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Financial strain, negative social interaction, and self-rated health: evidence from two United States nationwide longitudinal surveys

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ABSTRACT
Three hypotheses concerning negative social interaction in later life were evaluated in this study. First, it was predicted that greater personal economic difficulty is associated with more frequent negative social interaction with social network members in general. Secondly, it was proposed that more frequent negative social interaction exacerbates the undesirable effect of personal financial strain on change in self-rated health during late life. Thirdly, an effort was made to see if some types of negative social interaction, but not others, accentuate the undesirable effects of personal economic problems on self-rated health. Data from two nationwide longitudinal surveys that were conducted in the United States revealed that greater personal financial difficulty is associated with more interpersonal conflict. The findings further indicate that the undesirable effects of personal economic difficulty on change in self-rated health are more pronounced at progressively higher levels of negative social interaction. Finally, the data suggest that one form of negative social interaction (not getting help when it is expected) is more likely to intensify the unwanted effects of personal financial strain on self-rated health than other types of negative social interaction.

KEY WORDS – financial strain, negative social interaction, health.

Introduction

Financial strain is among the most frequently investigated stressful experiences in social gerontology. A number of researchers report that exposure to relentless economic problems exerts a deleterious effect on a wide range of health-related outcomes, including self-rated health and physical functioning (Kahn and Fazio 2005), blood pressure (Steptoe,

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Brydon and Kunz-Ebrecht 2005), depressive symptoms (Mendes de Leon, Rapp and Kasl 1994), and life satisfaction (Krause 2005). Moreover, a significant relationship between financial strain and health-related outcomes has been observed in many racial and ethnic groups in the United States, such as older Whites (Krause 2005), older African-Americans (Lincoln, Chatters and Taylor 2005), and older Mexican-Americans (Angel *et al.* 2003), and also among older people in Hong Kong (Boey and Chiu 2005). In addition, as Ferraro and Su (1999) report, financial strain is associated with greater psychological distress among older adults residing in Fiji, the Republic of Korea, Malaysia, and the Philippines. Because this stressor has such widespread effects, it is imperative that researchers learn more about it.

Even though the relationship between financial strain and health is now well established, there is less consensus about how the noxious effects of relentless economic problems arise. Researchers have identified several potentially important mechanisms, including negative emotions (Krause 1995), elevated stress hormones (*e.g.* cortisol; see Steptoe, Brydon and Kunz-Ebrecht 2005) and undesirable health behaviours, such as increased alcohol use (Peirce, Frone and Cooper 1996). It is especially important for the purposes of our study to point out that social relationships may also be involved. More specifically, research by Krause and Jay (1991) suggested that older adults who experience chronic financial strain tend to encounter more negative social interaction with their social network members than do older people who have not been exposed to relentless personal economic problems. This association is important because a number of studies reveal that negative social interaction also has adverse effects on health and well-being in late life (Newsom *et al.* 2003, 2005; Rook 1984, 2001; Sorkin and Rook 2006).

The purpose of the present study is to examine the relationships between financial strain, negative social interaction, and self-reported health in late life. In the process, we aim to contribute to the literature in three potentially important ways. First, as noted above, research suggests that financial strain may foster negative social interaction with social network members. This issue is typically evaluated by regressing negative social interaction on financial strain and select control variables. However, these analyses do not go far enough because there is an additional way to specify the relationship between these constructs that highlights a subtle, but frequently overlooked, aspect of the stress process. As Wheaton (1994) insightfully pointed out, stressors do not arise or operate in isolation from other challenging events. Instead, one stressor may give rise to another, and the cascading impact of these causally linked events may be especially likely to put a person at risk for developing physical or mental health

problems. Cast within the context of the present study, this means that financial strain and negative social interaction may jointly affect the self-rated health of older people in ways that neither stressor could do on its own. This suggests that the interaction between financial strain and interpersonal conflict may have a significant effect on perceived health in late life. We have been unable to find any studies that empirically evaluate this perspective. The goal of the present study is to do so.

Secondly, research on the measurement of negative social interaction has not kept pace with that on other kinds of social relationships, such as social support. More specifically, researchers have known for some time that social support is a complex, multi-dimensional construct and comprises several different ways in which people help each other, as captured in Barrera's (1986) well-known distinctions between emotional support, tangible help, and informational assistance. Recently, Newsom and his colleagues demonstrated as well that there are qualitatively different kinds of *negative* social interaction (Newsom *et al.* 2005). To the extent that this is the case, exploring the relationship between financial strain and distinct types of negative social interaction on self-rated health may help identify the precise aspects of negative encounters that place older people at risk. Based on this rationale, we examine the effects of financial strain and four dimensions of negative social interaction on self-rated health. This appears to be the first time the relationship between financial strain and specific dimensions of negative social interaction has been evaluated in the literature.

Thirdly, we estimate the relationships between financial strain, negative social interaction, and perceived health with one data set, and then replicate them with another. This contribution directly addresses a major gap in social science research. In one of the last books he wrote, Hubert Blalock (1984) raised a series of basic questions about why the social sciences have not reached their full potential. One issue had to do with the replication of study findings. Blalock (1984) argued that everyone calls for replication, and most social scientists recognise the importance of doing so, but few investigators ever replicate their findings. The purpose of a replication is to demonstrate the robustness of study findings. Unrepresentative samples and random sampling error both contribute to uncertainty about estimates obtained from a single study. In addition, survey items only imperfectly measure the latent constructs they are thought to represent. Estimates may, therefore, vary if investigators use different indicators to assess the same latent construct. However, greater faith may be placed in a finding if it emerges from different studies using different samples and measures. To the best of our knowledge, the current study is the first to produce replicated results for the relationship between financial strain and self-rated health.

Financial strain, negative social interaction, and self-rated health

The theoretical underpinnings of this study were developed by examining the interface between financial strain and health, financial strain and negative social interaction, and negative social interaction and perceived health. Then the joint effects of financial strain and negative social interaction on self-rated health are briefly discussed. In the process, an effort is made to show why it is important to examine these relationships in samples of older adults.

Financial strain and self-rated health

There are a number of ways in which financial strain may contribute to physical health problems. Two were mentioned earlier – impaired immune functioning and undesirable health behaviours, but there may be other potentially important causal mechanisms. Although we do not evaluate each mechanism empirically, it is nevertheless important to identify them. Doing so provides a richer theoretical context for the work presented here and makes it easier to see why it is important to examine the relationship between financial strain and perceived health.

Some intriguing reasons for the hypothesis of a relationship between financial strain and health were provided by Holden and Smeeding (1990) in their widely cited studies on the economic problems of older people. These investigators pointed out that many economically-challenged elders live in fear of having insufficient funds to cover the costs of significant illness or assisted-living expenses, should the need arise. This suggests that older adults in economic difficulty may as a result be less optimistic and feel they are unable to control the unwanted things that happen in their lives. This is important because an extensive literature indicates that both pessimism (Peterson and Seligman 2004) and low feelings of personal control (Ross and Sastry 1999) are associated with poor health across the lifecourse.

There is no universal, state-funded health care system in the United States. One consequence is that financial strain may make it difficult to get good medical care when it is needed. Even many older people receive assistance with medical expenses through the Medicare and Medicaid programmes, research has revealed that they may, nevertheless, encounter significant health-care expenses. Moreover, this problem appears to be especially pronounced among the poor and near-poor (*i.e.* people with a household income not exceeding 125 per cent of the poverty level). More specifically, data provided by the Federal Interagency Forum on Aging Related Statistics (2004) revealed that out-of-pocket medical expenses for

people aged 65 years and older consumed 19 per cent of the household income of the poor and near-poor, and eight per cent of the household income among older people with more economic resources. Not having access to preventive medical care, or to medical assistance during illness, will clearly make it more difficult for older adults to avoid and recover from the physical health problems that confront them.

Financial strain and negative interaction

There are at least two ways in which financial strain creates negative social interaction in social networks. First, research by Krause (1987) revealed that financial problems may persist for long periods. This is important because, as Coyne, Wortman and Lehman (1988) convincingly argued, persistent problems may have an adverse effect on social network functioning. More specifically, these investigators maintained that significant others are often willing to help when a problem first emerges, but if a problem continues unabated they may feel overly burdened by the continuing need for assistance in the absence of improvement. When support providers feel burned out, Coyne and his associates argued, negative social interaction is likely to arise. Although this argument is compelling, there is another way to think about the relationship between financial strain and negative social interaction. It arises when the entire social network encounters economic difficulty. Social networks are typically homogeneous with respect to socio-economic status (McPherson, Smith-Lovin and Cook 2001), which suggests that if an older person is experiencing financial difficulty, there is a good chance the members of his or her social network also have economic problems. These common economic difficulties may have a profound effect on social relationships. The essence of this problem was described by Hobfoll (1998: 208) as the 'pressure cooker effect': 'Since no one in the system is free of threat, individuals who themselves have great need to depend on others must serve as supporters and lose precious resources that they themselves require at the time'. When there are too few resources to go around, it is not difficult to see why inter-personal conflict may arise.

Unfortunately, we know little about the form that inter-personal problems take in economically-challenged social networks. One possibility is that shared economic problems may erupt into bouts of criticism and rejection. Another possibility is that people in economically-challenged social networks maintain amiable relationships but are unable to help each other out when assistance is needed. Evidence of this may be found in Belle's study of women living in poverty. She reported that 'unmet expectations for help during a crisis were among the most serious problems

women reported' (Belle 1982: 138). This is important because a study by Miller and Surtees (1995) revealed that feeling let down by social network members (*i.e.* expecting support but not receiving it) is associated with elevated symptoms of psychological distress. As this brief overview has revealed, there are a number of ways in which negative social interaction may be expressed when older people and their significant others experience extended economic problems. Knowing how these problems are made manifest is an important first step in mending inter-personal difficulties that arise in economically-challenged social networks. We are unaware of any studies that probe the nuances of economically-driven inter-personal conflicts.

Negative social interaction and self-rated health

Rook and Pietromonaco (1987) identified several reasons why negative social interaction may have substantial effects on health and wellbeing, even exceeding those of positive interaction, and one is especially relevant to this study. They pointed out that most people typically encounter in daily life many more instances of positive social interaction than of negative social interaction. This creates the expectation that social interactions will be positive. If a negative social interaction arises, it may shatter these expectations and stun the recipient. The notion that negative social interaction shatters expectations about the behaviour of others is important because such experiences may be especially consequential in late life. Even though our samples do not contain younger people, nevertheless it is important to examine these age-related issues because doing so helps show why it is essential to evaluate the effects of negative social interaction specifically among older adults.

There are at least two reasons why older adults may be especially vulnerable to the health-related effects of negative social interaction. First, Carstensen's (1992) socio-emotional selectivity theory posits that as people grow older, they develop a greater preference for social relationships that are emotionally close. If older people place a high value on close emotional ties, but encounter negative social interaction instead, then the health-related consequences of these negative exchanges may be especially noxious. The second reason why it is important to study the effects of negative social interaction in late life may be found in Erikson's (1959) widely-cited developmental theory. He maintained that as people approach late life, they enter the final stage of development that is characterised by the crisis of integrity versus despair. During this time, older people reflect upon their lives and attempt to reconcile the inevitable gap between what they set out to do and what they have actually

accomplished. If they can meet this challenge successfully, they tend to derive a deep sense of meaning in life. However, if older people cannot resolve this challenge, then, Erikson argued, they may slip into despair. We suspect that an older person's social relationships may influence whether they are able to resolve the crisis of integrity versus despair. More specifically, if people encounter conflict in social relationships during late life, it will be more difficult for them to conclude that their lives have turned out well. If this is true, then their ability to derive a sense of meaning in life may be compromised. This is important because several studies suggest that the ability to derive a sense of meaning in life is associated with better health (Krause 2004).

Probing the joint effects of financial strain and negative social interaction

There are two ways to think about the manner in which financial strain and negative social interaction may be related. First, as discussed above, financial difficulties may create inter-personal difficulties with social network members, but there may also be a second and more subtle relationship between these measures. When financial problems arise, older people often look to significant others for assistance (Krause 2006). And if help is forthcoming, it should reduce the deleterious effects of financial strain on health. But the noxious effects of financial strain are likely to be more pronounced if older people encounter negative social interaction instead of receiving support from others. If this is true, then the effect of financial strain on health will depend upon whether negative social interaction is encountered in a social network. As noted earlier, this specification suggests there may be a statistical interaction effect between financial strain and negative social interaction on self-rated health in late life.

Data and methods

Study One

The first data set used in the analyses presented below is the Late Life Study of Social Exchanges (LLSSE). The study population was defined as all those aged 65 to 90 years of age who were English-speaking and living independently in the coterminous United States. The names of study subjects were obtained from the Medicare Beneficiary Eligibility List maintained by the Center for Medicare and Medicaid Services (CMS). The complex sampling design used to field the sample from this list is described in detail by Sorkin and Rook (2004). Altogether, five waves of

interviews were conducted for the LLSSE Study. Waves 1, 3 and 5 were conducted face-to-face in the homes of study participants, and the Waves 2 and 4 interviews were conducted over the telephone. The analyses provided below are based on responses to the Wave 1 and Wave 5 interviews only. A total of 916 older adults were interviewed successfully at Wave 1. Wave 1 interviews took place in 2000. The response rate was 53 per cent. A total of 666 of these individuals (*i.e.* 72.7 %) were successfully re-interviewed at Wave 5. The Wave 5 survey was conducted in 2002.

After using listwise deletion of cases to deal with item non-response, complete data were available for between 595 and 875 cases. The sample of 875 cases represents the number of study participants in the Wave 1 survey. Based on the Wave 1 survey data, preliminary analysis revealed that the average age of the subjects was 74.2 years (standard deviation (s.d.) 6.6 years), 57 per cent were women, and approximately 55 per cent were married. Education was coded into an eight-category ordinal scale for this survey, with responses ranging from less than eighth-grade school education to completed graduate school or professional training. The average score on this education measure was 4.5 (s.d. = 1.9), suggesting that the typical study participant had slightly more than a high school education. These descriptive statistics, as well as the results presented below, are based on data that have been weighted to take the influence of sampling error and non-response into account.

Study Two

The data for this study come from a nationwide longitudinal survey that was conducted by Krause (1994). When the baseline interviews were administered, the study population was defined as all household residents who were non-institutionalised, English-speaking, at least 65 years of age, and retired (*i.e.* not working for pay). The study population was restricted to persons residing in the coterminous United States. As in the LLSSE Study, the sampling frame consisted of all eligible persons contained in the CMS beneficiary list. Three waves of interviews were conducted between 1992 and 1999. A total of 1,103 older people were interviewed in 1992–93. The response rate was 69.1 per cent. Then, 605 of these study participants were interviewed successfully in 1997–98. A third round of 520 interviews was carried out in 1998–99.

A fourth wave of interviews was conducted in 2002–03, but with a complex sampling strategy. Two groups of study participants were interviewed at this point. The first consisted of 269 older people who participated in Waves 1–3. This group was supplemented by a sample of older adults who had not been interviewed previously. The CMS files were once

again used as a sampling frame for the supplemental sample. Altogether, the Wave 4 sample comprised 1,518 older people (see Krause 2004 for a detailed discussion of this sample). The overall response rate for the Wave 4 sample was 54 per cent. The fifth wave in 2005 re-interviewed successfully 1,166 Wave 4 participants, while 102 refused to participate, 45 were too ill to take part, 76 could not be located, 21 had moved to a nursing home, and 108 had deceased. Not counting people who had moved into a nursing home or those who had died, the re-interview rate for the Wave 5 survey was 83.9 per cent.

The data used in the analyses presented below come from the Wave 4 and Wave 5 surveys only. These waves were selected because the between-round interval (approximately two years) is the closest to the between-round interval in the LLSSE Study (also about two years). In addition, using the Wave 4 and 5 surveys helped ensure that the sample would be large enough for the complex analyses. After using listwise case deletion to deal with item non-response, the analyses were performed on between 1,008 and 1,312 cases. The average age of the sample of 1,312 was 74.6 years (s.d. 7.4 years), 42 per cent were men, 58 per cent were married, and the average level of educational attainment was 12.1 years (s.d. 3.3 years). All the descriptive statistics and the findings that follow are based on data that have been weighted.

Measures

Table 1 contains the core study measures that were administered in the two surveys. Information on the procedures used to code the study indicators is provided in its footnotes.

Self-rated health

Two items were used to assess global self-rated health in the LLSSE Study. The first asked study participants to rate their overall health from 'poor' to 'excellent' whereas the second asked respondents to compare their health to the health of people of the same age. Identical indicators of self-rated health were administered in the Wave 1 and Wave 5 surveys. These indicators are coded so that a high score denotes better health. The correlation between the two health items at Wave 1 is 0.55 ($p < 0.001$) and the correlation at Wave 5 is 0.61 ($p < 0.001$). The mean of the two-indicator, self-rated health measure at Wave 1 is 5.0 (s.d. 1.7) and the corresponding estimate at Wave 5 is 5.0 (s.d. 0.8). It should be emphasised that the preliminary data that are provided for all the measures in this study are based

TABLE 1. *The core study measures*

1. Global self-rated health

A. LLSSE Survey B, Wave 1 and Wave 5

1. How would you describe your health at the present time?[a]
2. Compared to most people your age, would you say your health is much better than people your age, better than people your age, about the same as people your age, worse than people your age, much worse than people your age?[b]

B. Krause (2004) Survey B, Wave 4 and Wave 5

1. How would you rate your overall health at the present time?[c]
2. Would you say your health is better, about the same, or worse than most people your age?[d]

2. Financial strain

A. LLSSE Survey B, Wave 1

1. How difficult is it for you to pay for the very basics, like food, housing, medical care and heating?[e]
2. In general, how do your finances usually work out at the end of the month?[f]

B. Krause (2004) Survey B, Wave 4

1. How much difficulty do you have meeting the monthly payments on your bills?[g]
2. In general, how do your finances usually work out at the end of the month?[h]
3. Using a scale of 0 to 10 where 0 means the worst possible financial situation and 10 means the best possible financial situation, how would you rate your finances these days?

3. Negative interaction

A. LLSSE Survey B, Wave 1[i]

1. In the past month, how often did the people you know give you unwanted advice?
2. Question or doubt your decisions?
3. Interfere or meddle in your personal matters?
4. Let you down when you needed help?
5. Ask you for too much help?
6. Fail to give you assistance that you were counting on?
7. Leave you out of activities that you would have enjoyed?
8. Forget or ignore you?
9. Fail to spend enough time with you?
10. Do things that were thoughtless and inconsiderate?
11. Act angry or upset with you?
12. Act unsympathetic or critical about your personal concerns?

B. Krause (2004) Survey B, Wave 4[j]

1. Thinking back over the past year, how often have you felt that others made too many demands on you?
2. Others were critical of you and things you did?
3. Those around you tried to pry into your personal affairs?
4. Others took advantage of you?
5. Others did things that were thoughtless and inconsiderate?
6. Others acted angry and upset with you?
7. Others questioned or doubted your decisions?

Notes: The items were categorised and scored (coding in parentheses) as follows: a. Poor (0), fair (1), good (2), very good (3), excellent (4). b. Much worse than people your age (0), worse than people your age (1), about the same as people your age (2), better than people your age (3), much better than people your age (4). c. Poor (1), fair (2), good (3), excellent (4). d. Worse (1), about the same (2), better (3). e. Not difficult at all (0), not very difficult (1), somewhat difficult (2), very difficult (3). f. Some money left over (0), just enough money (1), not enough money (2). g. None (1), only a little (2), some (3), a great deal (4). h. Money left over (1), just enough (2), not enough to make ends meet (3). i. Never (0), not very often (1), sometimes (2), often (3), very often (4). j. Never (1), once in a while (2), fairly often (3), very often (4).
Sources: See text.

upon the responses of older people who participated in both the Wave 1 and Wave 5 interviews.

Two indicators were also used to assess global self-rated health in the study by Krause (1994). Like the items in the LLSSE, these indicators reflect overall self-ratings of health and the respondent's own health compared to that of same-age peers. The same items were used in the Wave 4 and Wave 5 surveys. These indicators are coded so that a high score stands for better health. The correlation between the two health indicators at Wave 4 is 0.57 ($p < 0.001$) and the correlation at Wave 5 is 0.60 ($p < 0.001$). The mean at Wave 4 is 5.2 (s.d. 1.4) and 5.2 (s.d. 1.4) at Wave 5.

Financial strain

Extended, ongoing economic problems were evaluated in the LLSSE with two items. The first asked study participants if they had sufficient money for basic things like food and housing. The second asked how their finances typically turned out at the end of the month. The financial strain measures in the analyses presented below come from the Wave 1 survey. A high score represents more financial problems. The correlation between the two financial strain indicators is 0.70 ($p < 0.001$). The mean financial strain score at the baseline interview was 1.2 (s.d. 1.5). Financial strain was assessed in the Krause (1994) survey with three indicators. The first two items asked study participants how much difficulty they had meeting their bills and how their finances worked out at the end of the month. The third indicator asked the participants to rate their overall financial situation on a scale from '0' to '10'. These items, which were administered during the Wave 4 survey, are coded so that a high score reflects more financial difficulty. The internal consistency reliability estimate for the brief composite that was formed by summing these indicators is 0.74. The mean for this scale is 6.1 (s.d. 3.0).

Negative social interaction

Unpleasant social interaction was measured in the LLSSE with 12 indicators from the Wave 1 survey. A high score denotes more negative social interaction. The reliability estimate for the scale that was formed by summing these measures is 0.89. The mean negative social interaction score is 4.86 (s.d. 6.30). A confirmatory factor analysis of these indicators revealed that they capture four dimensions or types of negative social interaction (see Newsom *et al.* 2005). The first three items for this measure in Table 1 reflect *unwanted advice*, the next three assess *others' failure to provide help when needed*, the following three items measure *rejection and neglect*, and

the last three items capture *unsympathetic behaviour*. Negative social interaction was assessed in the study by Krause (1994) with seven items administered in the Wave 4 survey. A high score represents more unpleasant interaction. The reliability estimate is 0.87. The mean negative social interaction score is 9.9 (s.d. 3.4). Unlike the items in the LLSSE, the indicators in the study by Krause were not designed to assess different dimensions or types of negative social interaction. Instead, an exploratory factor analysis (not shown here) revealed that they assessed a single latent variable that reflected general or overall unpleasant interaction.

Socio-demographic control variables

The relationships between financial strain, negative social interaction, and self-rated health are evaluated in both studies after controlling for the effects of age, sex, marital status and education. These socio-demographic measures come from the baseline interviews in both surveys. Age was measured as a continuous variable in both studies. Marital status was evaluated in both surveys with a binary variable that contrasts currently married participants (scored '1') with all others (scored '0'). Gender is also presented with a binary measure in both studies, with '1' for men and '0' for women. Finally, as noted earlier, education is scored in an ordinal format in the LLSSE that contains eight categories, whereas education is coded continuously in years in the study by Krause (1994).

Results

The findings are presented in four sections. The first are the preliminary analyses of bias or selective non-response to the follow-up interviews. The second presents the analyses of the relationship between financial strain and negative social interaction. The third has the findings about the effect of the interaction between financial strain and negative social interaction on change in self-rated health over time. The final section provides the results of the analyses of interactions between financial strain and specific types of negative social interaction and their influence on change in perceived health.

Assessing the effects of sample attrition

Although it is difficult to determine conclusively if the loss of subjects over time has biased this study's findings, some insights can be obtained from a close description of the non-respondents to the follow-up interview. First, a binary variable was created by assigning '1' to study participants who

TABLE 2. *Assessing the cross-sectional relationship between financial strain and negative interaction*

	LLSSE survey		Krause (2004) survey	
Independent variables	Standardised regression coefficient	Metric regression coefficient[1]	Standardised regression coefficient	Metric regression coefficient[1]
Age	−0.149***[a]	−0.150	−0.133***	−0.062
Sex	−0.025	−0.339	−0.038	−0.264
Education	0.016	0.054	0.008	0.009
Marital status	−0.046	−0.617	0.064*	0.444
Financial strain	0.128***	0.566	0.121***	0.134
Multiple R^2	0.041		0.039	
Sample size	841		1,312	

Note: 1. Metric (unstandardised) regression coefficient.
Significance levels: *$p<0.05$; ***$p<0.001$.

were lost to follow-up and '0' to the respondents who were re-interviewed successfully. Then, using logistic regression, this binary outcome was regressed on the baseline measures of self-rated health, financial strain, negative social interaction, and the socio-demographic control variables listed above.

Analyses of the LLSSE survey (not shown here) suggest that older adults who were lost to follow-up were more likely to be older ($b=0.043$; $p<0.001$), less educated ($b=-0.096$; $p<0.05$), and in poor health ($b=-0.122$; $p<0.01$). On the other hand, none of the variables for gender, marital status, financial strain or negative social interaction were significantly associated with participation status at the follow-up interview. In contrast to the LLSSE findings, it was somewhat surprising to find in the study by Krause (1994) that not one baseline measure was significantly related to participation status at the follow-up interview. Taken together, the findings from the sample attrition analyses suggest that the loss of subjects over time may not have been random. There is considerable debate in the literature about whether study findings are biased if sample attrition occurs non-randomly (see Groves 2006 for a detailed discussion of this controversy). Because this issue cannot be resolved in the current study, it is best to keep in mind the possibility that there was non-random subject attrition and that this may have introduced bias.

Financial strain and negative social interaction

Table 2 contains the results of the analyses that were designed to see if greater economic difficulty was associated with more negative social interaction. The findings in the left-hand columns are from the LLSSE

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data, whereas the results provided in the two right-hand columns are based on the data from the study by Krause (1994). Both sets of analyses were performed with the baseline data only. The decision to examine cross-sectional relationships had the following rationale. The between-round interval for interviews in both studies is about two years. If financial strain creates more negative social interaction, then it is not clear why it would take two years for inter-personal problems to arise. Instead, it seems more likely that the proposed inter-personal difficulties would emerge within a fairly short period. As the findings provided below reveal, there is some indication this reasoning is valid. Consistent with the theoretical rationale that was developed for this study, the data from the LLSSE survey indicate that greater financial strain associated with more negative social interaction (Beta = 0.128; $p < 0.01$). Virtually identical results emerged from the Krause survey data (Beta = 0.121; $p < 0.001$).

The analyses presented so far were based on the assumption that negative social interaction arises shortly after financial difficulties are encountered, but a competing assumption can be tested. Instead of arising quickly, it may take an extended period for inter-personal conflict to emerge in response to economic problems. This alternative specification can be evaluated by seeing whether financial strain at baseline is associated with increased negative social interaction over the following two years. A statistically significant relationship between financial strain and change in negative social interaction was not established in either study (results not shown). A final set of supplementary analyses of the LLSSE data assessed the relationships between financial strain and each of the four measured dimensions of negative social interaction. The strongest relationship was with the failure of social network members to provide help when needed (Beta = 0.123; $p < 0.001$), followed by receiving unwanted advice (Beta = 0.116; $p < 0.01$), rejection and neglect (Beta = 0.102; $p < 0.01$) and unsympathetic behaviour (Beta = 0.072; $p < 0.05$).

Financial strain, negative social interaction, and change in self-rated health

Table 3 presents the results of the tests of the interaction effect between financial strain and negative social interaction on change in self-rated health. These analyses were performed with hierarchical ordinary least squares (OLS) multiple regression models, which were estimated in two steps. First, self-rated health at the follow-up interviews was regressed on the baseline measures of self-rated health, financial strain, negative social interaction, and the demographic control variables (see Model 1 in Table 3). Following this, a multiplicative term was created by multiplying financial strain by negative social interaction scores. This cross-product

TABLE 3. *Financial strain, negative interaction, and change in self-rated health*

	LLSSE survey		Krause (2004) survey	
Independent variables	Model 1	Model 2	Model 1	Model 2
Age	−0.097**[a]	−0.099**	−0.039	−0.034
	(−0.028)[b]	(−0.029)	(−0.008)	(−0.007)
Sex	−0.022	−0.020	0.006	0.001
	(−0.080)	(−0.073)	(0.017)	(0.002)
Education	0.016	0.017	0.138***	0.141***
	(0.015)	(0.015)	(0.056)	(0.057)
Marital status	−0.081*	−0.087**	0.017	0.023
	(−0.289)	(−0.312)	(0.049)	(0.064)
Financial strain	−0.050	−0.047	−0.029	−0.027
	(−0.058)	(−0.055)	(−0.013)	(−0.012)
Negative interaction	−0.010	0.013	−0.045	−0.027
	(−0.003)	(0.004)	(−0.018)	(−0.011)
Self-rated health at baseline	0.640***	0.638***	0.555***	0.555***
	(0.660)	(0.658)	(0.550)	(0.550)
Financial strain by negative interaction	–	(−0.012)**	–	(−0.010)***
Multiple R^2	0.441	0.446	0.383	0.390
Sample size	595	595	1,008	1,008

Notes: a. Standardised regression coefficient. b. Metric (unstandardised) regression coefficient.
Significance levels: * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.

term was added to the model at the second step (see Model 2 in Table 3). All variables were centred on their means prior to the analysis (Aiken and West 1991).

Two somewhat surprising findings emerge from the first step. As shown in the first column of Table 3, neither financial strain (Beta = −0.050; *not significant*) nor negative social interaction (Beta = −0.010; *n.s.*) were significantly associated with change in self-rated health in the LLSSE survey. The same conclusion arises from the Krause (1994) survey data. Once again, neither extended economic problems (Beta = −0.029; *n.s.*) nor unpleasant social interaction (Beta = −0.045; *n.s.*) were significantly related to change in self-rated health (see the third column in Table 3). Taken together, these results initially appear to suggest that economic problems and negative social interaction do not affect the way older people rate their health. However, as the tests for the proposed interaction effect reveal, this conclusion may be premature.

In contrast to the findings reported so far, Model 2 in Table 3 revealed a statistically significant relationship between financial strain and negative social interaction on change in self-rated health in the LLSSE data (b = −0.012; $p < 0.01$). Note that unstandardised estimates are discussed when presenting results involving cross-product terms because standardised estimates are not meaningful in this context. This finding is

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replicated with the data from the study by Krause (1994) (see the far right column in Table 3) (b = −0.010; $p < 0.001$).

Steps were taken to clarify the nature of the interaction effect by calculating the two formulae provided by Aiken and West (1991). If the hypothesis developed for this study is accurate, then the deleterious effects of financial strain on change in self-rated health should become progressively larger at successively higher levels of negative social interaction. The first formula allows researchers to illustrate this type of relationship by calculating an unstandardised estimate of the effects of financial strain on change in self-rated health at select levels of negative social interaction. The second formula produces standard errors for these estimates, making it possible to determine if they are statistically significant. The calculations recommended by Aiken and West (1991) were first performed with the data from the LLSSE study. Although any value of negative social interaction could be used in these computations, the following values were selected: no negative social interaction, a negative social interaction score of 5 (just above the mean of 4.9), and a negative social interaction score of 12 (just above one standard deviation above the mean, *i.e.* 11.2). The findings from these additional computations (not shown in Table 3) reveal that financial strain was not associated with change in self-rated health for older adults who had not encountered negative social interaction (Beta = 0.003; $b = 0.004$, *n.s.*). The same is true for older adults who reported experiencing roughly average amounts of unpleasant interaction with their social network members (Beta = −0.048; $b = -0.057$; *n.s.*). But, in contrast, financial strain was associated with a decline in self-rated health for older adults who encountered relatively more negative social interaction (*i.e.* those with negative social interaction scores that were approximately one standard deviation above the mean) (Beta = −0.120; $b = -0.141$; $p < 0.01$).

Very similar findings emerged with the data provided by Krause (1994). Financial strain was not associated with change in self-rated health for older people who had not encountered negative social interaction with significant others (Beta = 0.037; $b = 0.017$; *n.s.*), nor was it significantly associated with an average level of negative social interaction (score of 10, just above the mean of 9.9) (Beta = −0.029; $b = -0.013$; *n.s.*). On the other hand, relatively high negative social interaction (score of 14, just beyond one standard deviation above the mean, *i.e.* 13.3), produced a significant result. Consistent with the results from the LLSSE survey, the findings from the study by Krause (1994) suggest that ongoing economic problems are associated with less favourable self-rated health for older adults with the elevated negative social interaction scores (Beta = −0.118; $b = -0.053$; $p < 0.005$).[1]

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Assessing the influence of specific types of negative interaction

As reported above, the LLSSE survey measured four distinct types of negative social interaction. Exploring the interaction between each type of unpleasant social encounter and financial strain on change in self-rated health may help researchers the better to understand how negative social interaction tends to exacerbate the deleterious effects of relentless economic problems. A final set of analyses was performed to address this issue. Once again, a hierarchical OLS model was evaluated, but instead of containing just one cross-product term, the second step in this model involved estimating the effects of four multiplicative terms. These multiplicative terms were formed by multiplying financial strain scores by each of the four dimensions of negative social interaction. The findings from these additional analyses (not shown here) were revealing. More specifically, only one interaction effect was statistically significant: financial strain and failure to receive help when it is needed ($b = -0.046$; $p < 0.05$). The sign of this relationship suggests that when financial strain was high, failure to get help when needed was associated with a decline in self-rated health over time. In contrast, none of unwanted advice ($b = -0.017$; *n.s.*), unsympathetic behaviour ($b = 0.011$; *n.s.*), or rejection and neglect ($b = 0.002$; *n.s.*) appeared to operate jointly with financial strain to influence significantly change in perceived health.

Discussion

Researchers have argued for decades that personal financial problems have an adverse effect on the physical and mental health of older people (*e.g.* George 1992). Given that numerous studies support this conclusion, the next step in moving this literature forward requires demonstrating how these undesirable effects arise. Although a number of factors are likely to be involved, the findings from the present study reveal that negative social interaction may play an important role. Four results support this view. First, the presented findings suggest that older adults who encounter extended economic difficulties tend to report having more negative social interaction with their social network members than older people who do not experience financial problems. Secondly, as the level of negative social interaction escalates, financial strain appears to have a more pernicious effect on self-rated health. Thirdly, it appears that some, but not all, types of negative social interaction are instrumental in this regard. Specifically, the relationship between financial strain and the inability to get help when it is needed was the strongest. Fourthly, the results further indicate that not

getting help when it is needed was the only type of negative social interaction that exacerbated the undesirable effects of financial strain on health. These findings suggest that being let down by friends and relatives in the face of personal financial difficulty has greater health consequences for older people than more overt forms of interpersonal conflict (*e.g.* criticism and rejection). This, is turn, provides deeper insight into why the effects of financial strain may be so pernicious – relentless economic difficulties tend to erode the very resources that are needed to eradicate them.

The findings from this study are noteworthy for several reasons. First, the relationships between financial strain, negative social interaction, and health were evaluated with data that were gathered at more than one point in time. Secondly, the findings from one United States nationwide survey were largely replicated with results from a second nationwide survey. Even though there were differences in the way financial strain and negative social interaction were measured, the results from both studies are largely the same. This provides some evidence that the findings are robust. Researchers have devised a number of ways to replicate findings using the same data set (Thompson 1994). Some approaches involve what Thompson refers to as internal methods. These involve procedures such as splitting the sample into two random halves or using more sophisticated jack-knife procedures. But as Thompson (1994: 159) argued, replication with an independent data set (*i.e.* an external analysis) is best: 'only external analyses invoke true replication'. We hope our findings encourage greater use of multiple data sets to study the same questions in stress research. Thirdly, greater specificity in measuring negative social interaction in the LLSSE survey made it possible to provide a more precise explanation of the findings. This appears to be the first time that a more focused explanation of the impact of negative social interaction and financial strain on health has been provided in social gerontology.

Even though the findings from this study have, we believe, made a useful contribution to the literature, there is still a good deal that we need to know about the interfaces between financial strain, negative social interaction, and self-rated health. For example, it is not entirely clear how the adverse effects of not getting help when needed tend to compromise the health of older people. On the one hand, not getting help in the face of economic difficulty may lead to poor health behaviours, such as bad eating habits or inadequate medical care. These negative health behaviours may, in turn, lead to physical health problems. Alternatively, a critical factor may be the sense of helplessness and hopelessness that arises when older adults realise that significant others either cannot or will not help. Yet another potentially important mechanism may be found in the concept of the self. The notion of the self has played a central role in psychology and

sociology ever since their foundation (Cooley 1902; James 1892/1961). As James pointed out, strong emotions associate with a person's sense of self: 'if they wax and prosper, he feels triumphant; if they dwindle and die away, he feels cast down' (1961: 44). Given the important part played by this construct in social life, it is important to reflect on how a sense-of-self arises. Some insight is provided in Cooley's (1902) classic discussion of the looking-glass self. According to his view, a person's sense of self is shaped by the reflected appraisals and feedback of significant others. Social norms suggest that family members should help older adults in need, but if they fail to do this, older adults may assume they are not held in high regard by those close to them. The negative self-images these unpleasant social encounters create are likely to lower their self-esteem. This is important because a number of studies indicate that diminished feelings of self-worth associate with poor health (Trzesniewski, Donnellan and Robins 2003).

Although the presented findings suggest that financial strain is associated with more negative social interaction, there is still a lot that we do not know about this process. For example, researchers need to identify those older people who are most likely to find that social network members have failed to provide assistance when it is needed. In addition, as discussed above, investigators need to evaluate empirically how being let down by others, in turn, creates physical health problems. Answers to these questions are needed if we are to develop interventions that will help older people confronted by extended financial difficulties.

In the process of examining these and related issues, researchers should keep the limitations of our studies in mind. Even though the data from both studies are longitudinal, we nevertheless have been unable to demonstrate conclusively that financial strain and negative social interaction 'cause' physical health problems. Such conclusions can only be drawn from true experiments, but it is difficult to imagine how a researcher could conduct a true experiment to study the effects of financial strain and negative social interaction on health. Secondly, global measures of self-rated health were the only outcome measures examined in this study. It will be important in future work to see if financial strain and negative social interaction affect other measures of health, like physical functioning and specific illnesses, such as hypertension. Thirdly, the measures of financial strain represent subjective evaluations of an older person's economic situation. But the content domain of these subjective indicators is not entirely clear. There is some evidence that subjective measures of financial strain are associated with income level, but as a detailed discussion by Krause (1995) revealed, there may be far more to it than this. Finally, our measure of financial strain is thought to reflect primarily

extended or continuous economic difficulties. Some older people, however, may experience abrupt changes in their financial situation and these changes are less likely to be captured with our measures. Consequently, we encourage other investigators to explore the relationships between other types of economic difficulty and health in late life.

Adam Smith is widely known for his classic work in economics, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776). Less well known is that he first wrote a treatise on fundamental aspects of human nature, *The Theory of Moral Sentiments* (1759). In the earlier work, Smith reflected on certain basic principles of negative social interaction. He wrote that social relationships typically operate smoothly and as a result, individuals tend to develop a good deal of sympathy for each other. Then, anticipating the insights provided by Rook and Pietromonaco (1987), he went on to argue that, 'Relationships being usually placed in situations which naturally create this habitual sympathy, it is expected that a suitable degree of affection should take place among them. We generally find that it actually does take place; we therefore naturally expect it should; and we are, upon that account, more shocked when, upon occasion, we find that it does not' (Smith 1759/2002: 258). These early insights suggest that the problems we have investigated (*i.e.* negative social interaction), and the mechanisms by which they operate, are centuries old. We hope the work presented here contributes to this distinguished line of inquiry by linking these interpersonal problems with the pressing economic (*i.e.* financial strain) and public health concerns of our time (*i.e.* the health of older people).

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NOTE

1 A series of analyses were conducted to assess the relationships between financial strain, negative social interaction, and self-rated health within the baseline surveys only. The findings from the survey conducted by Krause (1994) reveal that greater financial strain is associated with less favourable health ratings in these cross-sectional analyses (Beta = −0.243; $p < 0.001$). However, a statistically significant relationship between negative social interaction and perceived health failed to emerge from the data (Beta = −0.020; *n.s.*), and perhaps most importantly, the interaction between financial strain and negative social interaction was not significantly associated with self-rated health at the baseline survey ($b = 0.001$; *n.s.*). Virtually the same findings

emerged from the analyses of the cross-sectional data in the LLSSE Study. More specifically, the data suggest that financial strain exerts a statistically significant effect on self-rated health (Beta = −0.223; $p < 0.001$), but statistically significant findings failed to emerge for negative social interaction (Beta = −0.053; *n.s.*) as well as the interaction effect between financial strain and negative social interaction on perceived health ($b = 0.008$; *n.s.*).

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