender, race/ethnicity) operate through structural factors (income, education) and in turn through health, social roles, and stress—proximal factors that

are more directly associated with social network size and relationship quality. Our underlying assumption is that the number and frequency of social contacts, and especially the quality of social relationships, are the ultimate arbiters of the influence of distal factors on loneliness. To the extent that distal factors filter down to affect social contacts and relationship quality, they will have an impact on loneliness.

For instance, we posit that an association between age and loneliness, if it exists, will be attributable to fewer social contact opportunities that arise because of age-related health problems and functional limitations, and/or because of age- or health-related reductions in social roles that previously afforded social contact opportunities (e.g., retirement, widowhood). Poor health and physical limitations are associated with increased loneliness (Pinquart & Sörensen, 2003), and we examined whether diminished social contacts and poor relationship quality help explain loneliness differences between healthy and unhealthy adults. Similarly, racial/ethnic differences in loneliness (Adams, Kaufman, & Dressler, 1989) are posited to be attributable to the disadvantaged position of minority populations on key social and economic dimensions. In U.S. society, educational and economic advantages favor Whites over Blacks and Hispanics. Low levels of education and income are associated with higher levels of loneliness (Savikko, Routasalo, Tilvis, Strandberg, & Pitkälä, 2005) and also tend to lead to worse health (Adler et al., 1994). In addition, fewer financial resources means less opportunity to engage in commercial activities that could increase social contacts (e.g., gym memberships). Indeed, low socioeconomic status has been associated with smaller, less diverse social networks (Antonucci, Ajrouch, & Janevic, 1999). Our data provided an opportunity to examine the degree to which effects of race/ethnicity on loneliness are mediated by one or more of the proximal pathways. Similar pathways may operate in explaining gender differences in loneliness. However, on the basis of prior literature showing small and inconsistent gender effects (Borys & Perlman, 1985), we do not hypothesize gender differences in loneliness.

Loneliness may differ as a function of social roles. Being married, for example, assures an individual of at least one social connection, usually a relatively potent one in terms of protection against loneliness (Pinquart & Sörensen, 2003). Being employed and having opportunities to establish social ties with coworkers, clients, and supervisors or supervisees are important means of feeling socially connected and can foster feelings of belonging that are effective in staving off loneliness (Hawkley, Browne, & Cacioppo, 2005). Similarly, being a member of a group (e.g., neighborhood society, athletic team, political organization, bridge club) and/or a regular church attendee can foster a sense of belonging as well as increase opportunities for the development of friendships and supportive relationships that diminish the likelihood or level of loneliness. We tested the extent to which associations between social structural factors and loneliness are explained by social roles that influence loneliness through their impact on social network size and relationship quality.

The stress of under- or unemployment, inadequate financial resources, and marital or family conflict have been associated with increased loneliness (Jones, 1992; Salamah, 1991; Segrin, 1999). These chronic stressors are more prevalent in socioeco-

nomically disadvantaged populations (Baum, Garofalo, & Yali, 1999) and may provide a pathway through which socioeconomic status influences loneliness. Our data allowed us to examine the extent to which life stress influences the transduction of distal factors to affect network size, relationship quality, and, ultimately, loneliness.

Prior research has focused on associations between individual predictors and loneliness, and, with few exceptions (e.g., De Jong Gierveld, 1987; Mullins, Elston, & Gutkowski, 1996), none have taken a multivariate approach to relationships among predictors of loneliness. The goal of the present study was to use a multivariate approach to examine a cascade of factors from demographic characteristics, education and income, health, social roles, life events and chronic stress, and social network size to social relationship quality and to determine the impact of distal and more proximal factors on loneliness in an urban, population-based sample of middle-aged adults.

## METHODS

### *Participants*

Data for this study were collected in the first year of the Chicago Health, Aging, and Social Relations Study (CHASRS), a longitudinal, population-based study of non-Hispanic White, African American, and non-Black Latino American persons born between 1935 and 1952 and living in Cook County, Illinois. The sample was selected using a multistage probability design in which the first stage involved identifying a subset of households estimated to have high probability of containing at least one adult aged 50 to 65 years (24% of the total frame). A stratified, equal-probability-of-selection sample was drawn from this subset. The three strata were (a) households from census tracts in which at least 80% of the residents were African American, (b) households for which the associated surname was identified by the U.S. Census Bureau as "Hispanic," and (c) all remaining households. The second stage involved selecting one age-eligible individual per household and screening selected individuals to include only those who belonged to one of the three racial/ethnic groups of interest and who were sufficiently ambulatory to come to the University of Chicago and participate in the study. A quota sampling strategy was used at both the household and individual levels to achieve an approximately equal distribution of participants across the six gender by racial/ethnic group combinations. Response rates approached 45% overall, an impressive rate given that participation in our study involved predominantly working adults spending an entire day at the university. The distribution of our sample on a number of characteristics (e.g., marital status, working status, self-rated health) compared quite closely to that obtained from the national population-based Health and Retirement Study. Participants in our sample tended to be better educated than the target population as a whole.

The final sample size for Year 1 of CHASRS was 229. Participants were paid \$90 for completing the day-long laboratory protocol.

### *Procedures*

Participants arrived at the laboratory between 8 a.m. and 9 a.m. for approximately 8 hr of testing, including informed

consent, questionnaires, interviews, lunch, and a cardiovascular protocol. This report uses self-report data from questionnaires and interviews.

### Measures

Table 1 provides sample characteristics and descriptive data for each of the measures.

**Revised UCLA Loneliness Scale.**—The Revised UCLA (University of California, Los Angeles) Loneliness Scale is a 20-item validated measure of general loneliness and feelings of social isolation (Russell, Peplau, & Cutrona, 1980). Examples of the items are “I lack companionship” and “There are people I can talk to.” These items assess the perception that one lacks companionship or has people to talk to (for example) and are to be distinguished from other measures that ask participants how many companions they have and how often they talk to others (see measures of social contact). Cronbach’s alpha across all 20 items was .91 in our sample. The response scale ranges from 1 (never) to 4 (often), and the range of possible scores is 20 to 80, with higher scores signifying greater loneliness.

**Demographic variables.**—We measured age in years. Binary variables indicated gender (male was the reference category) and Black and Hispanic race/ethnicity (non-Hispanic White was the reference category).

**Socioeconomic status.**—We indexed education as having obtained a high school diploma or its equivalent. Participants reported household income in 12 categories (less than \$5,000 to more than \$200,000); we used the natural log-transformed category median in analyses to minimize positive skew in the distribution.

**Health.**—We assessed chronic conditions (e.g., diabetes, stroke) by self-report questionnaire and used the Charlson Comorbidity Index (Charlson, Pompei, Ales, & MacKenzie, 1987) to obtain a measure of number of chronic conditions weighted by severity (Katz, Chang, Sangha, Fossel, & Bates, 1996). We resolved a positive skew in this distribution by creating four categories of chronic conditions (0 = none, 1 = 1, 2 = 2–3, and 3 = >3 conditions). Symptoms were represented by a count of the number of symptoms (e.g., frequent headaches, joint pain) experienced in the past year. We summed restrictions in activities of daily living (Mahoney & Barthel, 1965) and, because a large portion of the sample reported no restrictions, dichotomized activity of daily living restrictions to contrast some with none.

**Social roles.**—Married indicated participants who were currently married or living with a partner. We binary-coded retired status and “other” employment statuses (full- and part-time employment was the reference category). Following the procedure employed by Cohen, Doyle, Skoner, Rabin, and Gwaltney (1997), we coded regular church attendance as present if participants attended at least twice a month. We coded group membership (e.g., charity organizations, social clubs) as present if one or more groups involved social interactions at least every 2 weeks.

Table 1. Measures of Loneliness and Covariates, 2002  
Chicago Health, Aging, and Social Relations Study

Measure	N	Statistic
Revised UCLA Loneliness Scale, <i>M (SD)</i>	225	36.0 (9.8)
Age in years, <i>M (SD)</i>	229	57.4 (4.5)
Female, %	229	52.4
Ethnicity, %	229	
White		35.8
Black		35.4
Hispanic <sup>a</sup>		28.8
High school diploma or equivalent, %	229	77.7
Household income <sup>b</sup>	216	
≤\$20,000		15.7
\$20–50,000		33.8
\$50–100,000		35.6
>\$100,000		14.8
Charlson Comorbidity Index, %	229	
0		67.7
1		17.9
2–3		11.8
>3		2.6
Number of symptoms, <i>M (SD)</i>	227	14.0 (10.3)
Activity of daily living restrictions, %	224	30.8
Marital status, %	229	
Married/living with a partner		61.6
Widowed		9.2
Divorced/separated		23.6
Never married		5.7
Employment status, %	229	
Work full or part time		58.5
Retired		24.0
Other		17.5
Church attendance, %	226	
<2–3 times a month		43.8
≥2–3 times a month		56.2
Group member with interactions at least every 2 weeks, %	229	20.5
Life event count, <i>M (SD)</i>	227	6.4 (7.1)
Chronic stress exposure, %	221	
General		81.0
Money and financial matters		73.8
Employment		78.7
Love and marriage		62.4
Family and children		55.5
Social life and recreation		64.3
Health		70.1
Residence		52.9
Number of network members, <i>M (SD)</i>	227	7.3 (2.3)
Median interaction frequency with network members, <i>M (SD)</i>	226	6.5 (0.8)
Marital relationship quality, % of those married or living with a partner	141	
Spousal non-confidant		22.7
Spousal confidant		77.3
Network relationship satisfaction, <i>M (SD)</i>	227	2.9 (0.5)

Notes: UCLA = University of California, Los Angeles.

<sup>a</sup>The majority of these 66 individuals were Mexican (72%), with the remaining individuals representing a wide range of ethnicities (e.g., Puerto Rican, Cuban, Chilean, Colombian, Dominican).

<sup>b</sup>Household income was reported in 12 categories that were collapsed to 4 categories here for summary purposes.

*Stress exposure.*—Participants used a 51-item checklist (based on the revised Social Readjustment Rating Scale; Hobson et al., 1998) to endorse life events that had occurred in the prior 12 months. We summed life events, counting multiple occurrences of the same event separately and omitting health-related events to avoid redundancy with measures of health. We used a natural log transformation to correct positive skew in the distribution of the life event count.

We assessed chronic stress exposure by using a series of questions about the presence of stress in eight domains (e.g., financial, employment, marital/romantic; Turner, Wheaton, & Lloyd, 1995). We coded chronic stress exposure as present or absent in each domain. We also conducted analyses using the count of endorsed statements within each stress domain. Results did not differ substantively from those reported here, and they are available from Louise C. Hawkley upon request.

*Social contact.*—Participants were asked to identify, in three separate categories, individuals “[with whom] you most often discuss matters important to you,” “who have been very demanding of you, or who have caused you a lot of stress or anxiety,” and “who have been very supportive of you during the past year.” Participants also identified the roles played by each of these individuals (e.g., spouse, parent, child, friend, neighbor, coworker, relative). Preliminary analyses indicated that the number of demanding individuals contributed to lower loneliness scores beyond what was predicted by the number of individuals in the two positive network categories, so we summed individuals identified in all three categories to create a measure of social network size. Frequency of interaction with each network member ranged from less than once a year to every day. We averaged median response categories endorsed across all network members to create a measure of interaction frequency with network members.

*Relationship quality.*—We coded as having a spousal confidant participants who identified a spouse as someone with whom they discussed important matters or someone who was a source of support. In addition, we averaged ratings of enjoyment and satisfaction with each of the identified network members to create a measure of overall network satisfaction (range = 0–4, or not at all to extremely).

### *Conceptual Model and Data Analysis Strategy*

The conceptual model guiding this research is that distal influences on loneliness tend to operate through more proximal factors to explain individual differences in loneliness. The most distal factors we consider are socially ascribed status indicators (age, gender, race/ethnicity), and we then consider a series of more proximal factors that may play a role in explaining loneliness differences. We group factors into conceptual categories and test them in a sequence that moves from demographic characteristics, socioeconomic characteristics, health, social roles, stress exposure, and social contact opportunities to social relationship quality. The sequence is not intended to represent a causal sequence but is meant to test the degree to which distal factors operate through more proximal factors, and ultimately social network size and relationship quality, to influence loneliness.

We conducted ordinary linear regression models in accordance with the conceptual model to examine the independent predictive capacity of each measure within a conceptual block of related variables, and then the independent predictive capacity of measures across blocks of predictor variables. We set statistical significance at  $\alpha = .05$ , two-tailed, unless the test of an association was a replication of an effect reported in prior literature, in which case we used a statistical criterion of  $\alpha = .05$ , one-tailed. One-tailed tests therefore applied to evaluation of the effects of high school diploma, household income, and marital status. At each step of the modeling sequence, we eliminated nonsignificant variables before proceeding to the next block. This strategy reduced the likelihood of overfitting the models with many nonsignificant variables and permitted identification of the empirically important measures within a block of conceptually related measures.

We first conducted the entire sequence of models bearing the cost of missing data (i.e., for the most comprehensive model, 26 cases were missing data on at least one variable). An analysis of variance contrasting those with missing versus complete data on all variables revealed that participants with missing data were less likely to have a high school diploma (57% vs 81%;  $p < .01$ ) and had higher loneliness scores (42.8 vs 35.1;  $p < .01$ ) than those with complete data. In addition, participants with missing data were more likely to be Hispanic (21.2% were missing data on at least one of the predictor variables) than White (4.9% with missing data),  $\chi^2(1) = 9.133$ ,  $p < .01$  ( $N = 148$ ); whereas Blacks (12.3% with missing data) did not differ from Hispanics or Whites in the prevalence of missing data ( $ps > .05$ ). We imputed values for missing data by regressing variables on race/ethnicity, high school diploma, and loneliness scores (categorized into quintiles). We repeated the entire model sequence using imputed data to maximize statistical power ( $n = 225$ ). Results did not differ substantively from the results obtained using only those cases with complete data, and we report here results obtained using imputed data. Results from the regression model sequence that used only cases with complete data are available from Louise C. Hawkley upon request.

## RESULTS

Table 2 displays results of the modeling sequence (i.e., unstandardized coefficients and standard errors).

### *Demographic Characteristics*

As shown in Table 2, Model 1A, Hispanics were lonelier, and Blacks tended to be lonelier, than Whites. Age and gender were not associated with loneliness in our sample ( $ps > .05$ ), although women tended to be less lonely than men ( $B = -2.49$ ,  $SE = 1.29$ ,  $p = .055$ ). Race/ethnicity explained 3% of the variance in loneliness (Model 1B).

### *Socioeconomic Characteristics*

In combination, household income and high school education explained a substantial portion of the race/ethnicity variance in loneliness, approximately halving the coefficients for Black and Hispanic race/ethnicity. In Model 2B, high school diploma and household income combined to explain 7% of the variance in loneliness.

### Physical and Functional Health

A preliminary model indicated that the Charlson Comorbidity Index showed a nonsignificant positive association with loneliness ( $B = 1.27$ ,  $SE = 0.80$ ,  $p > .1$ ), but the addition of number of symptoms and activity of daily living restrictions to the model showed that symptoms largely explained the comorbidity effect. Health measures also reduced the effect of household income, suggesting that health differences explain part of the association between income and loneliness. In Model 3B, a high school diploma and health symptoms combined to explain 14% of the variance in loneliness.

### Social Roles

In Model 4A, only being a group member was independently associated with lower loneliness. Being married, retired or unemployed, or a regular church attender was not associated with loneliness. Being a group member explained an additional 2% of the variance in loneliness in Model 4B relative to Model 3B.

### Stress Exposure

In Model 5A, chronic marital/romantic stress and chronic social stress were independently associated with loneliness. Ancillary analyses revealed that the influences of diploma and symptoms on loneliness were at least partly explained by chronic stress in everyday life. Relative to Model 5A, the effect sizes for marital stress and social stress (i.e., not having the desired time or company to enjoy social activities) increased in Model 5B when the other chronic stress measures were eliminated, a pattern that reflects shared variance among these stress measures. Variables retained in Model 5B combined to explain 27% of the variance in loneliness, an 11% increase in variance explained relative to Model 4B.

### Social Contact

In Model 6A, only network size was significantly associated with loneliness, such that each additional person in the network reduced the loneliness score by approximately 1 point on the 60-point scale. The inclusion of network size resulted in a 43% reduction in the coefficient for group membership relative to Model 5B. Ancillary analyses confirmed that group members had significantly larger social networks than non-group members,  $M$ 's = 7.9 ( $SD = 2.1$ ) vs. 6.7 ( $SD = 2.4$ ),  $p < .01$ . In addition, the association of loneliness with high school diploma was substantively reduced in Model 6A relative to Model 5B. Ancillary analyses showed that those with a high school diploma had larger social networks than their less educated counterparts ( $M = 7.5$ ,  $SD = 2.3$ , vs  $M = 6.4$ ,  $SD = 2.2$ ;  $p < .01$ ), indicating that education-related differences in loneliness are at least partially attributable to differences in network size. Significant predictors retained in Model 6B explained an additional 5% of the variance in loneliness relative to Model 5B.

### Relationship Quality

In Model 7A, having a spousal confidant was significantly associated with lower levels of loneliness, but being married to a non-confidant was not associated with loneliness and was no more protective than not being married at all. Being satisfied

with network relationships had an additional protective effect independent of network size and marital relationship quality. Adding the two relationship quality measures diminished the size of the adverse effect of chronic marital and social stress relative to Model 6B, consistent with the idea that chronic stress in these domains reflects, in part, qualitatively inferior social relationships. In addition, adding the relationship quality measures further reduced the effects of having a high school diploma on loneliness, indicating that positive social relationships help to explain why those with a high school diploma are at decreased risk for loneliness. All predictors in Model 7A were statistically significant and combined to explain 37% of the variance in loneliness.

We constructed a final model (Model 8) in which all predictors were returned to the model to examine evidence that eliminated variables, if retained in the model, might release the effect of other variables that would otherwise go unnoticed (i.e., statistical suppression; MacKinnon, Krull, & Lockwood, 2000). To avoid redundant predictors, spousal confidant and spousal non-confidant replaced marital status as a social role, and the unmarried continued to serve as the reference category. In this model, the effect of having a high school diploma was further reduced, the effect of marital stress on loneliness was sizably diminished, and work stress emerged as a predictor of loneliness. Ancillary analyses revealed that although work stress was equally likely in married as in unmarried individuals, work stress had a more marked effect on loneliness among the unmarried than the married, especially the married with a spousal confidant, indicating that good-quality marital relationships mask the impact of chronic work stress on loneliness.

We conducted supplementary analyses that reintroduced gender as a predictor variable in each of Models 2 through 7. Results showed that women were significantly less lonely than men in this sample, and this was true from Model 3 through Model 7. Follow-up analyses showed that women reported significantly more health symptoms than men ( $M_{\text{women}} = 12.81$ ,  $SD = 10.96$ ;  $M_{\text{men}} = 10.88$ ,  $SD = 8.54$ ) and that the gender difference in loneliness emerged only when health symptoms were held constant. In other words, the effect of symptoms on loneliness suppressed the gender difference in loneliness.

We conducted additional supplementary analyses for each of Models 2 through 7 to examine whether the predictor variables operate in a similar manner in men and women. The full gender interaction models revealed only one instance of men and women differing in an association between predictor and loneliness. Specifically, in Model 5, women exhibited a larger association between life events and loneliness than did men ( $B_{\text{female} \times \text{life events}} = 3.57$ ,  $p < .05$ ;  $B_{\text{female}} = -8.35$ ,  $p < .01$ ;  $B_{\text{life events}} = -0.51$ ,  $p > .6$ ) in a model that adjusted for high school diploma, health symptoms, group membership, and chronic marital and social stress. The coefficient for this interaction term was reduced only slightly when added to the final model, Model 8 ( $B_{\text{female} \times \text{life events}} = 2.58$ ,  $p = .06$ ). Otherwise, no gender interaction term was significant ( $ps > .05$ ).

## DISCUSSION

We formulated our conceptual model under the assumption that explanations for individual differences in loneliness are

Table 2. Unstandardized Coefficients (*SE*) From Regression of Loneliness on Covariates in Linear Regression Models (*N* = 225)

Covariate	Model 1: Demographics		Model 2: Socioeconomic Status		Model 3: Health and Functioning	
	1A	1B	2A	2B	3A	3B
Age	-0.10 (0.15)					
Female	-2.49 (1.29)					
Race/ethnicity: White						
Black	2.79 (1.53) <sup>†</sup>	2.72 (1.53) <sup>†</sup>	1.24 (1.58)			
Hispanic	4.15 (1.65)*	4.41 (1.61)*	2.69 (1.67)			
Diploma			-3.71 (1.61)*	-4.36 (1.56)*	-4.57 (1.49)*	-5.03 (1.48)*
Household income			-1.55 (0.73)*	-1.73 (0.71)*	-1.00 (0.70)	
Chronic conditions					0.02 (0.82)	
Number of symptoms					0.25 (0.07)*	0.30 (0.06)*
Activity of daily living restrictions					2.07 (1.46)	
Spouse/partner						
Work role: Working						
Retired						
Not working						
Regular church attender						
Group member						
Life event count						
Chronic stressors						
General						
Money and financial						
Employment						
Love and marriage						
Family and children						
Social life and recreation						
Health						
Residence						
Network size						
Frequency of contact						
Marital relationship: Not married						
Spousal non-confidant						
Spousal confidant						
Network satisfaction						
<i>R</i> <sup>2</sup>	.05	.03	.08	.07	.16	.14
Covariate	Model 4: Social Roles		Model 5: Stress Exposure		Model 6: Social Contacts	
	4A	4B	5A	5B	6A	6B
Age						
Female						
Race/ethnicity: White						
Black						
Hispanic						
Diploma	-4.23 (1.50)*	-4.38 (1.49)*	-3.98 (1.40)*	-3.80 (1.40)*	-2.89 (1.36)*	-3.19 (1.35)*
Household income						
Chronic conditions						
Number of symptoms	0.28 (0.06)*	0.30 (0.06)*	0.22 (0.06)*	0.26 (0.06)*	0.28 (0.05)*	0.29 (0.05)*
Activity of daily living restrictions						
Spouse/partner	-1.51 (1.28)					
Work role: Working						
Retired	0.51 (1.45)					
Not working	1.78 (1.76)					
Regular church attender	-0.30 (1.27)					
Group member	-2.89 (1.28)*	-2.93 (1.23)*	-2.94 (1.19)*	-2.81 (1.15)*	-1.65 (1.14)	
Life event count			1.24 (0.76)			
Chronic stressors						
General			-1.71 (1.54)			
Money and financial			1.71 (1.39)			
Employment			2.25 (1.54)			
Love and marriage			3.82 (1.27)*	4.71 (1.21)*	4.13 (1.18)*	4.19 (1.18)*
Family and children			-0.03 (1.22)			

(Table 2 continues)

Table 2. Unstandardized Coefficients (*SE*) From Regression of Loneliness on Covariates in Linear Regression Models (*N* = 225) (*Continued*)

Covariate	Model 4: Social Roles		Model 5: Stress Exposure		Model 6: Social Contacts	
	4A	4B	5A	5B	6A	6B
Social life and recreation			3.36 (1.26)*	3.92 (1.22)*	3.93 (1.18)*	3.88 (1.18)*
Health			0.28 (1.21)			
Residence			0.84 (0.56)			
Network size					-1.10 (0.25)*	-1.15 (0.24)*
Frequency of contact					-0.40 (0.70)	
Marital relationship: Not married						
Spousal non-confidant						
Spousal confidant						
Network satisfaction						
<i>R</i> <sup>2</sup>	.18	.16	.31	.27	.33	.32
			Model 7: Relationship Quality		Model 8	
Covariate			7A			
Age						-0.23 (0.14)
Female						-3.11 (1.35)*
Race/ethnicity: White						
Black						0.86 (1.45)
Hispanic						-0.84 (1.56)
Diploma						-2.07 (1.37)
Household income						-0.06 (0.74)
Chronic conditions						0.47 (0.81)
Number of symptoms						0.21 (0.06)*
Activity of daily living restrictions						1.43 (1.36)
Spouse/partner						1.62 (1.79)
Work role: Working						
Retired						2.75 (1.57)
Not working						1.58 (1.64)
Regular church attender						1.24 (1.19)
Group member						-1.78 (1.21)
Life event count						0.72 (0.75)
Chronic stressors						
General						-1.11 (1.58)
Money and financial						1.92 (1.37)
Employment						3.28 (1.59)*
Love and marriage						1.78 (1.25)
Family and children						-0.10 (1.19)
Social life and recreation						3.19 (1.22)*
Health						0.72 (0.53)
Residence						-0.59 (1.15)
Network size						-0.99 (0.26)*
Frequency of contact						-0.28 (0.72)
Marital relationship: Not married						
Spousal non-confidant						0.80 (1.70)
Spousal confidant						-2.50 (1.17)*
Network satisfaction						-4.79 (1.73)*
<i>R</i> <sup>2</sup>						-2.92 (1.15)*
						.45

Notes: "A" models introduce blocks of conceptually related variables. "B" models drop individual nonsignificant predictors within blocks. See text for a description of directional hypotheses.

\**p* < .05; †*p* < .1.

improved by considering the filtering of distal social structural factors through more proximal factors that influence loneliness to the extent that social network size and especially social relationship quality are affected. Our results provide evidence consistent with this filtering process, and the outcome is a relatively comprehensive profile of risk factors for loneliness in an urban setting in the United States. Specifically, our final

model shows that men, people who are unhealthy, people undergoing chronic work stress, people unable to satisfy a desire to engage in social activities with others, people in small social networks, and people suffering from poor-quality relationships in marriage and in their broader social networks are likely to be disproportionately represented among lonely individuals. These results support our hypothesis that social

network size and particularly relationship quality are key determinants of loneliness.

Viewing this in another way, we see that factors representing latent social opportunity (i.e., education, income, health) influence loneliness to the degree that they affect manifest social relationships (quantity and quality), and this translation from latent to manifest social relationships is shaped by factors that are potentially toxic to social relationships (e.g., chronic stress). In combination, the distal and proximal factors in our model explained approximately 37% of the variance in loneliness in our sample.

Our final set of risk factors does not rule out a role for race/ethnicity and socioeconomic status in predicting loneliness. Rather, our results showed higher levels of loneliness in Hispanics and, to a lesser degree, in Blacks in this urban population-based sample of middle-aged adults, but we found that these racial/ethnic differences were explained in large part by education and income differences. Similarly, household income was associated with less loneliness, but this effect was explained by its association with better health, a proximal factor that protected against loneliness. In addition, education proved to be a potent protective factor against loneliness, and its effect was largely explained by proximal indicators of less chronic stress, a larger network size, and good-quality marital and social relationships. These findings indicate that possession of a high school diploma may be a surrogate measure for social class, marital stability, self-esteem, and other factors that could enhance the likelihood of success in various life domains, including social relationships.

Extending prior research (Pinquart & Sörensen, 2003), we found that being married was negatively associated with loneliness, but only if the marital partner served as a confidant. If the spouse was not a confidant, being married was no more protective against loneliness than not being married. These results correspond to observations that intimacy and communication in marriage, but not agreement or marital satisfaction per se, protect against loneliness (Olson & Wong, 2001). In addition, having a spousal confidant minimized the effect of chronic work stress on loneliness. This is consistent with research showing that adequate and appropriate social support from a spouse reduces perceptions of stress (Dehle, Larsen, & Landers, 2001). Chronic work stress took its toll in feelings of loneliness among the middle-aged and older adults in our sample who lacked a spouse or a spousal confidant.

Having a spousal confidant also significantly reduced the effect of chronic marital stress on loneliness. In other words, a close marital relationship may diminish the impact of marital stress on feelings of loneliness. Research on commitment in close relationships supports this conjecture. Committed partners behave toward each other in pro-relationship ways, including a greater willingness to sacrifice for the good of the relationship, and these acts enhance their trust in each other. As trust increases, marital stresses and strains (e.g., conflictual interactions, disagreements on financial priorities) are less likely to foster reactionary behavior and are more likely to be accommodated for the sake of the relationship (Wieselquist, Rusbult, Foster, & Agnew, 1999). What might have been a significant source of stress is instead transformed into an opportunity for greater interdependence and commitment, and the consequence is protection against feelings of loneliness.

Having a large social network was associated with less loneliness independent of the overall quality of the social relationships with network members. Given that loneliness is most robustly associated with qualitative aspects of social relationships (De Jong Gierveld, 1987; Pinquart & Sörensen, 2003), the fact that network size continued to exhibit an inverse association with loneliness is quite remarkable and suggests that participants' ability to create and/or avail themselves of opportunities to form social connections is itself a potentially protective mechanism against feelings of loneliness. This conclusion is supported by the additional finding that chronically undesirable or inadequate opportunities to socialize were associated with greater loneliness independent of existing network size. It is possible that a larger network offers a better cushion of good-quality relationships to counter the effects of any one or more network members who are demanding and burdensome. Alternatively, even burdensome network members may be better than no or fewer network members in protecting against loneliness. Ancillary analyses indicated support for the latter hypothesis: Burdensome and close network members contributed additively to lower levels of loneliness. Additional research is needed to replicate this finding and examine the types (i.e., children, friends, spouse) and qualities (i.e., negative and positive) of these relationships more closely. For instance, ambivalent feelings about a relationship partner (i.e., high feelings of positivity *and* negativity) are toxic to the relationship (Holt-Lunstad, Uchino, Smith, & Hicks, 2007) and may be even more potent predictors of loneliness than indifferent feelings (i.e., moderate levels of positivity and negativity) or pure negativity.

Our finding, in the final model and in supplementary analyses of Models 3 through 7, that women were significantly less lonely than men, is consistent with some prior research (De Jong Gierveld, Kamphuis, & Dykstra, 1987; Mullins, Tucker, Longino, & Marshall, 1989; Pinquart & Sörensen, 2003) but is at odds with other reports of either no gender differences or women being lonelier than men (Borys & Perlman, 1985; De Jong Gierveld, 1987; Mullins et al., 1996). We should note that our gender difference would not have been evident had we not included health symptoms in the model. Our results suggest that unmeasured and/or untested factors (e.g., health) and less comprehensive statistical modeling (i.e., no checks for suppressive effects) may bias estimates of gender differences in loneliness in unexpected ways and contribute to gender difference discrepancies in the literature. An alternative explanation that has been offered for discrepant gender effects is that gender differences in loneliness are observed only when respondents are asked to rate how "lonely" they feel, in which case women report being lonelier than men because they may be less reluctant to admit having these feelings (Borys & Perlman, 1985). The Revised UCLA Loneliness Scale does not ask blatant questions about "loneliness," and our finding of greater loneliness in men may be attributable, in part, to this feature of our loneliness measure. Longitudinal studies that examine predictors of change in loneliness and differences in trajectories of loneliness over time will enhance researchers' understanding of factors that contribute to gender differences in loneliness. For instance, loneliness differences between men and women at one point in time may be attributable to gender differences in the timing of precursors to loneliness that

preceded the present loneliness assessment (e.g., divorce and/or widowhood that occurred earlier in one gender than the other, or gender differences in years since retirement or since changes in household income). This hypothesis awaits testing in future longitudinal research that examines changes in loneliness as a function of changes in life circumstances and psychosocial status in the CHASRS.

Independent of gender differences in loneliness, we observed one significant gender difference in the correlates of loneliness: Number of life events had a larger association with loneliness in women than in men. This single significant gender interaction speaks to Tornstam's (1992) argument that gender differences in loneliness may be attributable to gender differences in reactions to stress. It warrants replication using a larger sample of men and women, a closer examination of the types of life events experienced by men and women, and subjective assessments of stress intensity. No other gender interaction term was statistically significant in our sample.

One concern of the present study is its relatively small sample. However, the CHASRS sample is a representative population-based sample of middle-aged and older adults that had sufficient statistical power to detect effects in spite of its size. We observed no nonsignificant effects that we would have expected to be significant based on prior literature. The limited size of our sample is offset by its rich set of measures (e.g., comprehensive measures of social relationship quantity and quality) that surpasses what is possible in large, national surveys. Whereas large-scale surveys can detect small effects of social structural factors, the strength of our smaller scale study is its broad and deep data that permit a thorough examination of the processes through which social structural factors operate to influence loneliness.

In summary, our multivariate approach has extended prior research and enhanced our understanding of loneliness by (a) adopting a filtration model that traces pathways through which distal factors may operate, (b) considering a wider range of loneliness risk factors than have been considered heretofore, and (c) employing a population-based sample of middle-aged and older adults. Now that we have shown that male gender, health, chronic stress, network size, and spousal and broader social relationship quality help to explain cross-sectional associations between social structural factors and loneliness, it remains to be seen the extent to which distal and proximal factors help to ameliorate any tendencies toward increasing loneliness over time in the aging CHASRS sample. Feelings of loneliness appear to hasten physiological decline (Hawley & Cacioppo, 2007), and it is therefore important to identify harbingers of loneliness that, with appropriate intervention, could minimize not only the psychological distress but also the physiological decline associated with felt deficits in social connections.

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