



Gender differences in the association between modifiable risk factors and financial hardship among middle-aged and older adults

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ABSTRACT

Objective: To identify associations between modifiable risk factors (cigarette smoking, alcohol consumption, and obesity) and financial hardship (difficulty paying bills, food insecurity and medication need) among middle-aged and older Americans in a nationally representative sample.

Methods: This was a cross-sectional study of 8212 persons age 50 years and older who completed the core 2010 Health and Retirement Study survey and the psychosocial questionnaire. We ran separate multinomial logistic regressions to assess the association of three modifiable risk factors and three different financial hardship indicators.

Results: Adjusting for all covariates, compared to men of normal weight, men who were obese had a 1.4 greater odds of difficulty paying their bills (95% CI: 1.08–1.76); former smokers had a 1.8 greater odds of being food insecure (95% CI: 1.05–2.95); current smokers were twice as likely to be food insecure (95% CI: 1.21–3.73); Compared to women who never smoked, current smokers had a 1.5 greater odds of having difficulty paying their bills (95% CI: 1.11–2.02); current smokers had a 1.8 greater odds of being food insecure (95% CI: 1.13–2.91); and women who were obese had a 1.5 greater odds of reducing medication due to cost (95% CI: 1.11, 2.02).

Conclusion: Our findings contribute to the literature on health behaviors and financial hardship by highlighting the cyclical nature between different indicators of socioeconomic status, modifiable risk factors, and poor health outcomes among middle-aged and older adults. Furthermore, findings highlight how modifiable risk factors may culminate in financial hardship in later life.

1. Introduction

Smoking, drinking and obesity are all risk factors leading to poor health outcomes. Participating in these modifiable risk behaviors has been shown to be related to socioeconomic status across the life course (Pampel et al., 2010) and these disparities are increasingly recognized as important and interrelated determinants of preventable deaths in the U.S. (Adler et al., 2016; McGinnis et al., 2002) and around the world (Stringhini et al., 2017).

Socioeconomic status (SES) in the form of education, income and occupational status associated with modifiable risk factors are established predictors of health outcomes. However, the precise relationship between health-related behaviors, financial circumstances and the mechanisms through which modifiable risk behaviors influence SES is still being elucidated. Modifiable risk factors have been found to

mediate the association between SES and mortality (Stringhini et al., 2010; Hastert et al., 2016), and, reciprocally, they may compound financial hardship through a combination of direct and indirect costs (Pampel et al., 2010). Financial hardship, one indicator of SES, has been found to capture other dimensions of SES that relate to identifying those in need and availability of resources (Cook and Kramek, 1986; Mayer and Jencks, 1989; Beverly, 2001). Although there is no consensus on the measurement of financial hardship, some common indicators used in the Health and Retirement Study to operationalize this measure include: difficulty paying bills, food insecurity, and reduced intake of medications due to cost (Marshall and Tucker-Seeley, 2018; Tucker-Seeley et al., 2016; Kiely et al., 2015; De Castro et al., 2010).

In the United States someone who smokes a pack a day spends on average \$1638 per year on cigarettes (Smith, 2008). Over their lifetime, a smoker spends on average \$1.1 million dollars on cigarettes (USA

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Today, n.d.), which rivals retirement savings for the average 65-year-old. While the overall U.S. population has seen a decline in smoking prevalence (Jamal et al., 2014), the prevalence among older Americans has remained stable (Isenberg et al., 2016). Further, the economic burden of smoking-related diseases in medical care and lost productivity is staggering (Goodchild et al., 2017). Many population-level estimates of the total economic costs of smoking tobacco exist for nations and health care systems, yet few studies have examined the direct and indirect financial tolls of tobacco use for individuals. In addition, while dependence on tobacco products may be costly to individuals over time, the effect of tobacco use on financial hardship has not been established among older adults.

Another modifiable risk behavior, at-risk alcohol consumption, has also increased for most sociodemographic groups in the U.S. over the past 10–15 years, especially among individuals with advancing age, low education, and low income (Grant et al., 2017; Han et al., 2017). Alcohol has become more affordable in the U.S. since the 1950's (Kerr et al., 2013), and lower cost alcohol has been linked to greater use (Elder et al., 2010). In addition, alcohol use disorders may interfere with an individual's ability to maintain a consistent work schedule and thus impact SES over the life course (American Psychiatric Association, 2013). The overall societal costs attributed to alcohol-related health consequences are significant (Rehm et al., 2009), but its impact on financial hardship at the individual level has not been characterized.

Obesity is a health outcome that is closely linked to risk factors including physical activity and diet. The prevalence of obesity in the U.S. has been growing for decades at a sizable cost to individuals and society (Flegal et al., 2016; Kim and Basu, 2016). Medical costs attributed to obesity are estimated to be twice as high for older adults than younger adults (Kim and Basu, 2016), which could place additional strain on already tight budgets. Throughout life, obese individuals may also face employment and other forms of discrimination that may lead to financial disadvantage. Outside of studies specific to older adults, there is a rich and complex literature on nutrition, physical activity, and weight in low-income communities (Laraia et al., 2017; Damon and Drewnowski, 2008; Caspi et al., 2012). Findings suggest that financial hardship increases the risk of obesity (Newton et al., 2017; Franklin et al., 2012), however, the association of obesity in reinforcing financial hardship has not been established.

Several studies suggest that gender may influence the relationship between health behaviors and financial hardship. While some studies characterize gender differences in the association between financial hardship and alcohol use (Shaw et al., 2011; Eaton et al., 2014), many more have focused on the differential impact of socioeconomic stress on weight in women vs. men (Conklin et al., 2013; Kim and Frongillo, 2007; Hernandez et al., 2017a; Newton et al., 2017; Franklin et al., 2012; Hernandez et al., 2017b; Murillo et al., 2017; Smith et al., 2016). These studies with general age populations have demonstrated stronger associations between financial hardship and weight gain, waist circumference, and obesity in women than men (Newton et al., 2017; Franklin et al., 2012; Hernandez et al., 2017b; Murillo et al., 2017; Smith et al., 2016; Leung et al., 2012). The few studies that have analyzed gender differences in older adults, have had mixed results (Conklin et al., 2013; Kim and Frongillo, 2007; Hernandez et al., 2017a).

The purpose of this study is to contribute to the literature on modifiable risk factors and financial hardship by: 1) describing the prevalence of modifiable risk factors and among middle-aged and older adults who experience financial hardship; 2) examining the adjusted associations between three modifiable risk factors (cigarette smoking, alcohol consumption, and obesity) and three indicators of financial hardship (difficulty paying bills, food insecurity, delay in taking medication due to cost); and 3) examining how these associations differ by gender. This study builds on previous studies by first examining financial hardship beyond traditional measures of SES and, second simultaneously considering three indicators of hardship. This study

captures the experience of SES that stems from distinct demands on financial resources that impact households day-to-day.

2. Methods

2.1. Data source and study sample

For this study, we used data from the publicly available 2010 wave of the Health and Retirement Study (HRS), which collects information from a nationally representative of non-institutionalized U.S. adults aged 50 years and older, including economic, health, demographic, and retirement data. Since 1992, data for the HRS has been collected bi-annually by the Institute for Research at the University of Michigan with support from the National Institute on Aging (Heeringa and Connor, 1995a). The HRS uses a multi-stage area probability sampling design of representative of non-institutionalized U.S. households, with oversampling for African Americans, Latinos and Florida residents to increase the representativeness of people of color in the sample (Health and Retirement Study, 2013). In 2006, psychosocial information was collected about participant's life circumstances, subjective well-being and lifestyle from a random 50% of the core sample who completed the face-to-face interviews (Smith et al., 2013). Completed Psychosocial and Lifestyle Questionnaires were returned to the study office by mail. A more detailed description of the HRS can be found elsewhere (Sonnegga et al., 2014; Heeringa and Connor, 1995b).

The analytic sample for this study (n = 8212) included respondents who completed the core survey in addition to the Psychosocial Questionnaire.

2.2. Measures

2.2.1. Independent variables

Based on previous recommendations for measures of financial hardship to assess consumption of essential goods and services (Marshall and Tucker-Seeley, 2018; Tucker-Seeley et al., 2016), we operationalized financial hardship using 3 indicators: *difficulty paying bills, food insecurity, and reduced medication use*. Difficulty paying bills was measured using the following question: "How difficult is it for you/your family to meet monthly payments on your/your family's bills?" Food insecurity was measured by asking "In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?" Reduced medication use was measured by asking, "Have you ended up taking less medication than was prescribed for you because of cost?" Each item response was dichotomized (0 = no or not difficult, 1 = yes or difficult). So not to obscure the unique contribution of each hardship variable, we examined the variables individually, rather than as an index of all 3 variables.

2.2.2. Dependent variables

The three *modifiable risk factor* indicators were *cigarette smoking, alcohol consumption, and obesity*. Smoking was categorized into 3 categories: 0 = never smoked; 1 = former smoker; 2 = current smoker. Alcohol consumption was also categorized into 3 categories: 0 = non-drinkers; 1 = low-risk drinker and; 2 = at-risk drinkers. At risk drinking was considered 2 or more drinks per day (Blazer and Wu, 2009; Moore, 2003). Obesity was categorized 0 = normal weight; 1 = overweight; or 2 = obese. Due to the small sample size, those who reported being underweight were considered missing.

2.2.3. Control variables

Control variables included: age (continuous 50–101 years), gender (male or female), race (White, African American and other), marital status (single, married/partnered, or separated/divorced/widowed), education (< 12 years, 12 years, 12+ years), annual household income (< \$20,000, \$20,000–\$39,999, \$40,000–\$59,999, \$60,000+), employment status (employed, unemployed, or retired), activities of daily

living (ADL:1 or more), instrumental activities of daily living (IADL: 1 or more), and depressive symptoms (0 ≤ 4 and 1 = 4+) (Mojtabai and Ofstedal, 2004).

2.3. Statistical analyses

All analyses were conducted using STATA version 14.0 (StataCorp, 2015), with the addition of sampling weights included in the HRS (Ofstedal et al., 2011). First, we generated unweighted frequencies percentages and p-values to describe the study sample. Second, adjusting for all control variables (age, gender, race, marital status, education, income, employment status, ADL, IADL's, depressive symptoms) we tested the association between three different modifiable risk factors and three different financial hardship indicators using multiple logistic regression analyses. Finally, we used the same model and stratified by gender to examine gender differences. All results are reported in odds ratios (OR) with a 95% confidence interval and p-values. Sampling, stratification, and clustering weights were applied to all models. Each multivariate model was developed for each financial hardship indicator as the primary predictor. Of note, data were cross-sectional, which does not permit the testing of causality.

3. Results

Table 1 presents characteristics of the study sample, comparing participants with and without difficulty paying bills, food insecurity, and reduced medication use due to cost. The average age among participants who had difficulty paying bills was 64.0 years (SD = 10.2), 60.4 years (SD = 8.9) for participants who were food insecure, and 61.7 years (SD = 9.0) for participants who reduced medication use due to cost. Almost 63% of the sample who had difficulty paying bills were female, nearly 68% of participants who were food insecure were females, while 68.9% of participants who reduced medication use due to cost were female. Fifty-five percent of the sample who had difficulty paying bills were married/partnered, 47% of the sample who were food insecure were divorced/separated/widowed, and almost 53% of the sample who reduced medication due to cost were married/partnered.

3.1. Difficulty paying bills

In Table 2, we present in the adjusted model, participants categorized as overweight were also found to have a greater odds of difficulty paying bills when compared to normal weight participants (1.21; 95% CI: 1.00–1.48).

3.2. Food insecurity

In the unadjusted model, participants who were current smokers had a 3.4 greater odds of being food insecure compared to those who never smoked (95% CI: 2.54–4.43) and this remained significant after adjusting for covariates (1.9; 95% CI: 1.34–2.65). Former smokers also had a greater odds of being food insecure in the adjusted model compared to never smokers (1.35; 95% CI: 1.34–2.65). Finally, compared to normal weight participants, obese participants had a 2.3 (95% CI: 1.75, 3.01) and a 1.6 (95% CI: 1.12–2.32) greater odds of being food insecure in both the unadjusted and adjusted models, respectively.

3.3. Reduced medication use due to cost

At-risk drinkers had a 57% lower odds of reduced medication use due to cost compared to never drinkers in the unadjusted model, this association remained significant for high-risk drinkers after adjusting for covariates (0.61; 95% CI: 0.44–0.84). Among participants who were obese, there was a 2.1 greater odds of reduced medication use due to cost compared to normal weight participants (95% CI: 1.59–2.73). This association remained significant in the adjusted model: obese

Table 1
Sample characteristics by indicator of financial hardship HRS 2010.^{a,b}

	Difficulty paying bills (N = 7784)		Food insecurity (N = 8156)		Reduced medication use (N = 8198)	
	No	Yes	No	Yes	No	Yes
Age	69.1 (10.6)	64.0 (10.2)	65.9 (10.4)	60.4 (8.9)	66.0 (10.4)	61.7 (9.0)
Race/ethnicity						
White (ref)	83.6%	65.7%	80.1%	50.7%	79.1%	63.4%
Black	11.1%	24.8%	13.8%	38.0%	14.7%	26.3%
Other	5.3%	9.5%	9.5%	11.3%	6.2%	10.3%
Gender						
Male (ref)	43.3%	37.5%	42.4%	32.5%	42.7%	31.1%
Female	56.7%	62.5%	57.6%	67.5%	57.3%	68.9%
Marital status						
Married/partnered (ref)	66.3%	54.6%	63.8%	42.4%	63.2%	52.7%
Single (never married)	3.8%	7.2%	4.5%	10.8%	4.8%	7.4%
Divorced/ separated/ widowed	29.9%	38.2%	31.7%	46.8%	32.0%	39.9%
Education						
< 12 years	14.7%	24.6%	17.2%	29.8%	17.3%	26.8%
12 years (ref)	32.0%	34.2%	32.8%	34.2%	32.9%	32.9%
> 12 years	53.3%	41.2%	50.0%	36.0%	49.8%	40.3%
Income (household)						
< \$20,000	16.6%	34.1%	19.9%	52.7%	21.2%	35.8%
\$20,000–\$39,999	23.4%	28.0%	25.2%	23.3%	24.5%	28.8%
\$40,000–\$59,999	17.4%	15.6%	17.1%	12.5%	16.7%	16.6%
\$60,000+ (ref)	42.6%	23.3%	37.8%	11.5%	37.6%	18.8%
Employment status						
Unemployed (ref)	15.4%	33.7%	19.0%	48.6%	19.6%	38.8%
Employed	34.1%	36.6%	34.6%	36.3%	36.9%	32.6%
Retired	50.5%	29.7%	46.4%	17.1%	45.5%	28.6%
Activities of daily living (ADLs)						
None	90.3%	83.0%	88.8%	76.4%	88.8%	79.0%
1 or more	9.7%	17.0%	11.2%	23.6%	11.2%	21.0%
Instrumental activities of daily living (IADLs)						
None	89.7%	81.1%	87.8%	71.8%	87.8%	76.4%
1 or more	10.3%	18.9%	12.2%	28.2%	12.2%	23.6%
Modifiable risk factors						
Smoking (ref) never	46.7%	40.4%	45.3%	34.6%	45.2%	38.6%
Former	43.2%	38.4%	42.5%	34.8%	42.0%	39.4%
Current	10.1%	21.2%	12.2%	30.6%	12.8%	22.0%
Drinking (ref) non- drinker	40.3%	46.1%	41.9%	48.4%	41.8%	48.6%
Low-risk drinkers	32.0%	33.8%	32.5%	33.6%	32.4%	33.6%
At-risk drinkers	27.7%	20.1%	25.6%	18.0%	25.8%	17.8%
Obesity						
Normal (ref)	30.6%	23.2%	28.7%	21.7%	28.9%	22.4%
Overweight	37.6%	35.5%	37.4%	31.1%	37.7%	30.7%
Obese	31.8%	41.3%	33.9%	47.2%	33.5%	46.9%
Depressive symptoms						
No (ref: CESD ≤ 4 symptoms)	90.7%	75.8%	87.7%	62.8%	88.0%	65.4%
Yes (CESD = 4+ symptoms)	9.3%	24.2%	12.3%	37.2%	12.0%	34.6%

^a N's will vary due to subgroup and response rate.

^b All models are < 0.001.

participants had close to a 1.5 greater odds of reduced medication use due to cost compared to normal weight participants (95% CI: 1.11–1.91).

Table 3 presents the ORs of the association among three modifiable risk factors and all three indicators of financial hardship, stratified by gender and adjusting for all covariates. In Model 1, compared to men of normal weight, men who were obese had a 1.4 greater odds of having difficulty paying their bills (95% CI: 1.08–1.76). Model 2 suggests that, compared to men who never smoked, men who were former smokers

Table 2
Unadjusted and adjusted associations between modifiable risk factors and indicators of financial hardship.

	Difficulty paying bills (N = 7287)		Food insecurity (N = 7366)		Reduced medication (due to cost) (N = 7398)	
	Unadjusted odds ratios (95% CI)	Adjusted odds ratios (95% CI)	Unadjusted odds ratios (95% CI)	Adjusted odds ratios (95% CI)	Unadjusted odds ratios (95% CI)	Adjusted odds ratios (95% CI)
Smoking (ref: never)						
Former	1.01 (0.89, 1.16)	1.05 (0.92, 1.22)	1.23 (0.96, 1.57)	1.35 (1.04, 1.76)**	1.04 (0.88, 1.24)	1.15 (0.94, 1.41)
Current	2.19 (1.84, 2.62)***	1.25 (0.98, 1.60)	3.35 (2.54, 4.43)***	1.88 (1.34, 2.65)***	1.71 (1.36, 2.16)***	1.03 (0.78, 1.38)
Drinking (ref: non-drinker)						
Low-risk drinker	0.88 (0.74, 1.05)	0.99 (0.81, 1.20)	0.82 (0.62, 1.08)	0.98 (0.72, 1.33)	0.75 (0.62, 0.91)**	0.79 (0.64, 0.98)
At-risk drinker	0.64 (0.53, 0.77)***	0.86 (0.69, 1.07)	0.53 (0.38, 0.73)***	0.75 (0.48, 1.16)	0.43 (0.33, 0.56)***	0.61 (0.44, 0.84)*
Obesity (ref: normal)						
Overweight	1.19 (0.99, 1.43)	1.21 (1.00, 1.48)*	1.13 (0.83, 1.53)	1.26 (0.88, 1.80)	1.00 (0.76, 1.31)	1.05 (0.80, 1.38)
Obese	1.70 (1.44, 2.01)***	1.28 (1.05, 1.55)**	2.30 (1.75, 3.01)***	1.61 (1.12, 2.32)**	2.08 (1.59, 2.73)***	1.46 (1.11, 1.91)***

*0.05; **0.01; *** < .001

Note: All adjusted models were adjusted by age, race, sex, education, income, marital status, employment status, ADL's, IADL's, and depressive symptoms.

Table 3
Association between modifiable risk factors and financial hardship; by gender.^a

	Men			Women		
	Model 1 Difficulty paying bills (N = 3089) Odds ratios (95% CI)	Model 2 Food insecurity (N = 3132) Odds ratios (95% CI)	Model 3 Medications (N = 3142) Odds ratios (95% CI)	Model 1 Difficulty paying bills (N = 4198) Odds ratios (95% CI)	Model 2 Food insecurity (N = 4234) Odds ratios (95% CI)	Model 3 Medications (N = 4256) Odds ratios (95% CI)
Smoking (ref: never)						
Former	1.03 (0.83, 1.27)	1.76 (1.05, 2.95)**	1.05 (0.72, 1.52)	1.40 (0.82, 1.33)	1.10 (0.72, 1.66)	1.12 (0.85, 1.49)
Current	1.05 (0.74, 1.48)	2.12 (1.21, 3.73)**	0.80 (0.49, 1.32)	1.50 (1.11, 2.02)**	1.81 (1.13, 2.91)**	1.10 (0.79, 1.54)
Drinking (ref: non-drinker)						
Low-risk drinker	0.94 (0.72, 1.22)	0.94 (0.54, 1.63)	0.56 (0.38, 0.82)**	0.98 (0.75, 1.28)	0.98 (0.71, 1.36)	0.93 (0.70, 1.23)
At-risk drinker	0.85 (0.64, 1.14)	0.67 (0.39, 1.17)	0.44 (0.29, 0.66)***	0.85 (0.65, 1.11)	0.85 (0.49, 1.49)	0.79 (0.50, 1.24)
Obesity (ref: normal)						
Overweight	1.28 (0.94, 1.76)	1.30 (0.72, 2.34)	1.03 (0.64, 1.67)	1.20 (0.92, 1.56)	1.27 (0.78, 2.06)	1.14 (0.81, 1.61)
Obese	1.38 (1.08, 1.76)**	1.50 (0.83, 2.63)	1.64 (0.97, 2.80)	1.21 (0.93, 1.56)	1.71 (1.08, 2.73)**	1.46 (1.11, 1.92)**

*0.05; **0.01; *** < .001

Sample is weighted.

^a Note: All models were adjusted for age, race, sex, education, income, marital status, employment status, ADL's, IADL's, and depressive symptoms.

have almost a 1.8 greater odds of being food insecure (95% CI: 1.05–2.95) and current smokers have more than a 2 times greater odds of being food insecure (95% CI: 1.21–3.73).

Among women, Model 1 suggests that women who are current smokers have a 1.5 greater odds of having difficulty paying their bills compared to never smoked (95% CI: 1.11–2.02). In Model 2, compared to female non-smokers, women who are current smokers have a 1.8 greater odds of being food insecure (95% CI: 1.13–2.91) and compared to women of normal weight, women who were obese has a 1.7 greater odds of being food insecure (95% CI: 1.08, 2.73). Finally, Model 3 suggests that compared to women of normal weight, women who were obese had close to a 1.5 greater odds of reducing medications due to cost (95% CI: 1.11, 2.02).

4. Discussion

This cross-sectional study analyzed the associations between multiple modifiable risk factors (cigarette smoking, alcohol consumption, obesity) and financial hardship (difficulty paying bills, food insecurity, not taking medications due to cost) in a nationally representative sample of middle-aged and older adults.

In fully adjusted models, we found several statistically significant associations between various modifiable risk factors and financial hardship. Analyses also highlighted the significant financial hardships experienced by women in later life, which aligns with earlier research (Minkler and Stone, 1985; Keith, 1993). That > 60% of women in our

sample had difficulty paying bills, close to 70% were food insecure, and 70% reduced medication use due to cost highlights the importance of ongoing efforts to improve income equity between the genders.

Compared to never smokers, both current and former smokers were found to have an increased odds of food insecurity. Findings also suggest that men who were both former and current smokers had an increased odds of food insecurity compared to never smoking men, while only current smoking women had an increased odds of food insecurity and difficulty paying bills compared to never smokers. For neither men nor women smokers were an association found with reduced medication use because of cost. To the best of our knowledge, this is the first study to identify the association between tobacco- use and financial hardship among older individuals. One longitudinal study among older adults found that those with financial hardship had greater odds of subsequent smoking (Shaw et al., 2011) presumably due to stress (Tucker-Seeley et al., 2015; Siahpush et al., 2009; Caleyachetty et al., 2012; Kendzor et al., 2010; Siahpush and Carlin, 2006; Costa and McCrae, 1981). While financial hardship may lead to smoking-related coping behaviors, it is also plausible that smokers who are unable to quit face greater financial hardships. For example, over the past several years, there has been a rise in taxes on tobacco products which has increased the price of cigarettes (*The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*, 2014). Moreover, studies of mixed-age U.S. adults have found that tobacco costs can “crowd out” other necessities like food, clothing, healthcare, and rent payments (Busch et al., 2004; Baggett et al., 2016). Tobacco

cessation, on the other hand, has been associated with lower spending on things that enable or complement smoking, including alcohol (Rogers et al., 2017).

Problematic alcohol consumption may interfere with drinker's ability to keep a job interpersonal relationships that offer economic support (American Psychiatric Association, 2013). Similar to tobacco use, alcohol consumption may take a toll on an individual's finances leading to financial hardships. However, our study found that, compared to never use, at-risk alcohol consumption was associated with lower odds of reduced medication use due to cost, though only remained significant among men in our gender-based analyses. Previous studies suggest that involuntary job loss is associated with increased odds of initiating alcohol consumption, but not the quantity of alcohol consumed (Gallo et al., 2001). Another study found that financial hardship increased the odds of subsequent heavy drinking in older men and those with low educational levels, but not other sociodemographic groups (Smith, 2008). More research is needed on the intersection of how financial hardship and alcohol use intersect with decisions to use or not use medications. Perhaps alcohol is used more often than medications to reduce emotional distress and help to regulate negative emotions that come from financial hardship (Abbey et al., 1993; Greeley et al., 1999; Veenstra et al., 2007; Canham et al., 2016). As well, at-risk drinkers may be less likely to reduce medication use for a number of reasons that should be explored in future research, including that at-risk drinkers are more likely to spend money on alcohol than medication or have lower rates of medication use compared to never drinkers.

Compared to normal weight participants, participants who were obese had significant increased odds of all three indicators of financial hardship. Obese men had an increased odds of difficulty paying bills, while obese women had an increased odds of food insecurity and reduced medication use due to cost. These findings converge with an earlier study that evaluated financial hardship in older white Europeans from 10 countries and reported a robust association between financial hardship and obesity in men and women (Eaton et al., 2014). In another study, food insecurity was associated with weight gain in older U.S. adults, while participation in Supplemental Nutrition Assistance Programs weakened the association (Conklin et al., 2013). Finally, a third study that has examined the association between low-income older U.S. adults and obesity determined that food insecurity was associated with obesity in men, whereas women had high prevalence of obesity regardless of food security (Kim and Frongillo, 2007). Of note, these earlier studies used different measures to quantify financial hardship than we used, but we identified similar associations.

This study contributes to the literature by describing how some health behaviors may have an added toll on individual and family finances. This is an important issue to study because it may help illuminate the cyclical nature of the relationship between SES (focusing on income/wealth) and poor health outcomes. Furthermore, it highlights how modifiable risk factors – often socioeconomically patterned and used to cope with stressful life experiences – may be associated with financial hardship in later life. Forgoing needed medications and food insecurity are major contributors to poor health among lower income older adults and may aggravate chronic health conditions, such as diabetes and hypertension, by inflicting both physical and mental harm.

This study has several strengths. First, we used a large, nationally representative sample of middle-aged and older adults in the United States. Outcomes of financial strain are robust, well-known measures that have been previously used to capture this complex construct. Further, by studying these relationships in an aging population, we can infer that unhealthy behaviors likely reflect long-term modifiable risk factors. This may add support to our hypothesis that financial strain may be due to the culmination of poor health behaviors over time, however, future research is needed to examine these associations over time. Further, this study adjusts for a range of pertinent factors that may confound the relationship between modifiable risk factors and

financial strain.

This study also has several weaknesses. Because this is a cross-sectional study, we cannot suggest a causal relationship between our modifiable risk factors predictors and our financial strain outcomes. Furthermore, reverse causation may threaten the validity of these findings. For example, those who are experiencing financial hardships may cope by smoking cigarettes. Or perhaps, if someone has been a smoker for a while or smokes heavily it may lead to financial hardship because the price of cigarettes are so expensive or they may have to pay more in health care coverage premiums because they are smokers. In another case, obesity may hinder one's economic life or perhaps people who have a more difficult economic life may consume poorer diets and are more likely to become obese or overweight.

Future studies using other statistical methods (e.g., instrumental variable estimation) and study designs (e.g. longitudinal) should further explore the relationship we identified. For instance, an instrumental variable approach could be used with this cross-sectional data to better address the potential issue of reverse causation while strengthening causal inference. Alternatively, analysis of longitudinal HRS data could identify whether that financial strain pre-dates modifiable risk factors. Despite these limitations, the present study contributes to the literature by being one of the first to examine the relationship between multiple modifiable risk factors and multiple indicators of financial hardship in a sample over age 50 years.

Future research should aim to corroborate this study's findings so that we can identify potential intervention points on these relationships at the individual, family, and policy level to promote greater financial, physical, and mental well-being among middle-aged and older adults. For instance, while individuals may not grasp health-focused arguments for avoiding smoking, unhealthy risky alcohol use, or obesogenic behaviors, they may be compelled to change these behaviors if they are aware of the economic consequences of these issues. At the family level, discussing these modifiable risk factors as risks to economic well-being may foster greater levels of family support. Further, policies could be developed to reduce the links between financial hardship and modifiable risk factors, which could be perpetuating poor health among socially disadvantaged older adult populations. For instance, health care systems may find additional incentive to address risky alcohol use, poor nutrition, and physical inactivity earlier in life to reduce the immediate and future financial burden of these modifiable risk factors.

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