Perceived Stress and Mortality in a Taiwanese Older Adult Population

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INTRODUCTION

The impact of events is partly determined by an individual's interpretation of how stressful they are (Lazarus 1966, 1977). This perception plays an important role in the emotional and physiological responses that ensue (Goldman et al., 2005). Cohen et al. (1997) presented a theoretical pathway that links the experience of stressors (e.g., environmental demands and life events) to physiological and behavioral responses. This model views the stress process as a sequence of steps in which events lead to either a benign appraisal or perception of stress. In the former case, no stress response is elicited. In the latter case, perceived stress results in negative emotional responses, which lead to a physiological or behavioral response. Hence, crucial points in this pathway are the individual's cognitive appraisal of the demands inflicted by the life events or stressors and his/her adaptive capacities (e.g., the availability of coping resources). In this view, it is the cognitively mediated emotional response to the life event, not the event itself, which result in the behavioral or physiological responses (Lazarus, 1977; Mason, 1971). The importance of this insight is underscored by variations in the assessment of stressors that may be influenced by multiple factors, including personal experiences, personality, coping mechanisms, and social support (Schwartz et al., 1996; Biondi & Picardi, 1999).

While most studies that examine stress and disease (or mortality) utilize the presence of 'objective' stressful events to determine these relationships, the links between perceptions of stress and adverse health outcomes (namely mortality) are much less studied. Among the few studies of perceived stress and mortality, the findings have been mixed. Perceptions of high stress were not predictive of all-cause mortality in a Scottish population (Macleod et al., 2001). High appraisal of stress, however, was associated with a greater risk of all-cause mortality among South Koreans and Danes (Khang & Kim, 2005; Nielsen et al., 2008). Among the Japanese, high perceived stress was associated with a higher risk of cardiovascular disease and stroke mortality in women and a higher risk of mortality due to myocardial infarction among men (Iso et al., 2002).

The purpose of this study is to investigate the relationship between perceived stress and mortality in a population of older Taiwanese adults. The analysis is based on rich data that comprise a battery of questions related to individuals' perceptions of stress and anxiety, an 8-year period of mortality follow-up, and extensive information on socioeconomic status, social support, and depressive symptoms.

METHODS

Our preliminary analyses are based on the Social Environment and Biomarkers of Aging Study (SEBAS). SEBAS comprises a random subsample of respondents from the Survey of Health and Living Status of the Near Elderly and Elderly in Taiwan (also

known as the Taiwan Longitudinal Survey of Aging or TLSA), a survey that began in 1989 of older Taiwanese adults (including institutionalized individuals).

Perceived stress, measured in 2000, was based on participant self-report of his/her level of stress (0=none, 1=some, 2=or a lot) in 8 situations: the individual's own health and financial situation; relationship with family members; his or her family's or children's health, financial situation, job, and marital status, as well as any other reported problem. The other reported problems included: excessive household chores, concern about a handicapped child, worry about security or safety, absence of children to help the participant, missing child or child death, loss of something important, absence of a job, and a divorced son (requiring the participant to care for the grandson). Using these 8 items, a summary score of perceived stress was created (range 0-16). If respondents had missing values for more than 2 domains, they were not included in the analyses (0.50% of the sample were missing on 3-6 domains). For individuals with missing values on 1 or 2 domains, they were assigned a score of 0 on those items.

The analysis uses data on survival status and date of death that were ascertained by linking SEBAS survey records with information from the Household Registration file of the Taiwanese Ministry of Interior and the Department of Health death registration records. We estimate a proportional hazards model to assess the association between perceived stress and survival, using age as the time-scale. The underlying hazard function is modeled with a Gompertz distribution, which provides a good fit to our data and is often used to describe death rates at older ages (Horiuchi & Coale, 1982).

Descriptive statistics for the variables included in our analysis are weighted to account for oversampling by age and urban residence. For proportional hazards models, we use unweighted data, but control for sex and urban residence to adjust for the sampling design. Because of the multistage sampling design, we use a robust estimator of variance and adjust for clustering by primary sampling units to produce corrected standard errors. All analyses are carried out with STATA version 11 (StataCorp, 2009).

PRELIMINARY RESULTS

The average age of the analysis sample is 66 years, with more males (57%) than females (Table 1). Nearly 60% of the participants report stress on at least one of the 8 domains examined. The three most prevalent domains are the participant's own health (33%), own financial situation (29%), and family member's financial situation (26%). On average, participants had a stress score of 2. By the end of 2008, almost 21% of the sample population had died.

Our preliminary analyses, which adjust for sex and rural/urban residence, find that perceived stress is associated with age-specific death after 8-years of follow-up (Table 2). This result is consistent for two parameterizations of perceived stress: [1] a continuous measure of the 8-item stress score (Model I, $p=0.01$) and [2] a categorization based on low (0), medium (1-2), and high (>2) scores of perceived stress (Model II, $p=0.85$ and $p=0.01$ for medium and high [respectively] compared with the low perceived stress category). In Model II, participants with 'high' perceived stress have a hazard ratio of 1.50 (95% confidence interval 1.09-2.06) compared with those reporting 'low' perceived stress.

FUTURE ANALYSES

The next stage of analysis will further explore the relationship between perceived stress and mortality by examining the chronicity of perceived stress (e.g., the impact of high levels of perceived stress at successive interviews in contrast to the impact of high levels at only a single wave). These analyses will use both SEBAS data (for the 2000 and 2006 waves) and TLSA data (for the 1999, 2003 and 2007 waves), each with mortality follow-up. While TLSA includes less detailed questions on perceived stress than SEBAS, TLSA is based on a larger sample size and includes three rounds with assessments of perceived stress. Examination of both SEBAS and TLSA data will allow for an investigation of the consistency and robustness of our preliminary results. Updated information on survival status of SEBAS and TLSA respondents through 2010 will be available shortly, thereby permitting us to extend the survival models to a 10-year period and increase the statistical power of our analyses.

We will consider factors that may influence the relationship between perceived stress and mortality. These include potential coping resources, such as social support, as well as possible moderators that indicate socioeconomic status (e.g., education and income) and the presence of depressive symptoms.

CONCLUSION

This study underscores the role of perceived stress in placing some individuals at an increased risk of adverse health outcomes, such as mortality. These findings and future analyses will attempt to resolve the discrepancies in the few previous studies that have been reported. It will build upon prior research by considering the potential influence of additional factors, including socioeconomic status and social support, which have received little attention in previous studies.

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Table 1. Sample characteristics of Taiwanese older adults at baseline (2000)

	2000	
	N	Mean ± SD or %
Age	998	66.37 ± 8.00
Men (%)	998	57.43
Perceived Stress		
Stress on any of 8 domains (%)	998	59.36
Any stress pertaining to (%):		
R's own health	991	33.13
R's own financial situation	993	28.95
R's relationship with family members	995	5.69
R's family member's health	995	20.54
R's family member's financial situation	994	26.36
R's family member's job	990	22.08
R's family member's marital status	990	22.19
Any other problem	976	1.47
Summary Score	998	2.09 ± 2.69
Died by end of 2008	998	20.86

R=respondent

Table 2. Mortality risk (between 2000 and the end of 2008) by perceived stress

	Model I		Model II	
	HR	(95% CI)	HR	(95% CI)
Females (vs. males)	1.47	(1.12-1.93)†	1.47	(1.12-1.93)†
8-item perceived stress score (continuous)	1.06	(1.01-1.11)†		
Perceived stress score ≥1 (dichotomous)*				
8-item perceived stress score categories**				
Low (0)				Reference
Medium (1-2)			1.03	(0.76-1.40)
High (>2)			1.50	(1.09-2.06)†
Number of respondents		982		982

The model estimates age-specific mortality and adjusts for rural/urban residence

*vs. stress score=0

**range 0-16, where the possible response for each of the 8-items could include: 0=no stress, 1=some stress, 2=a lot of stress

† $p<.05$