Effect of Financial Strain on Mortality in Community-Dwelling Older Women

Sarah L. Szanton, Jerilyn K. Allen, Roland J. Thorpe, Jr., Teresa Seeman, Karen Bandeen-Roche, and Linda P. Fried

Objectives. Although it is well established that low socioeconomic status is related to mortality, little research has focused on whether financial strain predicts mortality. Still less research has examined this question by race, despite the evidence that African Americans suffer earlier mortality and more financial strain at the same levels of socioeconomic status than their Caucasian counterparts. We examined the extent to which financial strain was associated with increased mortality risk in older women and whether the relationship differed by race.

Methods. The sample was the Women’s Health and Aging Studies I and II of community-dwelling older women aged 70 to 79. We used Cox proportional hazards models to estimate the effect of financial strain on 5-year mortality rates.

Results. Women who reported financial strain were almost 60% more likely to die within 5 years independent of race, age, education, absolute income, health insurance status, and comorbidities (p < .01). Although race was not a predictor of mortality, the association between financial strain and mortality was stronger for African Americans than for Caucasians (p < .01).

Discussion. For older women, financial strain may be a better predictor of mortality than annual income, particularly in the case of older African American women.

Key Words: Financial strain—Mortality—Health disparities—Race.
have wide variation in the financial strain they experience. The distinction between income and financial strain could be especially relevant in older adults, who tend to have a truncated income range.

Assessing the subjective measure of financial strain is methodologically challenging because the same income and expenses might be perceived as a financial strain by one person and plentiful by another. However, these perceptions can drive important aspects of the hypothesized relationship between financial strain and mortality, including decreased social activity, physical activity, and health care utilization, among other factors (Kahn & Pearlin, 2006).

Important work has already shown that those reporting financial strain have poorer self-rated health (Kahn & Pearlin, 2006), earlier disability (Matthews, Smith, Hancock, Jagger, & Spiers, 2005), increased psychological distress (Angel, Frisco, Angel, & Chiriboga, 2003; Ferraro & Su, 1999), and more chronic conditions (Kahn & Pearlin, 2006). However, few studies of older adults have investigated the relationship between financial strain and mortality itself. Blazer, Sachs-Ericsson, and Hybels (2005) found that an index of unmet needs, including financial strain, predicted mortality. Lantz and colleagues (2005) found that a financial stress index predicted mortality, but not independent of income. Krause (2006) found that providing church-based social support decreased the strength of the relationship between financial strain and mortality. However, this study did not assess financial strain independent of actual income, nor did it examine mortality independent of chronic diseases and health insurance status. The current study extends this line of inquiry by asking whether financial strain is associated with an increased likelihood of mortality independent of actual income, diagnosed health conditions, and health insurance status.

Not only is there limited research on financial strain and mortality, but there is even less on how race might affect this relationship. Blazer and colleagues (2005) found no racial difference in the mortality risk of those reporting unmet needs, and Krause (2006) and Lantz and colleagues (2005) included race in their models but did not test for interaction effects by race. There are at least three reasons why it is important to focus on race as well as financial strain. First, despite nationwide research attention, African Americans have an earlier onset of chronic disease (Hummer et al., 2004), experience worse health in middle age (Farmer & Ferraro, 2005), and die at an earlier age (Hummer et al., 2004) than do Caucasians. For example, using U.S. Vital Statistics and Census data, Hummer and colleagues showed that mortality rates in African Americans are 30% to 50% higher than in Caucasians at ages 65 to 79. Second, African American adults accumulate a lifetime of social and health insults (Ferraro & Farmer, 1996; Kuh & Ben-Shlomo, 2004) that may make their health more vulnerable to financial strain as older adults. Third, research that has explicitly examined both race and SES in older adults has found significant interactions between race and education as well as race and employment status on health effects (Farmer & Ferraro, 2005). For instance, Farmer and Ferraro found that as educational levels increased, African Americans did not experience the same improvements in self-rated health as Caucasians. In summary, because of the confounding of race and SES in studies (LaVeist, 2005; Laveist, Thorpe, Mance, & Jackson, 2007), and because of the differential effects of education by race, it is important to examine racial interactions whenever possible in health disparities research (Kawachi, Daniels, & Robinson, 2005).

Therefore, the primary objective of the current research was to examine whether financial strain predicts 5-year all-cause mortality in a population of community-dwelling older women independent of actual income, diagnosed health conditions, and insurance status. A second objective was to use the interaction approach to determine whether the relationship between financial strain and mortality differs for African American and Caucasian women.

**METHODS**

**Study Population and Measures**

Data for this longitudinal analysis came from the Women’s Health and Aging Studies (WHAS) I and II, which focused primarily on the causes and course of disability. WHAS I and II are two prospective, population-based cohort studies that recruited community-dwelling older women who were complementary with respect to physical function status. The participants in WHAS I and II were randomly selected from one Medicare sampling frame using 12 zip codes of Eastern Baltimore City and County. Women were eligible for WHAS I if they were 65 or older, had difficulty in two or more areas of physical functioning (thus representing the one-third most disabled older women in the community), and had a Mini-Mental State Examination score of at least 18. Women were eligible for WHAS II if they were between 70 and 79 years of age, had difficulty in no or only one area of physical functioning (thus drawn from among the two thirds who were least disabled), and had a score of at least 24 on the Mini-Mental State Examination. Both studies have been described elsewhere (Fried, Bandeen-Roche, Chaves, & Johnson, 2000; Guralnik, Fried, Simonsick, Kasper, & Lafferty, 1995). Baseline assessments were performed in 1992–1995 in WHAS I and 1994–1996 in WHAS II. Women were eligible for inclusion in the combined sample for the current analyses if they were between the ages of 70 and 79 with a score of at least 24 on the Mini-Mental State Examination. The sample size for the current analysis was 728. The Johns Hopkins Medical Institutions Review Board approved the research protocols. Each participant provided written informed consent.

**Sampling weights.**—We weighted data in all analyses to account for the sampling design and to correct for nonresponse. We calculated weights, as described in Guralnik and colleagues (1995), for each participant based on the probability of selection into the study. These probabilities varied based on age, race, and disability status. We then used the sampling weights to refer back to the entire population of community-dwelling women.

**Financial strain.**—We measured financial strain by using an ordinal response to the following question: “At the end of the month, do you have some money left over, just enough, or not enough?” This measure of resource adequacy was originally used by Pearlman, Lieberman, Menaghan, and Mullan (1981) and...
was later adopted by two population-based studies: the Americans' Changing Lives Study (House et al., 1994) and the Established Populations for the Epidemiologic Studies of the Elderly (Cornoni-Huntley et al., 1993). This construct of adequacy of income measures the balance between resources and need. We should note that there is a subset of individuals who may answer that they have enough money when, by an objective measure, they do not. Conversely, there is also a subset of individuals who will answer that they do not have enough money when, by objective measures, they do. Therefore, because of the subjectivity in the answers given, this question is an indicator of financial strain rather than of actual adequacy of resources.

Mortality.—Vital status was acquired through interviewing designated proxies, searching obituaries, and matching the National Death Index in a 5-year period. We obtained death certificates for 111 of the 117 deaths and recorded date of death for each death.

Covariates.—In the multivariable analyses, we controlled for race, age, education, household income, investment income, chronic disease, and insurance status, as these are related to both mortality and financial strain. We coded race as African American or Caucasian. We measured age in years and restricted it to 70 to 79 at baseline (the age range that both WHAS studies had in common). We measured income as dollars per year and log-transformed it because of its non-normal distribution. We recorded investment income as the dichotomous answer to the question “Do you have investment income?” We measured education in years completed. We determined chronic disease number at baseline and measured it as a continuous variable. We measured insurance status as Medicare Part A only (uninsured except for hospitalization), Medicare plus Medicaid, or Medicare plus private health insurance.

Analysis
We compared descriptive statistics for participants based on financial strain category. Because the strain measure consisted of three ordered categories (more than enough money, just enough, and not enough), we used a weighted ordinal logistic regression model to evaluate differences across adequacy categories (see Table 1). To accomplish our first objective, we fitted a univariable Cox proportional hazards model to examine the risk of mortality with each unit increase in financial strain. We then used multivariable Cox proportional hazards models to estimate the risk of mortality over the 5 years of follow-up (see Table 2). We created interaction terms for Financial Strain × Race, Educational Attainment × Race, and Education × Financial Strain. Assumptions of proportionality were met when evaluated using complementary log-log hazard curves and visual inspection. As a sensitivity analysis, we modeled financial strain as a nominal variable, which resulted in similar results and provided a positive global test of significance. We report survival analysis results as conditional hazard ratios (HRs) with 95% confidence intervals (CIs). We used the sampling weights described above in each model discussed below. We computed variance estimates by direct correction to the variance matrix of the estimators. We performed all analyses using Stata version 9.0 (College Station, TX).

RESULTS
Table 1 displayed the baseline characteristics of the 728 participants, categorized by financial strain. In all, 76% of the women were Caucasian, and 23% had an eighth-grade education or less. At baseline, 66% responded that they had more than enough income, 29% had just enough, and 5% had not enough each month. Financial strain differed across the races, with Caucasian women more likely to report that they had more than enough money at the end of the month (71%). A substantial portion of Caucasian women had just enough (24%), and few reported not enough income (5%). In contrast, almost equal proportions of the African American participants had more than enough and just enough money (46% and 43%, respectively), and 11% reported not enough income. At baseline, 76% of the participants had commercial insurance plus Medicare, 13% had Medicaid plus Medicare, and 11% had Medicare hospitalization coverage only.

We then addressed the first objective of our study by asking the following question: Was financial strain associated with increased mortality risk over 5 years? There were 117 deaths in the 5-year follow-up period. According to univariable Cox analysis, for each unit increase in financial strain, participants...
Table 2. Crude and Adjusted Cox Proportional Hazards Models for the Relation Between an Increase in Financial Strain and Mortality Among Participants in the Women’s Health and Aging Studies I and II (N = 728)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 HR (95% CI)</th>
<th>Model 2 HR (95% CI)</th>
<th>Model 3 HR (95% CI)</th>
<th>Model 4 HR (95% CI)</th>
<th>Model 5 HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial strain</td>
<td>1.57 (1.19, 2.06)</td>
<td>1.67 (1.25, 2.23)</td>
<td>1.59 (1.16, 2.16)</td>
<td>1.21 (0.83, 1.74)</td>
<td>1.21 (0.83, 1.75)</td>
</tr>
<tr>
<td>Income</td>
<td>1.17 (0.94, 1.54)</td>
<td>1.09 (0.98, 1.21)</td>
<td>1.14 (0.95, 1.37)</td>
<td>0.85 (0.71, 1.03)</td>
<td>0.85 (0.71, 1.03)</td>
</tr>
</tbody>
</table>

Other demographics and health

- Age
  - 1.06 (0.99, 1.13)
  - 1.05 (0.98, 1.12)

- Race
  - 0.75 (0.67, 0.86)
  - 0.29 (0.12, 0.71)

- Years of education
  - 1.02 (0.96, 1.09)
  - 0.96 (0.90, 1.03)

- Insurance status
  - 1.34 (1.02, 1.77)
  - 1.34 (1.00, 1.78)

- Count of comorbidities
  - 1.15 (1.00, 1.31)
  - 1.15 (1.00, 1.31)

- Financial Strain × Race
  - 2.67 (1.36, 5.21)
  - 2.67 (1.36, 5.21)

- Wealth
  - 0.78 (0.48, 1.26)


- An ordinal measure of more than enough, just enough, or not enough money to cover expenses each month.
- Logarithm of household income.
- Baseline age of 70 to 79.
- Odds ratio for Black versus White.
- Medicare hospitalization coverage only (reference) compared to Medicaid/Medicare compared to Medicare plus outpatient coverage.
- No investment income compared to some investment income.

Discussion

This study’s primary finding, that older women reporting financial strain were more likely to die within 5 years (HR = 1.57, 95% CI = 1.19, 2.06). Adding a logarithm of continuous income into the model increased the strength of financial strain’s mortality prediction to an HR of 1.67 (95% CI = 1.25, 2.23). Log income itself was not predictive of mortality in any model. Neither years of education nor race predicted mortality.

In addressing our second objective, we found that although African American race did not predict mortality in this sample, race moderated the effect of financial strain on mortality. Perception of financial strain predicted mortality more robustly for African Americans. The interaction between race and financial strain had an HR of 2.67, indicating that the main effect of financial strain on mortality was no longer significant for Caucasians. The HR for African American women alone, upon stratification, was 3.54 (95% CI = 1.95, 6.43). None of the other interactions were significant.

Originated from different parts of the country and therefore might reflect differences in financial strain as a result of differences in housing, food, and transportation costs. The Duke Established Populations for the Epidemiologic Studies of the Elderly is based in North Carolina and includes a substantial rural population (Cornoni-Huntley et al., 1993), whereas the current study drew participants from urban and suburban Baltimore. The results support the approach of testing for possible health effects of financial strain by race. This difference in financial strain on mortality by race has at least four plausible explanations. First, for each category of financial strain, African Americans had a lower income than Caucasians, so there was likely more strain experienced by African Americans in each category. Second, the difference in wealth across race in this country is significant (Orzechowski & Sepielli, 2003) and was not measured in this study. In other words, a Caucasian participant of a particular income who answered “just enough” on the adequacy instrument was likely to have 5 to 10 times the wealth (e.g., in terms of home ownership or retirement accounts) of a African American participant with the same income and a “just enough” response. Thus, the ability to afford, for example, increases in the price of items such as medical prescriptions would be differentially robust for the Caucasian and African American participants. A third credible explanation is that neighborhood effects are confounding the data. Due to residential segregation, Caucasians and African Americans of similar income tend to live in dissimilar neighborhoods with different levels of housing quality, access to services, and resources. For example, in Baltimore City and in much of Baltimore County, 74% of Caucasians would have to move in order for African Americans and Caucasians to be evenly dispersed throughout the area (Iceland, Weinberg, & Steinmetz, 2002). Because race and neighborhood may be related to both the outcome and the predictor, our results may be confounded by neighborhood effects on mortality. Fourth, the life course effects of accumulated disadvantages on health.
and mortality in African Americans are well documented (Farmer & Ferraro, 2005; Ferraro & Farmer, 1996; Ferraro, Farmer, & Wybraniec, 1997; Kuh & Ben-Shlomo, 2004). Thus, at the same level of need, African American older adults are likely to have more accumulated physiologic damage that may not have been measured in the adjudicated disease measure.

A limitation that we should note here is the fact that the financial strain question asked in this study did not measure wealth. Because older adults generally have a limited income, wealth (opposed to income) is a crucial resource measure. The present study assessed investment income but not home ownership or other assets that are potentially, but not currently, liquid. Also, the “income inadequate” group contained only 44 older women. The members of this group, in addition to being considerably more likely to die within 5 years, were also more likely to have fewer years of education and less income and were more likely to be African American. Although our analyses controlled for these potential confounding factors, it is possible that there was residual confounding occurring here as a result of other unmeasured factors, such as the lesser quality of the education received by some women (Manly, 2006).

In summary, these data suggest that for older women, financial strain may be a better predictor of mortality than annual income, particularly for older African American women. Future research could use financial strain as an additional measure of financial resources in older women. Studying financial strain in older adults may be a more precise way of observing SES because it probes the issue of adequacy. Furthermore, addressing the imbalance between need and resource in older adults may be a more practical intervention target (e.g., in the form of prescription co-pay supports or increases in food stamps) than increasing actual monetary supports.

ACKNOWLEDGMENTS

This work was supported by National Institutes of Health Grants 1F31NR009470-01, 1-T32 NR07968-01, R01 AG11703, and IR37AG1990502; the John A. Hartford Foundation Building Academic Geriatric Nursing Capacity Scholars Program; and the Johns Hopkins Older Americans Independence Center (1P50AG021334-01).

S. L. Szanton planned the study, analyzed the data, and contributed to writing and revising the paper. J. K. Allen contributed to writing and revising the paper. R. J. Thorpe contributed to conceptualizing the paper as well as revising it. T. Seeman contributed to revising the paper. K. Bandeen-Roche consulted on data analysis. L. P. Fried contributed to conceptualizing and writing the paper.

We have no financial relationships to disclose.

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Received August 30, 2007
Accepted July 23, 2008
Decision Editor: Neal M. Krause, PhD

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