Gender differences in the relationship between social support and strain and mortality among a national sample of adults

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Abstract   We assessed gender differences in the relationship between mortality and social support, strain, and affectual solidarity received from family, friends and spouses. Data of 6259 adults from the Midlife Development in the United States (MIDUS) survey were analyzed. Cox proportional hazards were used to assess relationships between mortality and support, strain, and affectual solidarity and whether the associations varied by gender. Support from family, friends, and spouses/partners and friend affectual solidarity were associated with lower mortality in the total sample. Friend strain was associated with higher mortality in the total sample. Family support and family, friend, and spouse affectual solidarity were associated with lower mortality in women. Friend and spouse strain were associated with a higher mortality for women. Support from friends, family and spouse are beneficial for reducing mortality in

men and women. Friend and spouse strain are targets for minimizing mortality risk in women.

Keywords   Gender · Social support and strain · Affectual solidarity · Mortality

Introduction

Social support is defined as the perception that one is accepted, cared for, and provided with assistance from others; it can be perceived as either positive or negative (Reblin & Uchino, 2008; Strom & Egede, 2012). Evidence suggests that an individual's experience within social relationships influences health outcomes (Holt-Lunstad et al., 2010). Relationships with both stronger structural and functional aspects, including perceived and received social support have been associated with a 50% reduction in mortality (Holt-Lunstad et al., 2010). One can perceive support from many sources including friends, spouses/partners, and family members. However, support can be perceived differently based on multiple factors including gender, race/ethnicity, and cultural influences (Strom & Egede, 2012). When perceived as positive, support from these types of relationships has been associated with improved health outcomes (Becofsky et al., 2015; Walen & Lachman, 2000). For example, perceptions of positive social support from friends has been associated with better self-perceived health (Walen & Lachman, 2000), while greater perceived positive support from a spouse/partner and relatives has been associated with a lower risk for mortality, long-term, in both men and women (Becofsky et al., 2015).

Social support can also be perceived as negative and serve as a source of strain for an individual. Social strain is defined as the extent to which social network members make

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too many demands, are critical, unreliable, and irritate or annoy others (Gilbert et al., 2018). A cross-sectional study in 2012 demonstrated that those who report greater social strain in their relationships with family, close friends, and spouses/partners are more likely to have poorer cortisol regulation, which is ultimately associated with greater mortality (Friedman et al. 2012; Kumari et al., 2011). Evidence suggests isolated family strain too is linked with negative health markers in men and women as indicated by increased inflammation (Yang et al., 2014) and poorer reported well-being (Krause & Rook, 2003). While each of these associations provides insight as to how social strain from varying sources affects health, they do not directly link strain to mortality, which makes comparisons between sources, and predictions regarding the long-term effects on health challenging.

Affectual solidarity takes both social support and strain into account in order to capture the degree of both positive and negative sentiment in a relationship. It is one of six dimensions in the Model of Intergenerational Solidarity that conceptualizes family relationships and can be used to assess diverse aspects of the roles and functions of social networks (Grzywacz & Marks, 1999). For both women and men, family affectual solidarity has been linked to proper use of medications (Grzywacz & Marks, 1999). Women with greater family affectual solidarity and individuals with greater spousal affectual solidarity are less likely to experience problems with alcohol (Grzywacz & Marks, 1999). Despite these associations, however, little research has been conducted to assess the relationship between affectual solidarity and mortality. This relationship is important to understand as it can provide additional evidence on the role of social support and health outcomes by relationship type, function, and structure.

Although individuals of both sexes can perceive social support and strain from similar sources, studies suggest that men and women have unique experiences within these relationships. Women reportedly experience more negative social interactions than men (Bedford & Turner, 2006; Newsom et al., 2008), while previous studies indicate men experience greater health benefits from social interactions than women (House et al., 1982; Wilkins, 2003). While social support is clearly a facilitator for health outcomes, more information regarding the link between social support and health is needed in order to target interventions with the goal of reducing mortality. However, to understand more fully the link between social support and long-term health outcomes, it is necessary to assess (1) the source of support, (2) gender of the individual perceiving the support, and (3) how much and how often the perceived support differentially affects a long-term health outcome such as mortality. Therefore, the purpose of this study was to assess gender differences in the relationship between all-cause mortality and social support, strain and affectual solidarity received from

friends, spouses/partners, and family members. We hypothesized that greater support and affectual solidarity, as well as lower levels of strain, will be associated with lower all-cause mortality across all relationships. In addition, since men reportedly experience greater health advantage from social interactions than women, we hypothesized that increased strain will result in higher mortality risk for women.

Methods

Sample and study population

The first national survey of Midlife Development in the United States (MIDUS) was conducted in 1995–1996 by the MacArthur Foundation Research Network on Successful Midlife Development (MIDUS, 2018). The collective aim was to investigate the role of behavioral, psychological, and social factors in accounting for age-related variations in health and well-being in a national sample of Americans. The study consisted of 7108 adults who participated in a phone interview and then were invited to complete a self-administered questionnaire (SAQ). This analysis used the first MIDUS survey. We included the 6325 participants who completed both phone and SAQ for this study. We further excluded 57 participants without any answers to social support questionnaires, 1 participant without the completion date for self-administered questionnaires, 7 participants who were deceased without death date, and 1 participant without age information, so the final analysis cohort size was 6259.

Mortality outcome

Mortality information was collected during MIDUS 2 and MIDUS 3 studies. We used the mortality statistics from MIDUS 3 and verified them with MIDUS 2 information. The mortality data included 3 general source categories: (1) tracing conducted by University of Wisconsin Survey Center (UWSC); (2) formal National Death Index (NDI) searches; and (3) longitudinal sample maintenance. The mortality outcome of interest in this analysis only included all-cause death.

Social support

In self-administered questionnaires, participants were asked to rate their relationship with family, friends, and their spouse/partner.

Family support included 4 items from the self-administered questionnaire: (1) "Not including your spouse or partner, how much do members of your family really care about you?"; (2) "How much do they understand the way you feel about things?"; (3) "How much can you rely on them for

help if you have a serious problem?"; and (4) "How much can you open up to them if you need to talk about your worries?". The mean of the four items constructed the family support score. Items were recoded such that a higher score reflected higher family support. The Cronbach's alpha score for the family support scale is 0.82.

Friend support was assessed with the same set of 4 questions: (1) "How much do your friends really care about you?"; (2) "How much do they understand the way you feel about things?"; (3) "How much can you rely on them for help if you have a serious problem?"; and (4) "How much can you open up to them if you need to talk about your worries?". The score for friend support was constructed by calculating the mean of the four times, and higher scores reflected higher support. The Cronbach's alpha score for the family support scale is 0.88.

Spouse/partner support was assessed with a total of 6 items: (1) "How much does your spouse or partner really care about you?"; (2) "How much does he or she understand the way you feel about things?"; (3) "How much does he or she appreciate you?"; (4) "How much do you rely on him or her for help if you have a serious problem?"; (5) "How much can you open up to him or her if you need to talk about your worries?"; and (6) "How much can you relax and be yourself around him or her?". The mean of the six items was used to calculate scores for spouse/partner support, and higher scores reflected higher support. The Cronbach's alpha score for the family support scale is 0.86.

The family strain questionnaire consisted of 4 items from the self-administered questionnaire including (1) "Not including your spouse or partner, how often do members of your family make too many demands on you"; (2) "How often do they criticize you?"; (3) "How often do they let you down when you are counting on them?"; and (4) "How often do they get on your nerves?" The family strain score was constructed by calculating the mean of the four items. Items were recoded so a higher score reflected higher strain. The Cronbach's alpha score for the family support scale is 0.80.

Friend strain was assessed using the same set of 4 questions: (1) "How often do your friends make too many demands on you"; (2) "How often do they criticize you?"; (3) "How often do they let you down when you are counting on them?"; and (4) "How often do they get on your nerves?" The friend strain score was constructed by calculating the mean of the four items. Items were recoded so a higher score reflected higher strain. The Cronbach's alpha score for the family support scale is 0.79.

Spouse/partner strain was assessed with a total of 6 items: (1) "How often does your spouse or partner make too many demands on you?"; (2) "How often does he or she argue with you?"; (3) "How often does he or she make you feel tense?"; (4) "How often does he or she criticize you?"; (5) "How often does he or she let you down when you are counting on them?"; and (6) "How often does he or she get on your nerves?". The score is determined by calculating the mean of the six items, where higher scores reflect higher strain. The Cronbach's alpha for the spouse/partner strain questions is 0.81.

Family affectual solidarity scale was constructed by calculating the mean of eight items (combining the four "family support" items and four "family strain" items). Friend affectual solidarity was constructed by calculating the mean of eight items (combining the four "friend support" items and four "friend strain" items). Spouse/Partner affectual solidarity was constructed by calculating the mean of 12 items (combining the six "spouse/partner support" items and six "spouse/partner strain" items). Items were recoded so that a high score signified high levels of affectual solidarity.

Demographic variables

Covariates included gender; age (grouped as 20–44 years; 45–59 years; 60–75 years); race/ethnicity (grouped as White; Black; and Other Minority); education (dichotomized as high school diploma or less and higher education); marital status (dichotomized as married and not married); household total income (grouped as less than $25,000; $25,000–< $75,000; and $75,000+).

Statistical analysis

This study analyzed the association between family, friends, and spousal relationships with mortality, following the participations from the date they completed the self-administered questionnaires at MIDUS 1 until their death, lost to follow-up, or end of follow-up, whichever came first. Death date only included the year and month. We used 15 as the day to get the date. The end of follow-up date was defined as the last date of death available in the mortality data—May 15, 2015. The censor date was defined as the date each individual participated in the SAQ of each MIDUS study. If individuals only participated in MIDUS 1, they were censored at the beginning of MIDUS 2 (January 1, 2004). If individuals participated in MIDUS 1 and MIDUS 2 only, they were censored at the beginning of MIDUS 3 (May 1, 2013). If individuals participated in every MIDUS study, they were censored at the end of the follow-up date (May 15, 2015). Each individual's end of follow-up date was the earlier date of death date and censor date.

The primary analytical goal was to test the independent association between all-cause mortality and each social support component. We first ran Pearson correlations to measure the strength of association between the support, strain, and affectual solidarity variables. We ran a univariate Cox proportional hazards regression analysis for each social support variable, then adjusted with all

demographic variables. Secondly, we further checked if the association varied by gender. We ran stratified analyses for all-cause mortality by gender, unadjusted and adjusted, to get the estimation of hazard ratio. Then, we performed each social support variable with interaction of gender to test for gender differences in social support. Then, we performed each social support and each strain variable in one model by gender, unadjusted and adjusted, to test for independent associations between affectual solidarity and mortality. Finally, we performed each social support variable, each strain variable, and each affectual solidarity variable, unadjusted and adjusted, to test which source (family, friend, spouse) was more important in the relationship with mortality. All statistical analysis was performed with SAS version 9.4 (SAS Institute).

Results

Demographic and social support characteristics by gender are presented in Table 1. Approximately 53% of the participants were women. Nearly 80% of the sample was between the ages of 20 and 59 years of age. Ninety-one percent of the sample was Non-Hispanic White. Approximately 62% had more than a high school diploma, and approximately 68% were married. Nearly 64% reported a total household income less than $75,000.

Significant differences were observed between men and women by race, educational level, marital status, and total household income. Both men and women were more likely to be white (p = 0.002). Women were more likely to have completed a high school diploma or less, while men were more likely to have completed higher education (p < 0.001). Men were more likely to be married compared to women, and 37% of women were not married compared

Table 1 Sample demographics by gender

	Total	Men	Women	P-value
Cohort count	6259	2971	3288	
Age group				0.487
20–44 years	45.8%	46.45%	45.4%	
45–59 years	34.0%	34.1%	33.9%	
60–75 years	20.2%	19.5%	20.7%	
Race				**0.002****
White	90.5%	91.4%	89.6%	
Black	5.3%	4.3%	6.3%	
Other minority	4.2%	4.4%	4.1%	
Education level				**<0.001*****
High school diploma or less	37.7%	34.2%	40.9%	
Higher education	62.3%	65.9%	59.1%	
Marital status				**<0.001*****
Married	67.7%	73.2%	62.7%	
Not Married	32.3%	26.8%	37.3%	
Household total income category				**<0.001*****
≤$24,999	19.4%	14.3%	24.0%	
$25,000–$74,999	44.2%	44.1%	44.3%	
$75,000+	33.6%	39.3%	28.4%	
Social support [Mean (SD)]				
Family support	3.43 (0.62)	3.38 (0.63)	3.49 (0.60)	**<0.001*****
Family strain	2.11 (0.61)	2.04 (0.59)	2.18 (0.62)	**<0.001*****
Family affectual solidarity	3.16 (0.51)	3.17 (0.50)	3.15 (0.52)	0.303
Friend support	3.23 (0.67)	3.09 (0.66)	3.35 (0.65)	**<0.001*****
Friend strain	1.93 (0.51)	1.95 (0.51)	1.92 (0.52)	0.052
Friend affectual solidarity	3.15 (0.45)	3.07 (0.44)	3.21 (0.45)	**<0.001*****
Spouse support	3.59 (0.57)	3.66 (0.50)	3.51 (0.64)	**<0.001*****
Spouse strain	2.23 (0.62)	2.17 (0.58)	2.28 (0.66)	**<0.001*****
Spouse affectual solidarity	3.18 (0.54)	3.24 (0.48)	3.11 (0.60)	**<0.001*****

Bold indicates significance at *p < 0.05, **p < 0.01, ***p < 0.001

to only 27% of men (p < 0.001). Women were more likely to make ≤ $24,999 compared to men, and men were more likely to make ≥ $75,000 compared to women (p < 0.001). Women reported significantly higher mean scores than men for family support (3.49 vs. 3.38; p < 0.001), family strain (2.18 vs. 2.04; p < 0.001), friend support (3.35 vs. 3.09; p < 0.001), friend affectual solidarity (3.21 vs. 3.07; p < 0.001), and spouse strain (2.28 vs. 2.17; p < 0.001). Women reported significantly lower mean scores than men for spouse support (3.51 vs. 3.66; p < 0.001) and spouse affectual solidarity (3.11 vs. 3.24; p < 0.001).

Table 2 shows the Pearson correlation coefficients for social support, strain, and affectual solidarity by gender. Support and strain from family members and friends had a weak correlation for the total sample, men, and women. Spouse support and spouse strain had a moderate negative relationship for the total sample (−0.65) and for both men (−0.59) and women (−0.68). Support from family, friends, and spouses had a strong positive relationship with affectual solidarity. Strain from all sources had a strong negative relationship with affectual solidarity except for friend strain, where the relationship was found to be moderate (total: −0.68 vs. men: −0.67 vs. women: −0.69).

Table 3 provides the multivariable Cox proportional hazards regression estimates for each social support variable (support, strain, affectual solidarity) controlling for demographic variables. Higher family support was associated with lower mortality in the total sample (HR = 0.89, 95% CI = 0.81–0.98) and women (HR = 0.81, 95% CI = 0.70–0.94). Family affectual solidarity was associated with lower mortality in women (HR = 0.77, 95% CI = 0.64–0.92). Friend support was associated with lower mortality in the total sample (HR = 0.89, 95% CI = 0.82–0.98). Friend strain was associated with higher mortality in the total sample (HR = 1.13, 95% CI = 1.01–1.28) and women (HR = 1.31, 95% CI = 1.11–1.56). Friend affectual solidarity was associated with mortality in the total sample (HR = 0.81, 95% CI = 0.70–0.93) and women (HR = 0.74, 95% CI = 0.61–0.89). Spouse support was associated with mortality in the total sample (HR = 0.87, 95% CI = 0.77–0.99). Spouse strain was associated with higher mortality in women (HR = 1.22, 95% CI = 1.02–1.45). Spouse affectual solidarity was associated with mortality in women (HR = 0.83, 95% CI = 0.68–1.00). There was a significant gender difference between mortality and family affectual solidarity (p = 0.045), friend strain (p = 0.020), and spouse strain (p = 0.006). There were no significant relationships between social support, strain, or affectual solidarity and mortality in men.

Table 4 shows the Cox regression model by gender, where support and strain variables from each source were included in one model (i.e., family support and family

Table 2 Pearson correlation coefficients for social support, strain, and affectual solidarity by gender

	Total	Men	Women
Family			
Support–strain	−0.39	−0.36	−0.45
Support–affectual solidarity	0.84	0.84	0.85
Strain–affectual solidarity	−0.83	−0.81	−0.86
Friend			
Support–strain	−0.14	−0.13	−0.16
Support–affectual solidarity	0.83	0.82	0.82
Strain–affectual solidarity	−0.68	−0.67	−0.69
Spouse			
Support–strain	−0.65	−0.59	−0.68
Support–affectual solidarity	0.90	0.88	0.91
Strain–affectual solidarity	−0.92	−0.91	−0.92

Table 3 Multivariable Cox regression estimates between support, strain, affectual solidarity, and mortality

Predictor	Total		Men		Women		Gender * Predictor
	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value	P Value
Family support	0.89 (0.81, 0.98)	**0.023***	0.95 (0.83, 1.09)	0.499	0.81 (0.70, 0.94)	**0.005***	0.114
Family strain	1.03 (0.92, 1.14)	0.622	0.93 (0.80, 1.08)	0.332	1.14 (0.98, 1.33)	0.083	0.071
Family affectual solidarity	0.89 (0.78, 1.01)	0.073	1.01 (0.85, 1.21)	0.895	0.77 (0.64, 0.92)	**0.004***	**0.045***
Friend Support	0.89 (0.82, 0.98)	**0.017***	0.89 (0.79, 1.01)	0.072	0.89 (0.78, 1.02)	0.097	0.973
Friend strain	1.13 (1.01, 1.28)	**0.041***	0.98 (0.82, 1.16)	0.802	1.31 (1.11, 1.56)	**0.002***	**0.020***
Friend affectual Solidarity	0.81 (0.70, 0.93)	**0.003***	0.88 (0.72, 1.07)	0.203	0.74 (0.61, 0.89)	**0.002***	0.217
Spouse support	0.87 (0.77, 0.99)	**0.039***	0.85 (0.70, 1.04)	0.108	0.89 (0.74, 1.06)	0.184	0.779
Spouse strain	1.03 (0.91, 1.16)	0.685	0.87 (0.74, 1.03)	0.116	1.22 (1.02, 1.45)	**0.026***	**0.006***
Spouse affectual solidarity	0.91 (0.79, 1.05)	0.189	1.02 (0.83, 1.26)	0.847	0.83 (0.68, 1.00)	**0.048***	0.137

*Bold indicates significance at p < 0.05. Total adjusted by sex, age group, race, education level, marital status, total household income. Men/Women adjusted by age, race, education level, marital status, total household income

HR hazard ratio, *95% CI* 95% confidence interval

Table 4 Adjusted Cox regression with each support and strain variable from family, friend, and spouse in the same model

Predictor	Total		Men		Women	
	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value
Family support	0.89 (0.80, 0.98)	**0.024***	0.93 (0.81, 1.07)	0.312	0.83 (0.71, 0.97)	**0.019***
Family strain	0.99 (0.88, 1.10)	0.819	0.91 (0.77, 1.06)	0.221	1.07 (0.91, 1.26)	0.406
Friend support	0.90 (0.82, 0.99)	**0.031***	0.89 (0.78, 1.01)	0.067	0.92 (0.80, 1.05)	0.227
Friend strain	1.11 (0.98, 1.26)	0.088	0.96 (0.81, 1.14)	0.663	1.29 (1.08, 1.53)	**0.004****
Spouse support	0.83 (0.70, 0.98)	**0.026***	0.70 (0.55, 0.88)	**0.003****	1.03 (0.81, 1.32)	0.789
Spouse strain	0.92 (0.79, 1.08)	0.305	0.74 (0.60, 0.90)	**0.003****	1.25 (0.98, 1.58)	0.069

Bold indicates significance at *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Total adjusted by sex, age group, race, education level, marital status, total household income. Men/Women adjusted by age, race, education level, marital status, total household income

HR hazard ratio, *95% CI* 95% confidence interval

strain were included in the same model). These analyses informed whether affectual solidarity, which is a combination of support and strain, contributed uniquely to the risk of mortality beyond either support or strain from each source. When entering both support and strain in one model, family support (HR = 0.89, 95% CI = 0.80–0.98), friend support (HR = 0.90, 95% CI = 0.82–0.99), and spouse support (HR = 0.83, 95% CI = 0.70–0.98) significantly contributed to a lower risk of mortality for the total sample; therefore, support was more important than strain in the total sample. Both spouse support (HR = 0.70, 95% CI = 0.55–0.88) and spouse strain (HR = 0.74, 95% CI = 0.60–0.90) contributed to a lower risk of mortality in men. In women, family support contributed to a lower risk of morality (HR = 0.83, 95% CI = 0.71–0.97), while friend strain contributed to a higher risk of mortality (HR = 1.29, 95% CI = 1.08–1.53). Affectual solidarity did not contribute uniquely to the risk of mortality for the total sample, men, or women beyond the observed independent associations of support and strain for the risk of mortality.

Table 5 shows the Cox regression model by gender, where each source of social support, each source of strain, and each source of affectual solidarity were included simultaneously in separate models to determine if one source of support or strain was more important than the other sources. When entering the three different support variables into a model at the same time, only family support was significantly associated with mortality for women (HR = 0.76, 95% CI = 0.60–0.98). For women, family support was more important than support from their friends and spouses. When the three strain variables were entered in one model together, only friend strain was significantly associated with mortality for women (HR = 1.31, 95% CI 1.00–1.72). For women, friend strain was more important in the risk for mortality than strain from their family members and spouses. There were no significant associations between the source of support and strain for men in the sample.

Table 5 Adjusted Cox regression with support variables, strain variables, and affectual solidarity variables in seperate models

Predictor	Total		Men		Women	
	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value
Family support	0.95 (0.81, 1.10)	0.488	1.07 (0.88, 1.31)	0.485	0.76 (0.60, 0.98)	**0.031***
Friend support	0.93 (0.82, 1.06)	0.295	0.88 (0.75, 1.04)	0.140	1.00 (0.82, 1.22)	0.978
Spouse support	0.91 (0.79, 1.05)	0.190	0.86 (0.70, 1.06)	0.169	0.97 (0.79, 1.17)	0.725
Family strain	1.01 (0.86, 1.19)	0.922	1.01 (0.81, 1.26)	0.909	1.05 (0.82, 1.34)	0.709
Friend strain	1.10 (0.92, 1.32)	0.309	0.94 (0.73, 1.20)	0.608	1.31 (1.00, 1.72)	**0.049***
Spouse strain	1.00 (0.87, 1.13)	0.941	0.88 (0.73, 1.05)	0.155	1.13 (0.94, 1.37)	0.200
Family affectual solidarity	0.96 (0.79, 1.16)	0.658	1.06 (0.82, 1.38)	0.643	0.80 (0.60, 1.08)	0.139
Friend affectual solidarity	0.85 (0.70, 1.05)	0.126	0.88 (0.67, 1.15)	0.334	0.82 (0.61, 1.12)	0.215
Spouse affectual solidarity	0.96 (0.83, 1.12)	0.637	1.04 (0.83, 1.31)	0.714	0.91 (0.74, 1.12)	0.393

Bold indicates significance at *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Total adjusted by sex, age group, race, education level, marital status, total household income. Men/Women adjusted by age, race, education level, marital status, total household income

HR hazard ratio, *95% CI* 95% confidence interval

Discussion

In this sample of adults, social support, strain, and affectual solidarity were associated with mortality risk by gender. Specifically, support from family members, friends, and spouses was significantly associated with lower mortality risk for the total sample. Friend strain was associated with a higher risk of mortality in the total sample, and friend affectual solidarity was associated with a lower risk of mortality in the total sample. For women, family support and family, friend, and spouse affectual solidarity were all significantly associated with a lower risk of mortality, whereas both friend and spouse strain were significantly associated with a higher risk of mortality. For women, family support was more important in the risk of mortality compared to support from friends and their spouses, and friend strain was more important in the risk of mortality than family and spouse strain. There were no significant independent associations for men between social support, strain, or affectual solidarity from any of the sources. Finally, affectual solidarity did not contribute uniquely to the risk of mortality beyond that associated with support and strain. These findings suggest, that while support from any source (family, friend, or spouse) may be beneficial in reducing mortality risk for both men and women, family support and friend and spouse strain are likely targets for minimizing mortality risk in women.

Our findings are supported by evidence from previous studies demonstrating that relationships with family members, friends, and spouses impact health. In this sample, we found family, friend, and spousal support to reduce the risk of mortality. This is similar to findings by Becofsky et al., (2015) who found support from relatives and spouses/partners was associated with a lower risk of mortality. Similarly, in a study to investigate the relationship between social support and health, Walen and Lachman (2000) found individuals with greater friend support reported better subjective health.

An additional finding in our study was that friend strain and spouse strain both increased the risk for mortality among women. These findings are supported by previous studies that link strain to biologic markers. Friedman et al. (2012) used cross-sectional data to link family, spouse/partner, and friend strain to dysregulation of cortisol (Friedman et al., 2012). They found that those who reported greater social strain from these sources had more flattened cortisol rhythms (Friedman et al., 2012), which have been associated with shorter survival rates and increased mortality (Abercrombie et al., 2004; Kumari et al., 2011). Unlike the present study, however, Friedman et al. (2012) did not analyze these differences based on gender. Our findings are additionally supported by previous studies that link spousal/partner strain to health. Spousal conflict has been associated with negative health-related behaviors, such as smoking and drinking, for

women exclusively (Cohen et al., 1991). Likewise, longitudinal data has been used to link marital strain to lower self-rated health (Umberson et al., 2006). However, in order to understand differences by gender in the relationship between social strain and mortality, it is necessary to obtain more information regarding the biologic and social mechanisms underlying this phenomenon.

In our study, we also found family affectual solidarity was associated with a lower risk of mortality in women, a contribution based on the roles of support and strain and not on a unique relationship between affectional solidarity and the risk of mortality. Family affectual solidarity takes both strain and support into account to determine the degree of positive or negative sentiment between family members (Grzywacz & Marks, 1999; Hwang et al., 2019). Often, it is associated with the positive connections between people—family members in the current study—and can characterize a relationship as being warm (Hazer et al., 2015). It is further characterized by emotional closeness, attraction, affirmation and affection, interaction, intimacy, and support (when needed) between individuals (Hazer et al., 2015). Grzywacz and Marks (1999) reported associations between family affectual solidarity and positive health-related behaviors for both men and women. They reported greater family affectual solidarity was linked to proper use of medications for both men and women and fewer problems with alcohol for women (Grzywacz & Marks, 1999). The observed finding between family affectual solidarity and lower mortality in our sample implies that perceptions of positive sentiment by women from their family members could potentially be a target of intervention for improving health outcomes. It also lends to understanding the needs of women in the context of family. Conceptually, our findings also warrant a better understanding of family connections across multiple generations (i.e., beyond the nuclear family) and how these relationships influence health behaviors and health outcomes (Bengtson, 2001; Hwang et al., 2019; Lowenstein, 2007). There is a paucity of research in this area; therefore, more work is necessary to demonstrate the link between health behaviors, affectual solidarity, and outcomes such as mortality.

This study is important because it demonstrates the role of social strain and affectual solidarity in the relationship with mortality and reinforces the role of perceived social support in improving health outcomes. Mortality is a terminal outcome that cannot be undone once it occurs. Given this terminality, it is important to identify the factors associated with lowering the risk of mortality in adults. Evidence shows higher social support, reflective of stronger social relationships, is associated with a 50% increased likelihood of survival across multiple factors including sex (Holt-Lunstad et al., 2010). This study demonstrates that perceived social support is important in reducing the risk of mortality and that the source, quantity (how much), and frequency (how

often) of support or strain contribute to these perceptions of support.

Furthermore, these findings demonstrate how social support and strain have the propensity to significantly impact individual health outcomes. The long-term effects of social support and strain on health depends greatly on the source and type of interaction; this is particularly true for the entire population, where the associated mortality risk is higher secondary to friend strain and where for women alone, spouse strain can result in an increased risk for mortality. The reasons for higher risk of mortality in women are not clear; however, evidence suggests that women are more engaged in their social networks and are therefore more likely to experience negative interactions within them (Walen & Lachman, 2000). Understanding how individuals of both sexes are uniquely affected by these relationships will afford the opportunity for recognizing potential areas of concern and targeting areas for intervening in patients' lives in order to optimize their health. Ultimately, this knowledge could be used to further individualize care and provide individuals with resources they need to gain access to relationships that positively influence health and decrease their time spent in relationships known to negatively impact long-term health.

Our study has limitations that must be acknowledged. First, while the data demonstrated an association between several social interactions and mortality, we cannot determine cause and effect of these findings given the cross-sectional study design. Second, since the participants provided information regarding their social interactions via questionnaires, their responses signify their opinions at the time of the survey and not throughout their entire life. These responses may have been influenced by specific factors that were not accounted for in the analyses. Lastly, most of our sample population was composed of non-Hispanic White, educated individuals. Therefore, our results may have limited generalizability to other population groups.

Conclusions

In this cross-sectional study of adults, gender differences in the relationship between all-cause mortality and social support, strain, and affectual solidarity perceived from friends, spouses, and family members was assessed. The results of this study indicate that support from friends, family, and spouse may be beneficial in reducing mortality for both men and women. In addition, the results reveal that friend and spouse strain are targets for minimizing mortality risk in women. Future research should focus on assessing this relationship in different population groups as well as determining a causal relationship between social support and long-term health outcomes such as all-cause mortality.

Compliance with Ethical Standards

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