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Psychological Distress and Mortality: Are Women More Vulnerable?*

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Abstract

Does psychological distress increase mortality risk? If it does, are women more vulnerable than men to the effect of distress on mortality? Drawing from cumulative disadvantage theory, these questions are addressed with data from a 20-year follow-up of a national sample of adults ages 25−74. Event history analyses were performed to examine mortality from general and specific causes for men and women. Findings reveal that the effect of psychological distress on all-cause mortality was nonlinear for men. Moderate amounts of distress were associated with lower mortality risk, but high levels of distress raised men's mortality risk. Moreover, the curvilinear relationship between distress and mortality varied by cause of death for men and women. Men with high levels of psychological distress were more vulnerable to ischemic heart disease mortality. Women with high levels of distress were more vulnerable to cancer mortality.

A wide array of research on mental health has identified adverse consequences of psychological distress. Strain, tenseness, and anxiety, especially when chronically experienced, can shape mind-body relations, thereby accelerating psychosomatic processes. Indeed, some research indicates that psychological distress can raise the risk of premature mortality.

The finding that psychological distress is associated with higher mortality risk is well established in clinical samples, but this may be due to the substantially higher rate of suicide and accidental deaths in a clinical sample (Roberts, Kaplan, and Camacho 1990). For community-based samples, the relationship between psychological distress and mortality is more difficult to summarize. This is because some studies show that mortality risk is heightened for distress or depressive symptoms (Mendes de Leon et al. 1998; Somervell et al. 1989), while other studies are unable to find an independent effect on mortality (Fredman et al. 1989; Thomas et al. 1992).

The purpose of this research is to identify possible reasons for the inconsistent findings and test hypotheses concerning this seemingly complex relationship. We believe that there are several plausible reasons for the inconsistency in results among previous studies, but we suggest that gender differences are critical to resolving the issue. The present research draws from cumulative disadvantage theory and specifies two questions to guide the analysis: Does

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psychological distress heighten mortality risk? And are women more vulnerable than men to the effect of psychological distress on mortality?

DOES PSYCHOLOGICAL DISTRESS RAISE MORTALITY RISK?

Both scientific research and popular culture point to the adverse effects of being psychologically distressed. When people are tense, irritable, restless, or worried, they experience many social and psychoimmunological processes that may eventually lead to health problems (Mendes de Leon et al. 1998; Mirowsky and Ross 1989). Indeed, many studies, including those completed on community samples, reveal that distress, depression, and affective disorders raise mortality risk. This has been reported in several studies in the United States (Bruce and Leaf 1989; Mendes de Leon et al. 1998) as well as in other countries (in France, for example; see Fuhrer et al. 1999). At the same time, many well-executed studies find no link between psychological distress or depressive symptoms and mortality (Everson-Rose, House, and Mero 2004; Fred-man et al. 1989; Rasul et al. 2004; Singer et al. 1976; Thomas et al. 1992).

As one surveys the literature in an attempt to understand why there is such inconsistency, several limitations of previous research merit consideration. First, the bulk of the U.S. studies have been conducted on local or regional samples, including Alameda County, California (Roberts et al. 1990), a rural eastern county of Georgia (Somervell et al. 1989), sections of New York City (Singer et al. 1976; Thomas et al. 1992), and New Haven, Connecticut (Mendes de Leon et al. 1998). Thus, part of the "inconsistency" could be due to genuine geographic and social variation, pointing to a need for research using national data.

Second, there is variability in the age ranges of the populations in the studies. Studies have reported elevated mortality risk due to psychological distress among older adults only (Mendes de Leon et al. 1998) and among adults of all ages (Somervell et al. 1989). However, other studies of differing age groups report no relationship between psychological distress and mortality (Roberts et al. 1990; Thomas et al. 1992).

Third, most of the previous research either examines mortality without differentiating among the causes of death (Thomas et al. 1992) or examines a single cause of death (Mendes de Leon et al. [1998] examined coronary heart disease deaths). Relatively few studies conduct cause-specific analyses on multiple causes of death, but it is theoretically plausible that psychological distress may affect some (though not all) causes of death. Indeed, it is possible that unobserved heterogeneity in all-cause mortality may mask important relationships. The study by Roberts et al. (1990) is a notable exception in the literature, because the authors tested for differences in the effects of psychological distress on mortality for different causes of death. In that study, however, the authors found limited evidence that psychological distress was associated with either all-cause or cause-specific mortality. By contrast, Mendes de Leon et al. (1998) examined coronary heart disease only and found that psychological distress substantially raised mortality risk for women. There may be distinct etiologic pathways between psychological distress and specific diseases, such as heart disease (Ketterer et al. 2004) and cancer (Honda, Goodwin, and Neugut 2005). Thus, studies examining *multiple* causes of death are needed, especially on national samples.

Fourth, a careful reading of the literature suggests the importance of considering nonlinear relationships between distress and mortality. Roberts et al. (1990) observed that moderate levels of distress could in some cases be associated with a *lower* risk of death. It was the high level of distress among Alameda County participants that was associated with higher mortality risk, although this relationship was attenuated after controlling for diseases and educational attainment. It may well be that busy and caring people have bouts of distress due to the demands they face and their desire for a successful resolution (Sapolsky 1994; Wheaton 1999). If that

is the case, we posit that there may be a threshold of distress that raises mortality risk, and it would be important to identify this threshold for proper intervention.

Fifth, differences in the variables that are controlled in previous research may also account for the apparent inconsistency in findings. Inadequate controls can give the appearance of a link, when that appearance may be due to some other factor; e.g., a disease may be the cause of both the distress and premature mortality.

Finally, we assert that gender is important to understanding the relationship between psychological distress and mortality (Verbrugge 1989). Beyond the Y chromosome, there is a host of social reasons to suspect that there may be gender differences in how distress may influence mortality. Indeed, some studies show that gender differences exist (Mendes de Leon et al. 1998), but much of the previous literature does not give systematic consideration to differences between men and women.

Are Women More Vulnerable to Distress?

The vast majority of the literature reveals that women are more likely than men to experience psychological distress, but this does not necessarily mean that women are more vulnerable than men to distress.[1] In addressing the question of vulnerability, it is important to understand that there are two main uses of the term "vulnerability" in research on gender differences in psychological distress. The first refers to gender differences in distress after controlling for other variables such as socioeconomic status, roles, and behavior. If women have higher levels of distress and if this fact cannot be explained by other variables, then one might conclude that women are more vulnerable (Kessler 1979). As George (2003) points out, caution is needed when attributing residual differences in distress to a disadvantaged group. Attributing vulnerability on the basis of residual group differences could be misleading for any group, especially if adequate statistical controls are not applied. And, of course, there will always be the question of the adequacy of controls.

The second use of the term "vulnerability" involves testing whether distress influences physical or mental health outcomes. For the present research, we ask whether the *effect of distress* on mortality is parallel for men and women. Evidence for such an effect requires a test of statistical interaction. Rather than presuming that unexplained differences in distress reflect vulnerability, our approach is to determine if the effect of distress on mortality is systematically different for men and women. Several scholars have argued that greater research attention should be given to the relationship between stressors and physical health outcomes, including mortality (Horwitz 2002; Horwitz, White, and Howell-White 1996; Thoits 1995). For the present research, we examine the effect of psychological distress on mortality and anticipate that women are more vulnerable than men.

Our test of the vulnerability hypothesis draws from cumulative disadvantage theory, which emphasizes how early advantage or disadvantage shapes the life course and differentiates cohorts over time (Dannefer 2003). Some people face disadvantages early in life, and these raise the risk of additional disadvantages later in life. The effects of risk factors accumulate over the life course, thereby increasing heterogeneity in outcomes of interest in later life (Dannefer 1987; Ferraro and Kelley-Moore 2003; O'Rand 1996).

[1]Men have higher rates of other types of mental health problems, but population-based surveys show that women are more likely to experience psychological distress (Fuhrer et al. 1999; Thoits 1986), depressive symptoms (Aneshensel et al. 1987; Turner, Wheaton, and Lloyd 1995), and physical symptoms of distress (Kessler and McRae 1981; Reskin and Coverman 1985). There are three major explanations why a gender difference in psychological distress exists: emotional responsiveness (Rossi 1984), willingness to report distress (Mechanic 1989; Ritchey, LaGory, and Mullis 1991, 1993), and structural inequalities (Reskin and Coverman 1985).

For the present research, we envision women experiencing greater structural strain due to gender inequalities. The strain or hardship places them at higher risk for a wide variety of negative outcomes (Ross and Huber 1985). As risks accumulate over the life course, the development of psychological distress is more likely for women than for men. Moreover, we posit that chronic distress may, in turn, lead to further disadvantage through unhealthy coping behaviors (e.g., eating disorders, smoking) and psychoimmunological responses, leading to psychosomatic illness. One should not minimize the roles that human agency and resilience play in shaping life-course trajectories, despite the cumulative risks. We assert, however, that the accumulated disadvantages that women face raise the risk of them being more likely than men to experience psychological distress *and* to be vulnerable to it. Simply put, disadvantage accumulates, and it does so more rapidly for women than for men.

Of the three main questions raised in the introduction of this paper, only one can be answered with certainty from the literature. It is clear that women are more likely to experience psychological distress, but the present research focuses on the remaining two questions. First, does psychological distress raise mortality risk? Second, are women more vulnerable than men to the effect of psychological distress on mortality?

Our approach to answering these questions is different from approaches used in previous studies in at least three ways. First, we use a 20-year follow-up of a national sample of adults to examine multiple causes of death. We consider the possibility that psychological distress may be related to selected causes of mortality, especially heart disease (Mendes de Leon et al. 1998; Stansfeld et al. 2002), cancer (Shekelle et al. 1981), and stroke, the three most common causes of death among adults in the United States (Anderson and Smith 2003).

Second, the present research also gives explicit attention to the possibility that the relationship between psychological distress and mortality may be nonlinear. Roberts et al. (1990) found that moderate levels of distress were associated with lower mortality risk but that high levels raised mortality risk. Therefore, the analysis tests for nonlinearities in the relationship between distress and mortality, examining both all-cause mortality and selected causes of death.

Finally, we examine whether women are more vulnerable to the effect of psychological distress on mortality. The evidence is mixed (Fuhrer et al. 1999; Mendes de Leon et al. 1998), but we test the hypothesis that women are more vulnerable than men.

METHOD

Sample

The current study uses longitudinal data from the National Health and Nutrition Examination Survey I (NHANES I), which was carried out by the National Center for Health Statistics (2005). NHANES I is a multistage national probability sample of noninstitutionalized U.S. adults (except those living on Indian reservations) ages 25−74 at baseline. The study was conducted between the years 1971−1975 and was designed to collect data on the dietary habits and health status of the U.S. population (National Center for Health Statistics 1977, 2005). This study makes use of data from the baseline survey and follow-up surveys tracking mortality through 1992, known as the National Health and Nutrition Epidemiologic Followup Study (NHEFS).

The analyses were completed on the NHANES I subsample that was administered the full interview schedule, including the Health Care Needs Questionnaire, at baseline (N = 6,913). Response rates for completed interviews were very high (86 percent in 1982−1984, 87 percent in 1987, and 85 percent in 1992) and did not differ by gender or educational level. The sample

used in this study comprises 5,955 white respondents (87.2%) and 878 black respondents (12.8%) at baseline.

All analyses presented below are based on the weighted sample and have been adjusted by Huber-White-sandwich procedures in Stata to account for the multistage sampling design.

Measurement

Data on mortality were collected from brief interviews conducted with proxies of deceased respondents. In addition, matches were made for all participants in the baseline survey to the National Death Index, the Social Security Administration Mortality File, and the enrollment file of the Health Care Financing Administration (Cox et al. 1997). Thus, failure to complete proxy interviews did not compromise identification of deaths. In addition, death certificates were used to obtain the respondent's date of death and the underlying cause of death (using the 9th revision of the International Classification of Diseases). Deaths due to ischemic heart disease, cancer, and stroke were identified.

Psychological distress was measured with three questions probing the respondent's subjective evaluations of stress during the past month, each with six response categories.[2] The first question asked, “Have you been anxious, worried or upset during the past month?” Responses ranged from not at all (coded 1) to extremely so, to the point of being sick (6). The second question was, “Have you been under or felt you were under any strain, stress, or pressure during the past month?” Responses ranged from “not at all” (1) to “yes—almost more than I could bear or stand” (6). The remaining question was, “How relaxed or tense have you been during the past month?” Responses ranged from “very relaxed” (1) to “very tense” (6). All three distress measures were summed to create a psychological distress index, which demonstrated high internal reliability ($\alpha = .80$).[3]

The remaining independent variables span a broad range of risk factors for psychological distress and mortality, either directly or indirectly. Demographic variables include age, female, black, and rural resident. Age is a continuous variable and was coded in years. All binary variables were coded 0 and 1, with 1 equal to the name of the variable.

Given our interest in gender differences, we also examined all marital status contrasts (with married serving as the reference group). Variables related to socioeconomic resources included education, income, and medical insurance. Education ranged from 0 to 7, with 0 being less than 8 years and 7 being post-college. Total family income at baseline (collected 1971−1974) was a 12-point scale (1 = less than $1,000 to 12 = $25,000+), with missing values (< 5%) handled via specific-mean imputation by age (< 45, 45−64, 65+), sex, and race categories. We also include two binary variables for two types of medical care insurance: private health insurance and Medicaid.

Smoking was identified by self-report of consumption of cigarettes, cigars, and pipe tobacco at the time of the interview and during one's lifetime. Alcohol consumption was measured by first assessing the total number of drinks consumed per week divided by the respondent's weight. Given the relationship between alcohol consumption and psychological distress, a

[2]Additional questions measuring psychological distress were asked of a subsample of respondents (approximately half), but the three measures used here were asked of all respondents in the detailed component of the survey. Although the three-item index has been shown to be predictive of changes in health over time (Farmer and Ferraro 1997), a larger number of items would be preferable for establishing construct validity of the index.

[3]A subsample of the NHANES I respondents were also asked a set of questions about depressive symptoms. Preliminary analyses with these indicators yielded two main conclusions. First, there was no significant relationship between depressive symptoms and all-cause mortality. Second, there is insufficient statistical power to examine relationships between depressive symptoms and cause-specific mortality on the subsample of NHEFS respondents to whom these questions were posed. Thus, the findings presented here refer to psychological distress per se, not to depression or depressive symptoms, which may have different relationships with mortality.

series of dichotomous indicators of alcohol consumption was created and examined in preliminary analyses (nondrinkers, light drinkers, moderate drinkers, and heavy drinkers, following the procedure of Coate 1993). Preliminary results showed the utility of distinguishing heavy drinking from other levels of alcohol consumption; thus, a binary variable was used in the analyses reported below (1 = heavy drinking; 0 = otherwise).

Although NHANES I did not include a measure of physical disability at the baseline interview, respondents were asked two questions regarding their exercise from both recreational and nonrecreational activities. To create a measure of regular exercise, those who had either moderate amounts or a lot of physical activity in either their job or in recreation were coded 1; all others were coded 0. A binary variable for obesity reflects whether the person's body mass index (kilograms / meters^2) was greater than or equal to 30 (coded 1 = obese; 0 = otherwise; National Heart, Lung, and Blood Institute 1998).

It is important for this research that morbidity and overall health status are controlled so that the effects of psychological distress are independent of health status per se (MacLeod et al. 2001; Rasul et al. 2004). The health measures used included self-reported morbidity and self-rated health. The self-reported morbidity questions ask whether a physician has identified the condition, and these measures have been shown to be equal or superior to physician-evaluated morbidity in predicting mortality (Ferraro and Farmer 1999). Separate binary variables were included for the serious or life-threatening conditions: heart problems (attack or failure), diabetes, cancer, and hyper-tension (no persons reported stroke at the baseline survey). The remaining conditions, described as chronic illness (nonserious), were summed to capture comorbidity. The chronic conditions included arthritis, asthma, bone fracture, cataracts, gout, psoriasis, and ulcer. Self-rated health was measured with the widely used five-category question probing one's overall health status (ranging from 1 = poor to 5 = excellent; Idler and Benyamini 1997).

Analytic Plan

Cox proportional hazards models were utilized to test hypotheses. Whereas events and social processes are time dependent, event history analysis is an effective method for studying mortality over the approximately 20-year period of the study. The analysis is conducted in two stages: all-cause mortality and cause-specific mortality. The three main causes of adult deaths in the U.S. were considered in the cause-specific analyses: deaths due to ischemic heart disease, cancer, and stroke (cerebrovascular disease). Given our interest in testing nonlinear relationships between psychological distress and mortality, we began with psychological distress in its original form and subsequently added polynomial forms (quadratic and cubic). The analyses were performed on the total sample and separately for men and for women.[4]

RESULTS

To provide background for the data and the analyses, Table 1 presents descriptive statistics for the total sample and for women and men separately. Means and standard deviations are presented for continuous variables (ordinal and interval). For binary variables, the mean represents the percent of cases with that characteristic (standard deviations of binary variables are omitted because they are simply a function of the mean). Men and women differ significantly on most of the variables, and they do so in ways that are consistent with most previous research. Two differences are noteworthy for the present analysis. First, women had significantly higher levels of psychological distress than men. Second, mortality was higher

[4]Additional covariates such as living alone and having a regular physician were initially included in the analyses. None of these covariates proved to be significant in any of the event history models and were therefore excluded from further analyses.

for men: 35 percent of the men died during the study, but only 23 percent of the women. Note also that men's mortality was higher for each of the three identified causes of death.

Table 2 presents the adjusted hazard ratios (HRs) for all-cause mortality for the total sample and by gender (HRs of less than 1 reflect lower risk; those greater than 1 reflect higher risk). To examine the possibility of a nonlinear relationship between psychological distress and mortality, two models are presented in Table 2. The first model tests a linear relationship, while model 2 adds a quadratic term for psychological distress. Interactions by gender were examined by testing for differences in parameter estimates; those that are statistically significant are identified by note *b* in Tables 2 and 3.

Results from model 1 of Table 2 for the total sample show that psychological distress is associated with a lower likelihood of all-cause mortality (HR = .96 for the total sample). As in the bivariate analysis, mortality was less likely among women than among men. Higher mortality risk for the total sample was also observed among older respondents, those with limited income, rural residents, persons who were separated or never married, those with poorer health ratings, those lacking private insurance, and smokers. Mortality was also higher for obese persons, those who did not exercise regularly, and those who were heavy drinkers. As expected, the binary indicators for serious illnesses were associated with higher mortality risk, but chronic nonserious illnesses were associated with lower mortality risk. (This is likely the result of a selection effect: Survivors were afflicted with more chronic nonserious conditions.) Testing for differences in the coefficients between women and men (columns 2 and 3) generally show similar relationships. The two exceptions are the effect of Medicaid on mortality, which was significant and positive for women only, and regular exercise: The protective effect of regular exercise was significant for both sexes, but the effect was stronger for men than women (.64 and .74, respectively).

Model 2 in Table 2 presents results from the tests of a nonlinear relationship between psychological distress and mortality by adding a squared term for distress to model 1.[5] The squared term for psychological distress is not significant in the total sample, nor is it significant for the subsample of women. For men, however, the squared term is significant, revealing that the relationship is curvilinear: Moderate amounts of psychological distress are associated with lower mortality risk, but as psychological distress reaches higher levels, it raises mortality risk for men (resulting in a shallow U-shaped curve). Supplementary analyses (not shown) revealed that the inflection in the relationship for men began midway in the scale, but that it was the fairly high levels of distress that were most influential upon mortality risk. Recall that the index of psychological distress ranges from 3 to 18. Closer inspection revealed that all-cause mortality risk actually fell for index values 3−10, remained relatively low for index values 11−14, and rose appreciably for men with index values 15−18. Most of the effects of the remaining variables are similar to those observed in model 1. There is no evidence from Table 2 that women are more vulnerable to all-cause mortality risk due to psychological distress.

In the next stage of the analysis, we estimated models that examine the three main causes of death in the United States. Table 3 shows the results of proportional hazards models of deaths due to ischemic heart disease (IHD), cancer, and stroke. A squared term for psychological distress is included in each model based on the findings from Table 2 and supplementary analyses comparing parallel models in the cause-specific analyses.

The results of Table 3 reveal a curvilinear relationship between psychological distress and deaths due to IHD for the total sample. Supplementary analyses (not shown) revealed that the nadir of the curve is at a value of 8, with both tails of the distribution having about double the

[5]Supplementary analyses also tested for a cubic term, but this variable was nonsignificant in all specifications.

mortality rate of IHD mortality. Ischemic heart disease deaths were more likely in the total sample for subjects with the following characteristics: white, male, older, lower levels of education, and poorer self-rated health. Deaths due to IHD were also more likely among persons who were on Medicaid or who lacked private health insurance. Smoking, obesity, and not regularly engaging in an exercise program raised the risk of IHD mortality in the total sample during the 20-year follow-up. As expected, heart problems, diabetes, and hypertension were associated with greater IHD mortality. Similar to all-cause mortality, chronic illness was associated with lower IHD mortality for the total sample.

The subsample analyses by gender reveal some distinctive relationships. Hazard rates for the main effect and squared terms for psychological distress are significantly different: For women, psychological distress is not related to heart disease mortality, but the curvilinear relationship is observed for men. Second, the effect of age is different for men and women. Although both are significant, the effect of age is actually stronger for women than for men. Rural men were more likely to die from IHD, but not so for rural women. The higher risk of divorce on IHD mortality was observed for women only.

The findings regarding psychological distress and cancer mortality are presented in columns four through six of Table 3. For the total sample, cancer mortality is higher for people with low levels of psychological distress, men, older people, and those with lower levels of education. Separated persons were much more likely than married persons to die from cancer. Cancer mortality was also more likely for smokers and people who were observed to have cancer at the baseline survey. As was the case with heart disease, chronic illness was associated with a lower likelihood of cancer mortality.

Turning to the gender-specific analyses, the effect of psychological distress on cancer mortality is significantly different. For women, a curvilinear relationship is observed between psychological distress and cancer mortality. Moderate levels of psychological distress are associated with lower cancer mortality risk, but high levels of distress raise the risk of cancer mortality for women (the nadir of the curve is about 13). For men, psychological distress is not related to cancer mortality. Note also that the effects of the health-related behaviors are different by gender. Smoking is associated with cancer mortality for men and women, but the effect is much stronger for men. Obesity is related to cancer mortality for women, but not for men, and the effect of regular exercise is distinct: It is associated with lower cancer mortality risk for men, but not for women. The effect of a prior cancer diagnosis on mortality was greater for men than for women.

The final cause of death examined was stroke. In the total sample analyses, there was no evidence that psychological distress was related to stroke mortality. Separate sample analyses were explored, but the number of men and women who died of stroke was relatively small (125 men, 74 women), and statistical power calculations revealed that there was insufficient power to proceed with the gender-specific analyses.

Supplementary cause-specific analyses (not shown) were performed to examine the possibility that there may be interactions between psychological distress and the various morbidity variables in shaping IHD and cancer mortality. (Parallel analyses for stroke were not conducted because no respondents reported the condition at the baseline interview.) There was no evidence from these additional analyses that psychological distress interacts with a disease in shaping mortality risk among men. The only instance of statistical interaction was for heightened cancer mortality risk among women who had been diagnosed with cancer and who also had high levels of psychological distress ($p < .05$).[6]

DISCUSSION

This study examined several research questions in an attempt to better understand the relationship between psychological distress and mortality for men and women. In light of our all-cause and cause-specific mortality models, both for the total sample and separately for men and for women, we believe findings from the National Health and Nutrition Examination Survey I and its mortality follow-up help to resolve some of the inconsistencies in previous research.

There are two main ways in which the conclusions of this study contribute to the literature. First, this study revealed evidence that psychological distress raises mortality risk under certain circumstances, but the relationship may not be linear. This conclusion was observed across causes of death and in gender-specific analyses. A curvilinear relationship was observed between psychological distress and IHD mortality for men and between psychological distress and cancer mortality for women. We believe that some of the confusion in the literature over whether psychological distress is related to mortality may well be because most of the studies that concluded that distress is not related to mortality risk examined a linear relationship only (e.g., Fredman et al. 1989; Singer et al. 1976; Thomas et al. 1992) or a binary classification of distress or depression (Rasul et al. 2004). We urge caution in concluding that *x* is not related to *y* without testing nonlinear relationships first. Binary classifications may be wholly appropriate, but there is now sufficient evidence to recommend testing more than one threshold for classifying cases (e.g., Roberts et al. 1990).

Moderate levels of distress were generally associated with lower mortality risk, but high levels of distress raised mortality risk under certain circumstances. Therefore, it may be best to think of the effects of psychological distress on health outcomes in terms of thresholds. Modest distress may simply reflect challenging or busy lives which, in turn, may be managed via problem-solving (Booth, Johnson, and Granger 1999; Selye 1974). The present research shows no adverse long-term effects on mortality due to modest levels of distress. High levels of distress, on the other hand, may represent a lack of control over one's life due to social or personal factors, thereby leading to negative consequences—in this case, premature mortality. From a sociological perspective, it is essential not simply to regard high levels of distress as a personal characteristic, but to recognize that such suffering is socially constructed (Macleod and Smith 2003).

It is clear from these data and previous research that women are more likely to experience distress, but modest amounts of distress do not exact a price on longevity. Persons who experience distress on an ongoing basis may have coping mechanisms in place to alleviate the strain. Moreover, a moderate amount of distress in one's life may be beneficial for an individual leading a healthy and productive life (Affleck and Tennen 1996; Booth et al. 1999; Selye 1974). Whatever the case, conclusions from the present research extend the logic and findings from Roberts et al. (1990), who also found that it is only the high or “marked” levels of distress that are influential upon premature mortality. It may be that persons who have suffered repeated or prolonged distress are beset by what may be considered a full psychiatric syndrome that compromises neuroendocrine and immune system functioning (Reiche, Nunes, and Morimoto 2004); this may be especially true for women who experience more cyclical fluctuations of estrogens and progesterone (Seeman 1997). Thus, it is not surprising that studies that examine only a linear relationship between psychological distress and mortality have yielded inconsistent results.

[6]To determine whether the results were similar across the 20-year duration of the study, parallel analyses were completed (not shown) in which alternative duration periods were specified (e.g., 10 years, 15 years). Conclusions from those analyses were very similar to those presented herein.

Another way in which this study contributes to the literature is that it demonstrates the importance of examining cause-specific mortality when studying the relationship between psychological distress and mortality. Although most of the previous research examined all-cause mortality, the results of the present investigation show the importance of separating causes of death. When IHD deaths were considered, men were more vulnerable to the effects of high levels of psychological distress; for women, psychological distress was not related to heart disease mortality. These results differ from those of Mendes de Leon et al. (1998), who studied older adults only in New Haven, Connecticut, and found that psychological distress increased the likelihood of heart disease deaths among women, but not among men. The present study examined a much wider age range of adults in a national sample and found that men were more vulnerable to the effect of psychological distress on heart disease mortality.

The importance of conducting cause-specific analyses is further substantiated by examining cancer deaths. The analyses reveal that high levels of psychological distress increased the likelihood of cancer deaths among women, but that psychological distress was not related to cancer deaths among men. Relatively little research has examined cancer mortality, but Shekelle et al. (1981) reported that psychological distress raised the risk of cancer mortality among men 40 to 55 years of age who were employees of Western Electric Company's Hawthorne Works near Chicago. Although that study examined middle-aged men working in a single plant only, results from this national sample of adults point to the importance of women being vulnerable to cancer mortality when faced with high levels of psychological distress. It is important to note that this finding emerged independent of one's smoking status and that a higher percentage of men actually died of cancer during the period of observation. Nevertheless, these results show that women with high levels of psychological distress are vulnerable to cancer mortality, perhaps because high levels of distress may interrupt the immune system's ability to prevent the establishment and spread of neoplasms. Some research shows that distress leads to repeated activation of the hypothalamic-pituitary-adrenal axis, thereby compromising immune response and increasing the likelihood of some types of cancer (Reiche et al. 2004).

Although we cannot isolate a precise etiologic mechanism from these data, we believe that this finding on cancer deaths among women merits attention. It should also be noted that although this study is prospective— deaths are observed—caution is still warranted when offering conclusions regarding cause and effect. For instance, it is possible that psychological distress may delay the recognition of cancer symptoms. We also found evidence of an interaction between high levels of psychological distress and a diagnosis of cancer, raising cancer mortality risk. Thus, in addition to distress delaying the detection of cancer, it is also possible that distress may accelerate mortality risk among those who know they have cancer. Sorting out the processes may be difficult, but we identify two potential processes that merit attention in future research: delayed disease recognition and distress-accelerated risk. The current analysis controls for a wide array of risk factors for cancer mortality, but it is also possible that unmeasured variables are the true causal agents. A stronger limitation is probably that the present study is limited to studying cancer mortality as a whole. Cancer is actually a set of diseases, but there was insufficient statistical power to examine variability in the site of neoplasms. Future research is needed to test the relationship between psychological distress and cancer by site or type.

It is also possible that part of the inconsistency in conclusions from previous research stems from divergent measures of psychological distress and the measurement error associated with each scale (Phillips and Smith 1991). Some studies use indicators of psychological distress and anxiety (Somervell et al. 1989), while others use depressive disorders (Bruce and Leaf 1989) or depressive symptoms (Everson-Rose et al. 2004). The present study is unable to definitively resolve this issue, but the literature and some supplementary analyses suggest that

the relationships between distress and mortality may be distinct from those between depressive symptoms and mortality, and there may be distinct etiologic pathways (Wulsin, Vaillant, and Wells 1999). An examination of nonlinear relationships and cause-specific analyses may provide the key to resolving the inconsistency. The findings presented herein apply to the relationship between psychological distress and mortality. Also, although the index of distress contained only three indicators, it nonetheless offers at least partial support to the conclusions of several previous studies (Fuhrer et al. 1999; Shekelle et al. 1981).

This study was also limited in its ability to study other causes of death. Stroke mortality was examined, but there was insufficient statistical power to do so by gender. Despite its many advantages, the NHEFS is also very limited in terms of the role that social relations may play in shaping mortality risk. Unfortunately, no measure of social support is available for this analysis. We found important differences due to marital status in these data: Separated and divorced persons, especially women, fared much worse. This was particularly noticeable for cancer mortality, where separated women were five times as likely as married women to die from cancer; and separated men were three times as likely to die from cancer as were married men. Divorced women were more than twice as likely as married women to die from IHD. The health effects of marital separation and divorce speak to the power of damaged social relations, but we are unable to determine precisely what it is about separation/divorce that elevates the risk of mortality. More generally, we welcome future research to help determine whether social support can reduce the effect of high levels of distress on men's and women's mortality.

Answering the vulnerability question requires sensitivity to the outcome considered. Although we hypothesized that women, because of their accumulated disadvantages, would have higher mortality risk due to distress, there is no omnibus conclusion that women are more vulnerable to mortality due to psychological distress. As Pearlin (1999) noted, people exposed to the same stressors are not always affected in the same manner. Indeed, Elder and Liker (1982) showed that the effect of the Great Depression on women's emotional well-being was shaped by social class; economic loss adversely affected working-class women but was benign for middle-class women.

Results from the NHEFS show that men are more vulnerable to the effect of psychological distress on heart disease mortality, while women are more vulnerable to its effect on cancer mortality. Women's accumulated social disadvantages are well documented and clearly translate into health risks, here identified as higher cancer mortality risk. At the same time, men face accumulated disadvantages that place them at risk of heart disease mortality, perhaps due to occupational pressures and the “hurry syndrome” (Sapolsky 1994). Whatever the case, each sex is vulnerable to high levels of distress.

These findings may also be helpful for tempering and extending cumulative disadvantage theory. Although cumulative disadvantage theory gives explicit consideration to the likelihood of inexorable effects due to risk factors, we believe more attention should be focused on differential consequences given social structure, resources, and human agency. A disadvantage may “scar” one person but lead to “acquired immunity” for another (Preston, Hill, and Drevenstedt 1998). Part of the reason for the different outcomes may be variability in the risk factor per se. Adverse events or experiences vary considerably in intensity. As shown here, modest distress did not increase mortality risk, but high levels of distress did. Cumulative disadvantage theory, therefore, may profit from quantification of the intensity of the experience and greater articulation of the meaning of the disadvantage. How intense was the experience? What efforts have been made to cope? What resources were mobilized? Each of these questions is important to consider before concluding that early disadvantages are inexorable in their effects.

It is also clear from these data that women are more likely to experience psychological distress. Despite differences in the prevalence of distress, the consequences of distress vary for men and women. Thus, we will need additional research examining cause-specific mortality to understand how distress leads to negative health outcomes. Although many early studies advanced the idea that elevated mortality risk was largely due to higher rates of suicides associated with distress, that conclusion was likely due to the practice of studying clinical samples. Evidence is emerging from population-based studies showing that high levels of psychological distress are implicated in heart disease and cancer mortality. Men and women are at risk for premature mortality due to high levels of psychological distress, but the life course pathway of accumulating disadvantage is distinct: Men are at risk of heart disease mortality when psychological distress is high; women are at risk of cancer mortality in the face of high psychological distress.

Biography

Kenneth F. Ferraro is Professor of Sociology and Director of the Center on Aging and the Life Course at Purdue University. His recent research focuses on cumulative disadvantage and health, especially between white and African Americans. Recent works appear in the American Sociological Review, Journal of Gerontology: Social Sciences, Social Forces, and *Social Science and Medicine*.

Tariqah A. Nuriddin is a former Minority Fellow of the American Sociological Association (2002−2005) and is currently a doctoral candidate in sociology with a graduate minor in gerontology. Her research interests include distress and physical health with a focus on the impact of widowhood on health and well-being.

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TABLE 1

Descriptive Statistics for Mortality Analysis of the National Health and Nutrition Examination Survey I: Epidemiologic Follow-Up Study[a]

Variables	Range	Total (n = 6,767)	Women (n= 3,704)	Men (n = 3,129)
Psychological distress	3–18	7.41 (3.27)	7.84 (3.37)	6.92 (3.07)***
Black	0–1	.13	.13	.12
Female	0–1	.54	—	—
Age	24–77	48.53 (14.23)	48.00 (14.28)	49.16 (14.17)***
Education	0–7	3.68 (1.58)	3.68 (1.46)	3.68 (1.71)
Income	1–12	7.64 (2.80)	7.46 (2.83)	7.86 (2.65)***
Rural	0–1	.39	.40	.39
Marital status[a]				
Married	0–1	.77	.71	.84***
Widowed	0–1	.09	.14	.03***
Separated	0–1	.03	.03	.02*
Divorced	0–1	.05	.06	.04***
Never married	0–1	.06	.06	.07*
Self-rated health	1–5	3.42 (1.16)	3.40 (1.15)	3.44 (1.18)
Medicaid	0–1	.04	.04	.03**
Private insurance	0–1	.84	.82	.86***
Smoker	0–1	.42	.33	.53***
Obese	0–1	.23	.29	.16***
Regular exercise	0–1	.92	.91	.93*
Heavy drinking	0–1	.11	.05	.19***
Heart problems	0–1	.07	.07	.08
Diabetes	0–1	.05	.05	.05
Cancer	0–1	.03	.03	.02***
Hypertension	0–1	.24	.27	.20***
Chronic illness	0–3	.29 (.50)	.34 (.52)	.23 (.46)***
Deceased by wave 4	0–1	.29	.23	.35***
Cause-specific mortality				
Ischemic heart disease death	0–1	.10	.07	.14***
Cancer death	0–1	.10	.07	.12***
Stroke death	0–1	.03	.02	.04*

Notes: The n of cases varies due to missing data. Tests of significance are for differences by gender: *t*-test for continuous variables; χ^2 for binary variables. Figures given in Total, Women, and Men columns are means, with standard deviations in parentheses. The mean of a binary variable represents the percent of cases with that attribute. Standard deviations are omitted for binary variables.

* $p = .05$

** $p = .01$

*** $p = .001$

[a]The reference category for marital status in all tables is married.

TABLE 2

Adjusted Hazard Ratios from Proportional Hazards Models of All-Cause Mortality by Gender from the National Health and Nutrition Examination Survey I: Epidemiologic Follow-Up Study

Independent Variables	Model 1			Model 2		
	Total (n = 6,459)	Women (n = 3,465)	Men (n = 2,994)	Total (n = 6,459)	Women (n = 3,465)	Men (n = 2,994)
Psychological distress	.96***a	.95***	.97***	.90*	.91*	.85**b
Psychological distress^2	—	—	—	1.00	1.00	1.01*b
Black	1.00	.97	1.06	.99	.96	1.04
Female	.58***	—	—	.58***	—	—
Age	1.09***	1.10***	1.09***	1.09***	1.10***	1.09***
Education	.95	.96	.94*	.95	.96	.94*
Income	.98*	1.00	.97	.98*	1.00	.98
Rural	1.52*	1.47	1.66***	1.52*	1.48	1.68***
Widowed	1.19	1.21	.94	1.19	1.21	.94
Separated	1.97***	2.40***	2.09***	1.98***	2.39***	2.09***
Divorced	1.22	1.15	1.30	1.21	1.14	1.31
Never married	1.45***	1.40*	1.49	1.45**	1.40*	1.48
Self-rated health	.89***	.87*	.89***	.89***	.87**	.88***
Medicaid	1.12	1.48*	.95*b*	1.11	1.48***	.93*b*
Private insurance	.77**	.85*	.71***	.77***	.85*	.70***
Smoker	1.76***	1.84***	1.73***	1.76***	1.84***	1.73***
Obese	1.15**	1.08	1.30*	1.15**	1.08	1.31*
Regular exercise	.70***	.74***	.64***b	.70**	.75	.66***
Heavy drinking	1.27**	1.01	1.34***	1.27**	1.01	1.34***
Heart problems	1.48***	1.28	1.77***	1.48***	1.28	1.76***
Diabetes	1.53***	1.61*	1.57***	1.54***	1.62*	1.59***
Cancer	1.61***	1.45*	2.02***	1.64***	1.47*	2.06***
Hypertension	1.26***	1.31***	1.19**	1.27***	1.31***	1.21**
Chronic illness	.87**	.85***	.88	.87**	.85**	.89
df	22	21	21	23	22	22

Independent Variables	Model 1			Model 2		
	Total (n = 6,459)	Women (n = 3,465)	Men (n = 2,994)	Total (n = 6,459)	Women (n = 3,465)	Men (n = 2,994)
Wald chi-square	6293.73	3710.13	4054.29	6471.64	3693.69	4169.36

*$p = .05$

**$p = .01$

***$p = .001$

[a]Hazard ratio.

[b]Coefficients for men and women are significantly different in parallel models ($p = .05$).

TABLE 3

Adjusted Hazard Ratios from Proportional Hazards Models of Cause-Specific Mortality by Gender from the National Health and Nutrition Examination Survey I: Epidemiologic Follow-Up Study

	Ischemic Heart Disease			Cancer			Stroke
	Total (n = 5,150)	Women (n = 2,906)	Men (n = 2,244)	Total (n = 5,096)	Women (n = 2,905)	Men (n = 2,191)	Total (n = 4,761)
Psychological distress	.88**[a]	.97	.77***[b]	.80*	.70**	.87[b]	.88
Psychological distress[2]	1.01*	1.00	1.01**[b]	1.01	1.01**	1.00[b]	1.01
Black	.43***	.48**	.42**	1.05	.93	1.23	1.81**
Female	.38***	—	—	.61***	—	—	.64**
Age	1.12***	1.14***	1.11***[b]	1.10***	1.09***	1.12***	1.17***
Education	.91**	.94	.92*	.92**	.96	.92*	.97
Income	1.00	1.00	1.00	.97	.98	.96	.97
Rural	1.88	1.61	1.86*[b]	1.32	1.48	1.29***	—[c]
Widowed	1.32	1.44	.67	.89	1.01	.68	1.20
Separated	1.51	1.73	1.24	3.73***	5.03***	2.70**	1.47
Divorced	1.39	2.29*	.93[b]	1.06	1.09	.95	1.03
Never married	1.23	.94	1.34	.85	.61	1.08	2.07
Self-rated health	.82***	.81*	.79***	.90	.84	.99	.92
Medicaid	1.50*	1.90*	1.21	.79	1.35	.71	.54
Private insurance	.67***	.73*	.58***	.95	1.32	.79	.81
Smoker	1.84***	2.40***	1.69*	2.07***	1.63***	2.40***[b]	1.71**
Obese	1.34*	1.23	1.70***	1.20	1.47*	1.08[b]	.59*
Regular exercise	.53***	.52**	.56***	.83	1.49	.51***[b]	.76
Heavy drinking	1.10	.76	1.18	1.16	.89	1.38*	1.07
Heart problems	2.08***	1.86	2.61***	1.26	.98	1.83**	2.26***
Diabetes	1.66***	2.16***	1.49***	1.01	.89	1.19	2.03*
Cancer	1.26	.98	1.48	3.27***	2.85***	4.28***[b]	3.12*
Hypertension	1.63***	1.58*	1.54***	.96	1.11	.83	1.31**
Chronic illness	.86*	.90	.81	.83*	.86	.88	.60**
df	23	22	22	23	22	22	22

	Ischemic Heart Disease			Cancer			Stroke
	Total (n = 5,150)	**Women (n = 2,906)**	**Men (n = 2,244)**	**Total (n = 5,096)**	**Women (n = 2,905)**	**Men (n = 2,191)**	**Total (n = 4,761)**
Wald chi-square	6307.75	2659.61	4720.63	2287.02	1191.70	1878.64	12834.70

* $p = .05$

** $p = .01$

*** $p = .001$

[a] Hazard ratio.

[b] Coefficients for men and women are significantly different in parallel models ($p = .05$).

[c] Zero restriction; insufficient number of cases to reliably estimate parameter.