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Loneliness as a Specific Risk Factor for Depressive Symptoms: Cross-Sectional and Longitudinal Analyses

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The extent to which loneliness is a unique risk factor for depressive symptoms was determined in 2 population-based studies of middle-aged to older adults, and the possible causal influences between loneliness and depressive symptoms were examined longitudinally in the 2nd study. In Study 1, a nationally representative sample of persons aged 54 and older completed a telephone interview as part of a study of health and aging. Higher levels of loneliness were associated with more depressive symptoms, net of the effects of age, gender, ethnicity, education, income, marital status, social support, and perceived stress. In Study 2, detailed measures of loneliness, social support, perceived stress, hostility, and demographic characteristics were collected over a 3-year period from a population-based sample of adults ages 50–67 years from Cook County, Illinois. Loneliness was again associated with more depressive symptoms, net of demographic covariates, marital status, social support, hostility, and perceived stress. Latent variable growth models revealed reciprocal influences over time between loneliness and depressive symptomatology. These data suggest that loneliness and depressive symptomatology can act in a synergistic effect to diminish well-being in middle-aged and older adults.

Keywords: loneliness, depression, social support, stress, hostility

Depressive symptomatology is an important indicator of general well-being and health among middle-aged and older adults (Federal Interagency Forum on Aging-Related Statistics, 2004) and a major economic burden in the United States (Greenberg, Stiglin, Finkelstein, & Berndt, 1993). Analyses from the first wave of the Health and Retirement Study (HRS) further indicated that approximately one third of adults (33.6% of those 51–55 years of age and 31.2% of those 56–61 years of age) reported moderate (Center for Epidemiologic Studies Depression Scale [CES-D] scores of 10–15; Radloff, 1977) to high (CES-D scores of 16 and over) levels of depressive symptoms (Steffick, 2000, see Table 22). Data from the second and third wave of the HRS and the first two waves of the Assets and Health Dynamics Study of the Oldest Old, in which the CES-D was used, indicated that from 14% to 19% responded that they "felt depressed," 21%–25% responded that "everything was an effort," and 17%–23% responded that they "could not get going" (Steffick, 2000, see Table 9). Individuals with elevated depressive symptoms are at risk for a host of problems that plague middle-aged to older adults, including poorer performance in the labor market (Broadhead, Blazer, George, & Tse, 1990; Ettner, Frank, & Kessler, 1997), functional impairments (Mehta, Yaffe, & Covinsky, 2002), cardiovascular disease (e.g., Barefoot & Schroll, 1996; Barth, Schumacher & Herrmann-Lingen, 2004; Carney & Sheps, 2004), diminished immunosurveillance (see review by Hawkley, Bosch, Engeland, Marucha, & Cacioppo, in press), and higher health care resource use (Wells et al., 1989; Wygaard & Albreksten, 1992).

Loneliness, described by Weiss (1973) as a gnawing chronic disease without redeeming features, has long been recognized as a strong correlate of depressive symptoms (e.g., Anderson & Arnoult, 1985; Brown & Harris, 1978; Horowitz, French, & Anderson, 1982; Levin & Stokes, 1986; Peplau, Russell, & Heim, 1979; Russell, Cutrona, Rose, & Yurko, 1984; Russell, Peplau, & Cutrona, 1980; Russell, Peplau, & Ferguson, 1978; Segrin, 1998; Weeks, Michela, Peplau, & Bragg, 1980; cf. Russell, 1982; Shaver & Brennan, 1991). The most frequently used measure of loneliness is the revised UCLA Loneliness scale (R-UCLA; Russell et al., 1980), a 20-item questionnaire measuring general feelings of social isolation and dissatisfaction with one's social interactions (Russell, 1996; Russell et al., 1980). Although notions that loneliness is a multifaceted construct date back to Weiss (1973), the evidence to date suggests that there is sufficient overlap in these factors that individual differences in the experience of loneliness appear to be adequately gauged by a unidimensional measurement instrument (Russell, 1996; see also Cacioppo et al., in press).

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Prior work has revealed that the levels of loneliness and depressive symptoms may vary across the life span. In an illustrative study, Nolen-Hoeksema and Ahrens (2002) investigated the levels of and relationship between loneliness and depressive symptoms in 25- to 35-year-old, 45- to 55-year-old, and 65- to 75-year-old adults. These groups were selected to represent different life circumstances and social histories. Results indicated that the middle-aged group was the most lonely, and the older adults were the least lonely, consistent with work by Carstensen and colleagues (e.g., Carstensen, Isaacowitz, & Charles, 1999), indicating that emotional closeness in relationships increases with age even as the number of social relationships decreases because people prioritize events in their lives. Despite these variations across the life span, however, the *association* between loneliness and depressive symptoms appears to be stable (i.e., moderately and equivalently positive) across age (Nolen-Hoeksema & Ahrens, 2002; Perlman, Gerson, & Spinner, 1978) and ethnicity (Hojat, 1983). Nolen-Hoeksema and Ahrens (2002) noted that "this finding suggests that concerns over close relationships are related to depressive symptoms at any point in the adult age span" (p. 123).

The magnitude of the association between loneliness and depressive symptoms (typically $.40 < r\text{s} \leq .65$) has raised questions about their conceptual or functional separation. In fact, loneliness and depressive symptoms have been sufficiently conflated that in some measures of depressive symptoms, such as the CES-D (Radloff, 1977), items about feeling lonely are included. Elsewhere, we have outlined an evolutionary model of loneliness in which in conditions of hardship, hunter–gatherers who had a genetic disposition to experience social pain from social separation (i.e., loneliness) may have been more likely to return to share their food, shelter, or defense with their family and allies to diminish the pain of loneliness (Cacioppo et al., in press). A person made to feel lonely, for instance, through ostracism, social exclusion, or bereavement feels threatened, anxious, and dysphoric—emotional states that promote attempts to reconnect for relief from their negative affect while also fostering their survival in a potentially hostile world. According to this reasoning, loneliness and depressive symptoms are intimately related but distinct. But does the empirical evidence support the conceptual distinction between loneliness and depressive symptoms? And, if so, what is the nature of the relationship between loneliness and depressive symptoms?

A formal structural examination of the relationship between loneliness (as measured by the UCLA Loneliness scale; Russell et al., 1980) and depressive symptoms (as measured by the Beck Depression Inventory; Beck & Steer, 1987) was performed in a study of 2,525 young adults (Cacioppo et al., in press). An oblique rotation was performed following a principal-axis factor analysis to allow correlated factors. Results confirmed that the loadings of loneliness items on the depressive symptoms factor were very low (i.e., < 0.10), as were the loadings of depressive symptoms items on the loneliness factors (i.e., < 0.19). An additional factor analysis in which the number of factors was constrained to two again established a clear separation of the loneliness items and depression items into two distinct factors (Cacioppo et al., in press). Weeks et al. (1980), Russell et al. (1980), and R. A. Bell (1985) similarly found loneliness and depressive symptoms to form two separable theoretical constructs using structural equation modeling in a study of undergraduate students.

These data support the notion that loneliness and depressive symptoms are separable though correlated constructs, but the research to date on this question has been limited to undergraduate students or samples of convenience. Cacioppo et al. (in press), therefore, conducted a second study in which the CES-D scale rather than the Beck Depression Inventory was used to measure depressive symptoms in a population-based sample of adults ages 50–67. As in the study of young adults, the results of the factor analyses indicated that the loneliness items and the depressive symptoms items loaded on distinct factors, with the exception that the item "I am feeling lonely" in the CES-D loaded on the loneliness factor (Cacioppo et al., in press). We and others have also addressed whether the association between loneliness and depressive symptoms represents the operation of individual differences in dispositional negative affectivity or neuroticism. Results indicate that these dispositional factors cannot account for the association between loneliness and depressive symptoms (Cacioppo et al., in press; Kahn, Hessling, & Russell, 2003).

Loneliness has been identified as a risk factor for depressive symptoms in cross-sectional (e.g., Chou & Chi, 2004; Nolen-Hoeksema & Ahrens, 2002) and longitudinal (Hagerty & Williams, 1999; Heikkinen & Kauppinen, 2004) studies of older adults, but as has been noted, loneliness is associated with a constellation of demographic (e.g., Nolen-Hoeksema & Ahrens, 2002; Perlman & Peplau, 1984; Prince, Harwood, Blizard, Thomas, & Mann, 1997; Tornstam, 1992) and psychosocial risk factors (e.g., hostility, low social support, perceived stress) for depressive symptoms (e.g., Cacioppo et al., in press; Duck, Pond, & Leatham, 1994; Hagerty & Williams, 1999; Rook, 1984). To what extent is the association between loneliness and depressive symptomatology attributable to its association with these other variables? Given the importance of satisfactory interpersonal relationships to well-being, we reasoned that loneliness is a unique risk factor for depressive symptomatology. The extant literature provides some support for this notion. Alpass and Neville (2003), for instance, reported a significant association between loneliness and depressive symptoms in 217 older men in New Zealand even after controlling for variables such as age, education, income, and social support, and Hagerty and Williams (1999) reported a significant association between loneliness and depressive symptoms in a sample of undergraduates and patients with major depressive disorder after controlling for social support, social conflict, and sense of belonging. Both studies involved convenience samples, however, and neither considered demographic variables such as ethnicity or marital status or psychosocial variables such as perceived stress and hostility. The first aim of the present research, therefore, was to examine in two population-based studies of middle-aged and older adults whether loneliness remained a risk factor for depressive symptoms after controlling statistically for demographic variables (i.e., age, gender, ethnicity, education, income, and marital status) and psychosocial risk factors (i.e., social support, hostility, and perceived stress).

Our second aim in this research was to investigate longitudinally the possible influences between loneliness and depressive symptoms. Dill and Anderson (1999), for instance, have posited that the threat to or loss of a cherished interpersonal relationship or the inability to establish a satisfying interpersonal relationship may elevate loneliness and subsequently lead to depressive symptoms. Allen and Badcock (2003), however, have argued that depressed

states have evolved to minimize risk in social interactions in which an individual perceives their social value is low relative to their social burden. According to this formulation, depressive symptoms may cause people to reduce their social activities or impair the quality of these activities, thereby elevating the person's feelings of loneliness. It is also possible that reciprocal determinism between loneliness and depressive symptoms exists. For instance, Hawkley, Preacher, and Cacioppo (in press) used an experience-sampling methodology in a study of young adults to examine, from occasion to occasion over the course of a 7-day sampling period, whether the quality of interpersonal interactions influenced subsequent mood states or vice versa. Data from the momentary experience samples on the quality of the interpersonal interactions and the respondents' mood reports were examined using multilevel modeling. Results revealed reciprocal influences between the quality of interpersonal interactions and mood states over 1–3 lags (i.e., 90 min–3 hr). It is conceivable that loneliness and depressive symptoms over years shows similar reciprocal influences. Finally, other factors may produce parallel but independent changes in loneliness and depressive symptoms, a possibility that can be investigated by the inclusion of demographic and psychosocial covariates in the longitudinal analyses.

The extant evidence from longitudinal research is limited and inconclusive regarding the possible causal relationships between loneliness and depressive symptoms. Weeks et al. (1980) measured loneliness and depressive feelings on two occasions 5 weeks apart in 333 undergraduate students in their first quarter at UCLA. They found no evidence that loneliness causes depressive symptoms or that depressive symptoms cause loneliness. Heikkinen and Kauppinen (2004), however, reported evidence that loneliness predicted changes in depressive symptoms in a 10-year study of very old adults living in Finland. The extent to which depressive symptoms also predicted changes in loneliness or the association could be explained in terms of demographic or other psychosocial variables was not examined. Therefore, longitudinal analyses were performed in Study 2 to determine the possible causal role of loneliness and related psychosocial variables in depressive symptoms (and vice versa) in middle-aged to older adults.

Studies 1 and 2

The hypothesis that loneliness would remain a significant risk factor for depressive symptoms after controlling for demographic variables and psychosocial risk factors was tested in two population-based studies of middle-aged and older adults. In Study 1, we used the 2002 wave of the HRS, a nationally representative, longitudinal study of persons born in 1947 or earlier who were interviewed by phone. For Study 2, we used the first year of data collected in the Chicago Health, Aging, and Social Relations Study (CHASRS), a population-based study of persons born between 1935 and 1952 living in a large metropolitan area (Cook County, IL) who were tested individually in our laboratory.

The causal relationship between loneliness and depressive symptoms was examined using longitudinal data from the first 3 years of the CHASRS. Latent growth-curve models were calculated for loneliness and depressive symptoms using data from Years 2–3, so that Year 1 data for these variables could be used as predictors to determine the extent to which loneliness and depressive symptoms in Year 1, for example, influenced the subsequent trajectories of depressive symptoms (or loneliness) in older adults.

We had three reasons for investigating the relationship between loneliness and depressive symptoms in two samples. First, although both studies were population based, differences in methodology (telephone survey vs. face-to-face), sample composition, and age ranges speak to the generalizability of replicated results. For instance, Study 1 involved a national sample, whereas Study 2 focused on a metropolitan sample; respondents in Study 1 were interviewed by phone, whereas respondents in Study 2 spent a day in our laboratory completing tasks, interviews, and surveys. And although the focus in both studies was middle-aged and older adults, respondents in Study 1 were, on average, a decade older than participants in Study 2 (M_{age} = 68.4 and 57.4 years, respectively). Second, the sample sizes and measurement detail differed in a complementary fashion across the two studies. Study 1 is characterized by a large sample size, but the nature and brevity of the telephone interview limited the information that could be collected, whereas sample size was sacrificed in Study 2 for the scope and depth of the assessments that could be collected. The reduced sample size in Study 2 is ameliorated somewhat by the longitudinal structure, which gains substantial added power with each year of follow-up for assessing differences in rates of change in the outcome variables. Using data from both studies enabled us to capitalize on the strengths of both. Third, additional data collected in the HRS and CHASRS (not reported here) were intended to address different aspects of the question of precisely how loneliness might affect health and well-being in middle-aged and older adults. We sought first to examine whether the basic structure of the association between loneliness and depressive symptoms was comparable in the HRS and CHASRS samples.

Method

Participants and Procedures

In Study 1, the participants were drawn from the 2002 wave of the HRS. The design of this study is detailed in Hughes, Waite, Hawkley, and Cacioppo (2004). At the close of the hour-long interview, the respondent is asked whether she or he would be willing to participate in the assigned module. The module from which data in the present study were drawn was assigned to 3,008 potential respondents (of approximately 22,000 in the entire HRS). Of these, 471 (15.6%) refused to participate in the module. Another 344 (11.4%) of the potential module respondents were actually proxy respondents who answered on behalf of a respondent who was ill or incapacitated. Proxy respondents, by definition, did not complete the loneliness module. Thus, the final sample size for the module was 2,193. Comparison of the module sample to the entire set of respondents to the 2002 HRS revealed that the module sample was significantly though nominally younger and more likely to be married than the entire sample. Overall, however, the module sample appears to represent the U.S. population age 54 and above quite well.

For the analytic sample used in this article, we excluded 201 persons who were under age 54. These persons were all spouses of an HRS respondent and were not part of the age-eligible sample. We also excluded

27 persons of "other" races[1], 10 persons who did not answer one or more of the loneliness items, and 10 persons who did not provide information about their marital status. Our analytic sample for Study 1 comprised 1,945 African American, European American, and Latino American individuals age 54 or above. The demographic characteristics of our analytic sample are summarized in the top half of Table 1.

Data for Study 2 were collected in the first 3 years of the CHASRS, a longitudinal, population-based study of persons born between 1935 and 1952 (Cacioppo et al., in press). The target population for Study 2 was European American, African American, and Latino American middle-aged and older adults between the ages of 50 and 67 living in Cook County, Illinois, who were sufficiently ambulatory to come to the University of Chicago for a day-long visit to the laboratory. The sample was selected by using a multistage probability design in which African Americans and Latino Americans were oversampled and gender equality maintained.

First, a sample of households was selected, then sampled households were screened by telephone for the presence of an age-eligible person. Age-eligible persons were then asked to participate in the study. If a household contained more than one age-eligible person, then the person with the most recent birthday was selected. A quota-sampling strategy was used to achieve an approximately equal distribution of respondents across the six Gender × Race/Ethnic Group combinations.

The response rate among eligible persons was 45%, comparable to the response rate for well-conducted telephone surveys and very good for a study that involves a full day of annual testing in a laboratory. This response rate assumes that households for which the presence of an eligible individual was unknown (23% of all households) were just as likely to contain an eligible individual as households that were successfully screened. As described in Hughes et al. (2004), the characteristics of the Study 2 sample closely matched characteristics of urban respondents to the HRS.

The final sample size for Year 1 of the CHASRS is 229. In the analyses in this article, we exclude four cases with missing data for the Loneliness scale, one case with missing information for education, and 12 cases with missing information for income. Our analytic sample for Study 2 thus contains 212 cases. The demographic characteristics of our analytic sample are summarized in the bottom half of Table 1.

Table 1
Descriptive Statistics

Measure	Mean (*SD*) or Percentage
Study 1: Health and Retirement Study (N = 1,945)[a]	
Loneliness scale (3–9)[b]	3.89 (1.3)
Depressive Symptoms scale (0–7)[b]	1.3 (1.7)
Female	61.8%
Ethnicity	
European American	82.1%
African American	11.7%
Latino American	6.3%
Age	68.4 (8.8)
Years of education	12.3 (3.4)
Household income ($)	59,779 (82,809)
Married	76.7%
Study 2: Chicago Health, Aging, and Social Relations Study (N = 212, unless otherwise noted)[c]	
Loneliness scale (20–80)[d]	36.0 (9.9)
Depressive Symptoms scale (0–56; N = 208)[d]	9.6 (8.5)
Hostility scale (0–50; N = 200)[d]	17.3 (7.5)
Perceived Stress Scale (0–40; N = 209)[d]	13.3 (6.4)
Social support (4–16; N = 206)[d]	12.9 (2.2)
Female	52.4%
Ethnicity	
European American	37.3%
African American	34.4%
Latino American	28.3%
Age	57.4 (4.4)
Years of education	13.5 (3.0)
Household income ($)	67,728 (56,582)
Married	61.3%

[a] Data are from the 2002 wave of the Health and Retirement Study. Sample includes age-eligible European American, African American, and Latino American respondents to Module 6. Twenty cases missing data for loneliness or marital status are excluded. Figures are unweighted. [b] Higher values indicate more symptoms of depression or greater loneliness. [c] Data are from the first (2002) wave of the Chicago Health, Aging, and Social Relations Study. Seventeen cases missing data for loneliness, education, or income are excluded. Figures are unweighted. [d] Higher values indicate greater loneliness, depressed affect, hostility, perceived stress, or social support.

Measures

Loneliness scale. In Study 1, we assessed loneliness using a three-item scale (Hughes et al., 2004) designed to gauge feelings of social isolation within the constraints of a short telephone interview. The scale consists of three questions such as "How often do you feel that you lack companionship: hardly ever, some of the time, or often?" The response categories were coded 1 = *hardly ever*, 2 = *some of the time*, and 3 = *often*. Each person's responses to the three questions were summed, with higher scores indicating greater loneliness. The coefficient alpha in the sample was .73, and the total score correlated well ($r = +.82$, $p < .0001$) with the full Loneliness scale given in Study 2 (Hughes et al., 2004). The mean and standard deviation of scores on this scale are shown in the top panel of Table 1. For our analyses, we standardized this variable so that it has a mean of zero and a standard deviation of one.

In Study 2, loneliness was indexed using the R-UCLA, a 20-item questionnaire measuring general feelings of social isolation, loneliness, and dissatisfaction with one's social interactions (Russell et al., 1980). The questionnaire consists of a list of statements such as "People are around me but not with me" and "There are people I can turn to." Participants were asked to rate how often they felt the way described by the items on a scale ranging from 1 (*never*) to 4 (*often*). Once certain items were reverse scored, all of the items were summed to tabulate loneliness scores for each participant, with higher scores indicating greater loneliness. As expected, the R-UCLA showed high internal consistency, with a coefficient alpha of .91. The mean and standard deviation for this variable are shown in the bottom panel of Table 1. In our analyses, we standardized this variable, with a mean of zero and a standard deviation of one.

Depressive symptomatology. In Study 1, we assessed depressive symptoms using a short form of the CES-D. The shortened form of the scale was designed for telephone interviews with older respondents and has satisfactory psychometric properties (Turvey, Wallace, & Herzog, 1999). The short form asks a subset (eight items) of the items on the full CES-D. In addition, the form of the questions was changed to read, "Much of the time in the last week I felt . . .," with a response set of yes or no. To create the scale, two items tapping positive affect are reverse coded, and the respon-

[1] The sample in the HRS represents the entire U.S. population, but the number of Asian Americans, Native Americans, Pacific Islanders, etc., in the HRS is small because the representation in the HRS reflects their small share of the underlying population. Consequently, we drop all "other" race/ethnicities from our analyses because there are too few to analyze even if we included them all in a miscellaneous (and analytically useless) "other" category.

dents' answers are summed. However, one item in the short-form of the CES-D asks whether the respondent felt lonely. To ensure any prediction of depressive symptoms by loneliness is not the result of item overlap, we deleted this item prior to calculating total score on this scale. We, therefore, refer to this scale as the *Short CES-D-ML* to indicate it is the short CES-D minus the loneliness item. The index ranges from 0 to 7 and is, in effect, a count of affirmative responses to questions about depressive symptoms. Six respondents did not respond to questions about depressive symptoms; their data were excluded from the analyses. The mean and standard deviation of the Short CES-D-ML in the Study 1 sample are also shown in Table 1.

In Study 2, depressive feelings and behavior were assessed using the full CES-D, which is a 20-item measure (Radloff, 1977). This scale, which has been used extensively to gauge depression in epidemiological studies, consists of a list of items such as "I felt depressed" and "I enjoyed life." Participants were asked to rate how often they felt the way described by the items during the past week on a scale ranging from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). After specific items were reverse scored, the items were summed to calculate depressive symptomatology scores for each participant, with higher scores indicating higher levels of depressive symptoms. Just as in Study 1, one item in the CES-D asks whether the respondent felt lonely, so this item was deleted prior to calculating the total score on the CES-D to ensure any prediction of depressive symptoms by loneliness was not because of item overlap. Thus, we refer to this scale as the *CES-D-ML.* Two cases with missing information on the CES-D were excluded from the depressive symptoms analyses. The mean and standard deviation for this variable are shown in Table 1.

Demographic variables. In both studies, we controlled for demographic characteristics that are associated with both loneliness and well-being. For instance, we included current marital status (married vs. unmarried) because of the negative association between marriage and loneliness (e.g., Barbour, 1993; Tornstam, 1992) and marriage and well-being (Waite & Gallagher, 2000). Including marital status in our models enabled us to judge the association between loneliness and depressive symptoms net of this important objective measure of social integration. For similar reasons, age (in years), gender (female vs. male), race/ethnicity (African American or Latino American vs. European American), education (in years), and household income (logarithm of reported value) served as covariates. Seven cases with missing information about education in Study 1 were assigned the sample mean education; five cases missing years of education completed in Study 1 but that had information about education level completed (e.g., high school, college) were assigned years. The distributions of these variables are presented in Table 1.

Construction and coding of these covariates was identical in the two studies, with one exception. In Study 1, respondents reported income in dollar amounts, but in Study 2, respondents reported household income in categories (e.g., $20,000–$30,000). For comparability with Study 1 and to avoid treating a nonlinear variable as if it were linear, in Study 2, we used the natural logarithm of the midpoint of each category. The lowest and highest categories were open ended. We, therefore, used the midpoint from Study 1 from the corresponding income categories for these categories in Study 2.

Psychosocial risk factors. A set of related psychosocial variables were also measured in Study 1 (perceived stress and social support) and Study 2 (perceived stress, hostility, and social support) to determine whether loneliness predicted depressive symptoms independently of these risk factors.

To index perceived stress in Study 1, we used the four-item Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983), which is designed to measure the degree to which respondents find their lives unpredictable, uncontrollable, and overwhelming. To simplify the telephone interview, we used the three-category response set used in the Loneliness scale (*hardly ever or never*, *sometimes*, *often*) instead of the five-category response set used in the original scale. The alpha coefficient of reliability for the scale as we used it was .63.

Perceived stress was measured in Study 2 using the 10-item PSS, a self-report questionnaire in which participants are asked to indicate how often they felt or thought a certain way during the past week. Responses to each item are recorded using a 5-point Likert scale that ranges from 0 (*never*) to 4 (*very often*). Scale scores for each participant are calculated by summing the responses to all items (Cohen et al., 1983). The scale ranges from 0 (*low perceived stress*) to 40 (*high perceived stress*). The Cronbach's alpha was .84 in Study 2. Three cases were missing values for this measure.

Our measure of social support in Study 1 was based on two items: how often respondents felt they could talk to friends about worries and how often they could rely on friends for help if they had problems. The response set was also the same as the set used for the Loneliness scale: *hardly ever* (or *never*), *some of the time*, or *often*. The alpha coefficient of reliability for this two item measure was .76.

In Study, 2, social support was measured using the 12-item Interpersonal Support Evaluation List (ISEL), a scale that assesses the perceived availability of three forms of social support—tangible, appraisal, and belonging (Cohen & Hoberman, 1983; Cohen, Mermelstein, Kamarck, & Hoberman, 1984). In this self-report questionnaire, participants are asked to rate the extent to which each item reflects their own feelings on a 4-point Likert scale that ranges from 1 (*definitely true*) to 4 (*definitely false*). Subscale scores (i.e., Tangible, Appraisal, Belonging) are computed by summing responses to subsets of items after reverse scoring appropriate items. For the purposes of this study, an overall social support score (range = 4–16) was computed by averaging the subscale scores. The alpha coefficient for this scale in Study 2 was .87. Six cases were missing values for this measure.

Finally, hostility was measured in Study 2 using the Cook-Medley Hostility Scale, a 50-item scale developed from the Minnesota Multiphasic Personality Inventory (Barefoot, Dahlstrom, Dodge, Peterson, & Williams, 1989; Cook & Medley, 1954). For each item, the participant is asked to read the accompanying statement and indicate whether it applies to them by marking either true (1) or false (0). Scale scores are computed for each participant by summing the responses after reverse scoring the appropriate items. Scale scores can range from 0 (*low hostility*) to 50 (*high hostility*). Cronbach's alpha for this scale has been established to exceed .80 (MacDonald, Laing, Wilson, & Wilson, 1999). Twelve cases were missing values for this measure.

Data Analysis

In Study 1, we used negative binomial regression to regress the Short CES-D-ML (omitting the "lonely" item) score on the set of covariates. Negative binomial regression is appropriate to model outcomes that represent counts (Long, 1997). Count data are often modeled using Poisson regression; however, negative binomial regression is used when the data show more variation than would be expected were they generated by a Poisson process. The estimated coefficients show the change in the expected number of depressive symptoms for a one-unit change in an independent variable. We present these coefficients, along with their associated p values. In Study 2, we used the full CES-D-ML (omitting the "lonely" item), in which each item has four response categories, and the scores range from 0 to 56. Because the full CES-D-ML is essentially a continuous variable, we modeled it with ordinary least squares regression. Again, we present the estimated coefficients and their associated p values.

All psychosocial variables (i.e., loneliness, depressive symptoms, perceived stress, social support, hostility) were standardized prior to analysis; therefore, coefficients are interpretable as the magnitude of change associated with an increase of one standard deviation in the predictor. Because of the differences in model specification across Studies 1 and 2, the coefficients are not directly comparable across studies.

In other respects, data analyses in Study 2 paralleled those in Study 1, with two exceptions. Although both samples are population based, the

sample for Study 2 is part of an ongoing longitudinal study in which participants spend 1 day each year undergoing extensive behavioral and physiological testing in our laboratory. The measures used in Study 2 are therefore more detailed, comprehensive, and reliable than those used in Study 1. However, the sample size in Study 2 is only about one tenth of that in Study 1. Consequently, we evaluated the Gender × Loneliness interactive model only in Study 1, in which we had sufficient cases to estimate reliably the coefficients. Second, the depth of Study 2 allowed us to secure more detailed measures of loneliness, depressive symptoms, perceived stress, and social support and to include the risk factor of hostility when evaluating whether loneliness is a unique risk factor for depressive symptoms. These models also provide information about the predictive value of each of these psychosocial risk factors net of the demographic and psychosocial factors.

Finally, longitudinal analyses were conducted using a random-effect latent growth model for loneliness and for depressive symptoms using Year 1 data from the CHASRS as baseline predictors for trajectories in the subsequent 2 years of follow-up. Latent growth models are used to identify differences over time in longitudinal designs. We fit linear models for loneliness and for depressive symptoms over Years 2 and 3, using demographic variables, and Year 1 values for loneliness, depression, and psychosocial factors as predictors, together with a linear time trend. Each participant's slope and intercept were permitted to vary as random effects in the model. These models then allowed us to determine the extent to which depressive symptoms net of demographic covariates and loneliness in Year 1, for example, predict differences in loneliness observed over the next 2-year period. Thus, we fit a latent growth model with time-invariant predictors as described in Section 8.2 of Singer and Willett (2003), which corresponds to a covariance structure analysis model. Specifically, we included fixed effects for baseline loneliness and depression, demographic, and psychosocial factors. We also included person-level random effects for the effects of time period (thus, allowing for individual variability in both level and slope over time). The random slope and intercepts were allowed to be correlated. There was no significant evidence of interperson variability about the average slopes and no evidence for a correlation between these random effects. As a result, we report the findings from the simple model in which individual variability is exhibited only through person-specific intercepts. The evidence for this level of between-person variability is very strong for both loneliness and depressive symptoms ($p < .0001$ in each case).

Results

The results of the set of models for the Short CES-D-ML in the national population-based sample (see Study 1) are summarized in Table 2. The results of the hierarchical regression models for the full CES-D-ML scale in the population-based sample from the CHASRS are summarized in Table 3. Recall that estimation of the models differed across the two studies because of differences in the underlying metric of the dependent variable. For Study 1, the figures in the table are coefficients from negative binomial regressions of depressive symptoms on loneliness and sets of covariates. For Study 2, the figures are coefficients from ordinary least squares regressions of depressive symptoms on the same set of covariates. Although the specific interpretation of the coefficients differs, in general, each indicates the relative increase in depressive symptoms associated with a one-unit change in the indicated covariate.

Study 1: HRS

The results from Study 1 replicated the finding in prior cross-sectional research showing that higher levels of reported loneliness are associated with elevated levels of depressive symptoms (see Table 2, Model 1). Models 2 and 3 show that higher education and higher income are associated with fewer depressive symptoms. These covariates had little effect on the strength or significance of the association between loneliness and depressive symptoms, however.

Model 4 was designed to estimate the effect size of the Gender × Loneliness interaction, which was statistically significant. The interaction indicates that the association between loneliness and depressive symptoms is significantly stronger among men than

Table 2
Coefficients and Standard Errors from Regressions of Depressive Symptoms[a] on Loneliness and Covariates: Health and Retirement Study 2002

Measure	Model 1	Model 2	Model 3	Model 4	Model 5
Loneliness[b]	.43** (.03)	.39** (.03)	.40** (.03)	.47** (.05)	.20** (.03)
Social support[b]					−.09* (.02)
Perceived stress[b]					.26** (.04)
Female		.21** (.06)	.22** (.06)	.23** (.06)	.18** (.06)
African American[c]		.05 (.09)	.06 (.09)	.05 (.09)	.04 (.08)
Latino American[c]		.16 (.12)	.15 (.12)	.14 (.12)	.15 (.11)
Age		.005 (.003)	.006 (.003)	.006 (.003)	.007* (.003)
Years education		−.04** (.009)	−.04** (.009)	−.04** (.009)	−.03** (.008)
Log household income		−.07** (.02)	−.08** (.02)	−.08** (.02)	−.05* (.02)
Married			.08 (.07)	.09 (.07)	−.01 (.07)
Loneliness: Female*				−.10* (.06)	
Constant	.12** (.03)	.74 (.38)	.70 (.38)	.72 (.38)	−.95 (.38)
N	1,939	1,939	1,939	1,939	1,921
Log likelihood	−2,998	−2,964	−2,964	−2,963	−2,680
df	1	7	8	9	10

[a] Higher values indicate more symptoms, out of a total of seven. [b] Measure is standardized with a mean of zero and standard deviation of one. [c] Reference category is European Americans.
* $p < .05$. ** $p < .01$.

Table 3
Coefficients (and Standard Errors) from Regressions of Depressive Symptoms[a] on Loneliness and Covariates: Chicago Health, Aging, and Social Relations Study 2002

Measure	Model 1	Model 2	Model 3	Model 4
Loneliness[b]	4.80*** (0.49)	4.36*** (0.47)	4.39*** (0.47)	2.62*** (0.52)
Perceived stress[b]				4.25*** (0.49)
Social support[b]				0.66 (0.52)
Hostility[b]				0.99* (0.46)
Female		1.81* (0.93)	2.14* (0.96)	1.04 (0.84)
African American[c]		2.02 (1.14)	2.23* (1.14)	1.41 (0.99)
Latino American[c]		2.30 (1.23)	2.57* (1.24)	1.21 (1.07)
Age		−0.26* (0.11)	−0.26* (0.11)	−0.23* (0.10)
Years education		−0.28 (0.17)	−0.22 (0.17)	−0.08 (0.15)
Log household income		−1.40** (0.54)	−1.71** (0.58)	−0.65 (0.50)
Married			1.51 (1.08)	0.17 (0.95)
Constant	9.7 (0.5)	39.5 (9.4)	40.3 (9.4)	27.8 (8.3)
N	208	208	208	192
F	97	21	19	27
df	(1, 206)	(7, 200)	(8, 199)	(11, 180)

[a] Higher values indicate more symptoms. [b] Measure is standardized with a mean of zero and standard deviation of one. [c] Reference category is European Americans.
* $p < .05$. ** $p < .01$. *** $p < .001$.

women, but the association between loneliness and depressive symptoms was strong and statistically significant for women as well as for men (coefficients = .40 and .51, respectively, $ps <$ .001).

When the individual psychosocial variables of perceived stress and social support were included as additional covariates in Model 5, loneliness remained a significant predictor of depressive symptoms with a sizable effect. Perceived stress and social support each were also significant and unique predictors of depressive symptoms, though the effect size for social support was small compared with those for loneliness and perceived stress (see Table 2, Model 5). Given the significant Gender × Loneliness interaction in Model 4, we examined Model 5 separately for male and female adults. The only difference was that the association between social support and depressive symptoms (results not shown) was not statistically significant for women.

Study 2: The CHASRS

The results of Study 2 were examined in two ways: (a) Hierarchical regression analyses of Year 1 data were performed to parallel those performed in Study 1; and (b) latent variable growth models for loneliness and depressive symptoms from Years 1 to 3 were performed to extend the cross-sectional analyses in Studies 1 and 2 to longitudinal analyses.

The results of the hierarchical regression analyses using the more detailed measures in Study 2 replicated the major findings of Study 1. Higher levels of reported loneliness were significantly associated with elevated levels of depressive symptoms (see Table 3, Model 1). The inclusion of demographic (see Model 2) and marital status (see Model 3) as covariates revealed that depressive symptoms were higher in women than in men, lower in older and wealthier respondents, and higher in African Americans or Latino Americans than in European Americans. As in Study 1, however, the addition of the demographic covariates and marital status had little effect on the strength of the significant association between loneliness and depressive symptoms.

When the individual psychosocial variables of perceived stress, hostility, and social support were included as additional covariates in Model 4, the results indicated that loneliness remained a significant predictor of depressive symptoms above and beyond the variance that can be explained by demographic factors, marital status, and all three additional psychosocial risk factors. Perceived stress and hostility each were significant predictors of depressive symptoms, whereas social support was not statistically significant.

Longitudinal Analysis

The test–retest reliabilities for depressive symptoms were as follows: $r_{\text{yrs.1–2}}(199) = .69$, $r_{\text{yrs. 2–3}}(188) = .70$, $r_{\text{yrs. 1–3}}(184) = .69$, $ps < .001$. Results of the latent variable growth analyses for depressive symptoms are summarized in the left three columns of Table 4. Inspection of the demographic variables indicated that depressive symptoms were higher in women than in men. Moreover and as would be expected, depressive symptoms in Year 1 predicted differences in depressive symptoms in the subsequent years of the study. More interestingly, loneliness in Year 1 predicted differences in depressive symptomatology in the subsequent years net of demographic variables, depressive symptoms in Year 1, and other psychosocial variables in Year 1. We removed nonsignificant predictors one at a time to ensure that correlated predictors were not masking each other's effects; no indication of masking was found.

The test–retest reliabilities for loneliness were as follows: $r_{\text{yrs. 1–2}}(203) = .76$, $r_{\text{yrs. 2–3}}(188) = .84$, $r_{\text{yrs. 1–3}}(187) = .73$, $ps < .001$. Results of the latent variable growth analyses for loneliness are summarized in the right three columns of Table 4. Loneliness in Year 1 predicted differences in loneliness in the subsequent years of the study, as would be expected given the temporal stability of loneliness. In addition, however, depressive symptomatology and

Table 4
Coefficients and Standard Errors From Regressions of Latent Variable Growth Models in the Chicago Health, Aging, and Social Relations Study: Depressive Symptoms[a] on Loneliness and Covariates and Loneliness on Depressive Symptoms[a] and Covariates

Latent variable growth model	α	*SE*
Depressive symptoms		
Depressive symptoms Year 1[b]	4.68**	0.63
Loneliness Year 1[b]	1.40*	0.55
Perceived stress Year 1[b]	0.02	0.58
Social support Year 1[b]	0.22	0.52
Hostility Year 1[b]	0.43	0.45
Year of study	−1.35*	0.53
Female	2.58**	0.87
African American[c]	0.58	0.99
Latino American[c]	0.94	1.06
Age	−0.08	0.10
Years education	−0.02	0.15
Log household income	−0.19	0.21
Married	1.49	0.97
Constant	14.26*	6.81
N	186	
χ^2	21.95***	
Variance component[d]		
Constant	22.1***	
Slope	4.6	
Residual	13.1***	
Loneliness		
Loneliness Year 1[b]	5.63***	0.62
Depressive symptoms Year 1[b]	1.56*	0.70
Perceived stress Year 1[b]	−0.98	0.64
Social support Year 1[b]	−1.54**	0.58
Hostility Year 1[b]	0.68	0.50
Year of study	0.11	0.44
Female	1.61	0.96
African American[c]	−0.19	1.10
Latino American[c]	−0.18	1.18
Age	−0.20	0.11
Years education	−0.20	0.16
Log household income	0.03	0.23
Married	1.83	1.08
Constant	47.61***	7.60
N	186	
χ^2	66.07***	
Variance component[d]		
Constant	12.6***	
Slope	0	
Residual	22.0***	

[a] Higher values indicate more symptoms. [b] Measure is standardized with a mean of zero and standard deviation of one. [c] Reference category is European Americans. [d] The constant and slope variances are between subject, whereas the residual is within subject.
* $p < .05$. ** $p < .01$. *** $p < .001$.

social support in Year 1 each predicted differences in loneliness in the subsequent years of the study net of demographic variables, loneliness in Year 1, and other psychosocial variables in Year 1. The iterative removal of nonsignificant predictors did not reveal any additional significant predictors.

Discussion

Loneliness has been found to predict a wide range of problems in middle-aged and older adults, including lack of independent living (e.g., Russell, Cutrona, de la Mora, & Wallace, 1997), alcoholism (Akerlind & Hornquist, 1992; R. G. Bell, 1956), elevated blood pressure (Cacioppo, Hawkley, Crawford, et al., 2002), impaired sleep (Cacioppo, Hawkley, Berntson, et al., 2002; Cacioppo, Hawkley, Crawford, et al., 2002), and suicide (Goldsmith, Pellmar, Kleinman, & Bunney, 2002; Wenz, 1977). The co-occurrence of loneliness and depressive symptoms has also long been noted, and items measuring loneliness have been included in some measures of depressive symptoms in older adults (Radloff, 1977). Subsequent research has established that loneliness and depressive symptoms are, in fact, distinct constructs (Cacioppo et al., in press; Weeks et al., 1980), but the specificity of loneliness as a risk factor for depressive symptoms (net of demographic and psychosocial variables) has not been addressed previously in multiethnic population-based studies of middle-aged and older men and women.

In this research, we replicated the association between loneliness and depressive symptoms in a national sample of adults aged 54 years and older (see Study 1) and in an urban sample of adults aged 50–67 years (see Study 2). Second, we found loneliness remained a significant risk factor for depressive symptoms even after controlling for demographic variables in Studies 1 and 2. Although the cross-sectional analyses in Studies 1 and 2 indicated that gender was associated with a higher risk of depressive symptoms, and education and income were also associated with a lower risk of depressive symptoms, the inclusion of demographic variables of age, gender, ethnicity, education, income, and marital status as covariates had little effect on the association between loneliness and depressive symptoms.

The sample size in Study 1 provided sufficient statistical power to also inspect the extent to which the association between loneliness and depressive symptoms differed for men and women. Koenig, Isaacs, and Schwartz (1994) investigated differences in the association between loneliness and depressive symptoms in adolescent girls and boys. Koenig et al. (1994) found that although the levels of depressive symptoms were higher in girls than in boys, the association between loneliness and depressive symptoms was comparably strong in girls and in boys. We, too, found that the association between loneliness and depressive symptoms was strong and significant for both men and women, but we further found that this association was significantly stronger for men. This gender difference is interesting in light of the higher levels of depressive symptoms in women than in men in prior studies (e.g., Federal Interagency Forum on Aging-Related Statistics, 2004; Heikkinen & Kauppinen, 2004) as well as in the present studies. These results suggest that the causes of depressive symptoms, or the weighting of the causes of depressive symptoms, differ for men and women, with loneliness a more frequent or powerful cause of depressive symptoms in men than in women. Consistent with this suggestion, both cross-sectional and longitudinal studies confirm that both men and women show increased depression following divorce or bereavement, but men appear to show more deleterious effects of bereavement or divorce than women (Lucas, Clark, Georgellis, & Diener, 2003; Stroebe, Stroebe, & Schut, 2001).

Being married has been found to have protective health effects (Waite & Gallagher, 2001) and to predict lower levels of loneliness (Barbour, 1993; Hughes et al., 2004; Tornstam, 1992). Consistent with this research, the bivariate relationship between marriage and depressive symptoms was negative (marriage protects against depression; results not shown). The introduction of sociodemographic or psychosocial covariates rendered this relationship statistically nonsignificant, however. These findings suggest that the protective effects of marriage operate through socioeconomic as well as psychological pathways (cf. Melchior, Berkman, Niedhammer, Chea, & Goldberg, 2003).

More important, the results of Studies 1 and 2 demonstrated that loneliness is a unique risk factor for depressive symptoms net of demographic covariates, marital status, and the psychosocial risk factors of perceived stress, low social support, and hostility. Although the association between loneliness and depression has been found to remain significant even after controlling for social support (e.g., Hagerty & Williams, 1999; Russell, Kao, & Cutrona, 1987; unpublished paper cited in Shaver & Brennan, 1991), to our knowledge, this is the first evidence that loneliness predicts depressive symptoms after controlling for a wide range of demographic and psychosocial variables in population-based samples of middle-aged and older adults. These analyses also revealed that perceived stress, hostility, and social support were associated with depressive symptoms net of demographic variables and marital status, but the loneliness association between loneliness and depressive symptoms could only partly be explained by these correlated psychosocial variables.

These results establish a significant and unique association between loneliness and depressive symptoms in middle-aged and older men and older women, but the cross-sectional nature of these analyses does not permit claims of causal influence. Therefore, a second aim in the present research was to examine longitudinally whether loneliness predicted subsequent differences between individuals in depressive symptoms and/or depressive symptoms predicted subsequent differences between individuals in loneliness. The temporal stability of individual differences in loneliness and in depressive symptomatology over the three annual assessments was high (all rs $\geq$ .69), so we included the Year 1 level of depressive symptomatology as a covariate in the longitudinal analyses of depressive symptoms, and we included the Year 1 level of loneliness as a covariate in the longitudinal analyses of loneliness. Our longitudinal analyses also included demographic and other psychosocial variables from Year 1 to better determine the extent to which loneliness in Year 1 uniquely predicted subsequent differences in depressive symptoms and vice versa. The results revealed that loneliness at Year 1 predicted subsequent differences in depressive symptoms net of depressive symptoms, demographic variables, and psychosocial variables at Year 1. Moreover, although the cross-sectional analyses suggested hostility, social support, and/or perceived stress may also influence depressive symptoms, the longitudinal analyses indicated these variables in Year 1 were not related to individual differences in depressive symptoms once depressive symptoms at Year 1 were considered (analyses not shown). Only gender and loneliness at Year 1 predicted subsequent individual differences in depressive symptomatology in the longitudinal analyses, and these findings were unchanged when nonsignificant predictors were iteratively deleted to evaluate possible suppressor effects.

These longitudinal results are in accord with those of Heikkinen and Kauppinen (2004) in their study of very old Finnish adults, showing that loneliness predicted long-term trajectories in depressive symptoms. The present research extends Heikkinen and Kauppinen's (2004) finding in several important respects, however. As noted above, we statistically controlled for the potentially spurious contributions of hostility, perceived stress, social support, and demographic variables. Both our results and those of Heikkinen and Kauppinen (2004) are inconsistent with the findings of Weeks et al. (1980), who found no significant causal influences between loneliness and depression in their 5-week study of first-quarter college students. In those findings, Weeks et al. (1980) acknowledged that "it may be that such causal relations exist but that the lag time for the effect is longer than 5 weeks" (p. 1242).

The present research also extends Heikkinen and Kauppinen's (2004) investigation of very old Finnish adults by investigating whether depressive symptomatology also predicts changes in loneliness longitudinally. The results indicated that depressive symptoms at Year 1 also predicted the subsequent changes in loneliness net of loneliness, demographic variables, and psychosocial variables at Year 1, indicating that the influences between loneliness and depressive symptoms are reciprocal in middle-aged and older adults.

In light of the specific role of loneliness in depressive symptoms, greater attention to loneliness in older adults may be important to maximize the likelihood they remain healthy and functional across their entire life span. Everyone feels lonely at some point in their lives, but situational factors can increase the frequency or chronicity of loneliness. Childlessness in Chinese older adults in Hong Kong, for instance, was found to be associated with loneliness and depression even after controlling for marital status, gender, age, education, self-reported health, and financial strain (Chou & Chi, 2004). In a Swedish random sample of 2,795 individuals 15–80 years of age, Tornstam (1992) found that married individuals are, on average, less lonely than unmarried individuals. In a semistructured interview of single, married, divorced, and widowed individuals 25–75 years of age, de Jong-Gierveld (1987) reported that living with a partner predicted the lowest levels of loneliness. Among elderly (60–106 years) individuals living independently, frequency of telephone contact with others predicted feelings of loneliness (Fees, Martin, & Poon, 1999).

Although many older adults value the independence of living alone, Henderson, Scott, and Kay (1986) found that elderly individuals who live alone are lonelier than age-matched individuals living with others despite reporting comparable social interaction frequency and personal network adequacy. Prince et al. (1997) reported that frequent loneliness was more common among those living alone, those lacking supportive neighbors or contact with friends, and those aged over 82 years (cf. Mullins, Sheppard, & Anderson, 1991; Victor et al., 2002). In light of these results, it is noteworthy that a growing fraction of the United States population lives alone. More than 27 million people live alone in the United States (Hobbs & Stoops, 2002), and the number of people living alone is estimated to reach almost 29 million by 2010—an approximately 30% increase since 1980 (U.S. Census Bureau, 1996). Living alone in later life does not necessarily lead to higher levels of loneliness, however. Pinquart and Sorensen's (2003) study of older adults indicated that loneliness is predicted by the quality rather than the quantity of contact. The finding that qualitative

aspects of social interactions are more predictive of loneliness as are quantitative aspects is a robust result in studies of younger (e.g., Cacioppo et al., 2000; Hawkley, Burleson, Bernston, & Cacioppo, 2003; Wheeler, Reis, & Nezlek, 1983) and older adults (Green, Richardson, Lago, & Schatten-Jones, 2001) and suggest interventions may be effective even for older adults living alone.

Study limitations should also be noted. For instance, our latent growth model looks at the outcome variables in Years 2 and 3 of the CHASRS data so that baseline values of loneliness and depression could legitimately be used as predictors. (Had we used all 3 years of the panel for outcomes, it would have violated the assumptions of the model to include Year 1 data in the predictors as well.) This has the result that only the most rudimentary form of "growth" could be examined in these longitudinal models; that is, linear changes could not be distinguished from more complex forms, including quadratic changes. Nonetheless, it seemed to us important to do two things that only this model could accomplish. First, because loneliness and depression are separate but interrelated, we wanted to account for the extent to which baseline levels of loneliness predicted future loneliness trajectories, net of the independent effects of depressive symptoms at baseline. To do this, we were necessarily limited to the 2-year longitudinal panel. Second, we hoped to see whether, net of baseline levels of loneliness and depression, there was significant between-person variability in the changes across Years 2 and 3, relative to any average secular trend. If individual trajectories are changing systematically over multiyear periods, then the test of the linear variance component should have power to detect marked variability in the (average) slope of these trends. Of course, high-frequency fluctuations (say over periods much less than 1 year or 2) would be unlikely to be detected.

What we found was that loneliness and depression both had substantial predictive value, even net of each other, in forecasting subsequent levels of depression or loneliness, and that although there is substantial variability between persons over a 2-year period in level, there is not substantial variability in trend. We did find a statistically significant drop in average depressive symptoms from Year 2 to Year 3, but there was no evidence for significant variation in the amount of the drop, and the change was not predicted differentially by baseline depressive symptoms or loneliness. A longer duration panel will provide us with greater power to detect individual variations in the shapes of depression or loneliness trajectories and to identify predictors of these parameters.

Despite the limitations of the data set and the simplicity of the models we were constrained to fit, some important findings emerge that only the longitudinal analysis could reveal: (a) Both loneliness and depressive symptoms are relatively stable features over a 3-year period; (b) each is significantly predicted by loneliness and depressive symptoms in the baseline year; (c) both baseline loneliness and depressive symptoms remain important incremental predictors of subsequent loneliness (and subsequent depressive symptoms); and (d) later levels of loneliness are significantly predicted additionally only by levels of social support, whereas no other psychosocial factors predicted levels of depressive symptoms once baseline loneliness and depressive symptoms are taken into account. In summary, these data suggest that loneliness and depressive symptoms have strong reciprocal influences in middle-aged and older adults. Recognition of the specific and reciprocal influences of loneliness and depressive symptoms may be important in mitigating their synergistic and deleterious effects on well-being in middle-aged and older adults.

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