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Predictors of health behaviors after the economic downturn: A longitudinal study

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Abstract

Economic declines and their associated stress, shortage of financial resources, and changes in available time can impair health behaviors. This study tested the association between change in working hours, change in employment status, and financial strain and health behaviors measured after the 2008 recession after controlling for pre-recession levels of the health behaviors. The moderating influences of demographic factors and pre-recession levels of the health behaviors on the association between change in working hours and employment status and financial strain and the health behaviors were also tested. Participants (N = 3984) were from a longitudinal study of a U.S. Midwestern community-based sample. Regression analyses tested the unique relations between change in hours worked per week, change in employment status, and financial strain and five health behaviors over and above demographic factors and pre-recession levels of the same behavior. Models included predictor by covariate interactions. Participants who reported higher levels of financial strain engaged in lower levels of all but one of the five health behaviors, but there were no significant main effects of a change in the number of hours worked per week or change in employment status. Significant interactions revealed moderation of these relations by demographic characteristics, but findings differed across health behaviors. Financial strain negatively affected engagement in multiple healthy behaviors. Promoting the maintenance of healthy behaviors for disease prevention is an important public health goal during times of economic decline.

Keywords

USA; Diet; Exercise; Financial strain; Health Behaviors; Seat belts; Smoking

Introduction

Considerable research has investigated the health effects of economic decline. Recent reviews concluded that poor economic conditions increase the risk of psychological and behavioral morbidity, including violence and suicide (Catalano et al., 2011), and mental health problems, including depression and substance use (Goldman-Mellor et al., 2010).

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Most of this prior work has focused on health *outcomes*, as opposed to health *behaviors*, which can help to prevent adverse health outcomes. However, economic downturns might be expected to negatively influence health behaviors through multiple mechanisms, including increases in stress that change motivation to engage in health behaviors, decreased financial resources, and changes in working hours or employment status that influence the time available to commit to health behaviors such as exercise. Few studies have tested the effect of an economic downturn on specific health behaviors, and they have not been entirely consistent in their findings. For example, financial strain has been associated with cigarette smoking, difficulty quitting smoking, and smoking relapse (Falba et al., 2005; Kendzor, et al., 2010; Nelson et al., 2008; Siahpush & Carlin, 2006), and a recent cross-sectional study found that full-time employment was associated with healthier eating habits, more physical activity, less cigarette smoking, and less alcohol consumption, compared with part-time employment or unemployment (Rosenthal et al., 2012). In contrast, however, findings from prospective studies in Iceland showed that the 2008 recession there led to improvements in most health behaviors considered, including smoking, heavy drinking, unhealthy eating, and indoor tanning (Ásgeirsdóttir et al., 2012; McClure et al., 2012), and Ruhm (2005) found that smoking and excess weight declined while physical activity rose during temporary economic downturns from 1987 to 2000 in the United States. Importantly, Ruhm (2005) predicted changes in health behaviors from relatively small-scale, temporary declines in macroeconomic activity. The inconsistencies in these studies' findings might be due in part to differences in how different recession-related factors influence health behaviors. That is, financial strain may have a different impact on health behaviors than changes in working hours or changes in employment status. For example, financial strain may negatively affect health behaviors due to decreased financial resources to purchase healthier foods or participate in organized exercise activities. In contrast, changes in employment status may result in more leisure time thus increasing opportunities for physical activity. Thus, the current study tested the association between financial strain, changes in working hours, and changes in employment status and engagement in health behaviors.

The current economic recession in the United States, the largest financial crisis since the Great Depression, will continue to place many Americans under financial strain. As such, it is critical for public health to better understand how financial challenges affect health behaviors, especially given the current recession, which has affected individuals of varying income levels. We capitalized on two waves of longitudinal data, one collected before and one collected after the recession started in 2008, so that we tested the relations between financial strain and changes in working hours and employment status and health behaviors over and above pre-recession levels of the health behaviors. Moreover, poor economic conditions may have different influences on different health behaviors, and previous studies have generally been restricted to one outcome. In addition to the Ruhm (2005) study that preceded the current recession, exceptions include the Rosenthal et al. (2012) cross-sectional analysis, the prospective studies from Iceland (Ásgeirsdóttir et al., 2012; McClure et al., 2012), and a study that reported significant associations between credit card debt and several health behaviors, but it was cross-sectional and restricted to a sample of college students (Nelson et al., 2008). In the current study, we examined changes in five health behaviors of mid-life adults – checking the ingredient label when buying food, choosing foods to eat based on health value, frequency of vigorous exercise, cigarette smoking, and seat belt use. We chose a range of health behaviors because financial strain and changes in working hours and employment status may have differential effects on different behaviors. For example, financial strain is likely to reduce resources available to purchase healthy foods, whereas a reduction in working hours (or a change in employment status from full-time to part-time) may provide additional leisure time to engage in physical activity. Therefore, we hypothesized that financial strain would be negatively associated with the behaviors related to healthy eating and with cigarette smoking, and change in working hours and employment

status would be associated with increased frequency of vigorous exercise. Finally, we included seat belt use as a health behavior that requires neither financial nor time resources hypothesizing that there would be no relation between the predictors of interest and post-recession seat belt use.

In testing the relations between changes in working hours and employment status and financial strain and health behaviors, we utilized a large, longitudinal, community sample. In addition to considering pre-recession levels of each health behavior, we also tested the association between changes in working hours and employment status and financial strain and the health behaviors over and above the effects of sex, age, marital status, and educational attainment, all of which were expected to influence the health behaviors. National epidemiologic data demonstrate that females are more likely to eat a healthy diet, more likely to always wear a seat belt, and less likely to smoke cigarettes. Those who are married are more likely to always wear a seat belt and less likely to smoke, and those with higher educational attainment are more likely to eat a healthy diet, more likely to exercise regularly, more likely to always wear a seat belt, and less likely to smoke (Centers for Disease Control and Prevention, 2009; 2010). Based on these data, we expected that females, those who were married, and those of higher educational attainment would be more likely to engage in healthy behaviors.

Moreover, the relations between financial strain and change in hours worked per week and employment status and health behaviors may vary as a function of demographic characteristics or prior levels of the health behaviors. One study found that financial strain was more strongly associated with difficulty quitting smoking for single individuals compared to those who were married or living with a partner (Kendzor et al., 2010), but another study of older adults did not find this (Falba et al., 2005). Rosenthal et al. (2012) did not find evidence of gender, race, or ethnicity moderating the effect of employment status on health behaviors, but McClure et al. (2012) found that a reduction in income resulted in lower risk of smoking relapse for males but not for females. Thus, little is known about whether financial strain or changes in working hours or employment status affect health behaviors differently as a function of demographic differences. Moreover, it is unknown whether the relations between financial strain or changes in working hours or employment status and health behaviors will vary as a function of pre-existing levels of health behaviors. Perhaps if high levels of health behaviors are already established, there will be little negative impact of financial strain and changed working hours or employment status. Accordingly, we tested both demographic factors and pre-existing levels of health behaviors as potential moderators of the relations between financial strain and changes in working hours and employment status and the five health behaviors.

In sum, the current study utilized a large sample to test the association between financial strain and changes in working hours and employment status and multiple health behaviors measured after the recent economic downturn. Availability of longitudinal data allowed us to control for pre-recession levels of the same behaviors. We also controlled for known demographic predictors of health behaviors. Although these methods create a conservative test, they increase confidence that any significant findings can be attributed to the effects of financial strain and changes in hours worked and employment status. Finally, the current study is the first to examine whether demographic characteristics and the prior level of the behavior moderate the relations between financial strain and changes in working hours and employment status and health behaviors.

Methods

Participants

Participants were from the Indiana University Smoking Survey, an ongoing cohort-sequential study of the natural history of cigarette smoking (Chassin et al., 2000). Between 1980 and 1983, all consenting 6th to 12th grades in a U.S. Midwestern county school system completed annual surveys. The total sample size of those who were assessed at least once was 8487. Follow-up surveys were conducted in 1987, 1993, 1999, and 2005. An additional wave of follow-up started in late 2009 and is nearing completion (this wave is referred to as the 2011 wave). At each completed wave, 70% or more of the original sample has been retained. The original 1980 to 1983 survey data were collected with group-administered questionnaires in school. In 1987, these procedures were followed for cohorts who were still in high school. For older cohorts and for all participants in 1993, 1999, 2005, and 2011, a survey was sent by mail followed by telephone interviews, and an online survey in 2011, if surveys were not returned. Participants were paid \$15 to \$35 over the waves, and in 1999, 2005, and 2011 they were also entered into lottery drawings for cash prizes up to \$500. The research protocol was approved by the Institutional Review Board at Indiana University, and informed consent was obtained for participation in the research.

Demographically, the sample is similar to the community from which it was drawn. For example, the marriage rate is 64% in this sample compared to 66% among similarly aged adults in the Midwest (Lugaila, 1998), and the high school graduation rate is 97% in this sample compared to 92% among similarly aged adults in the Midwest (Day & Curry, 1998). Thus, the sample is representative of its community, one that is well educated and predominantly white. At the current follow-up, 52.5% reported educational attainment of at least a bachelor's degree. Because the sample is 96% non-Hispanic Caucasian, ethnic differences are not considered. Attrition biases have been discussed in detail elsewhere (Rose et al., 1996). For each follow-up, those who were lost were compared with those who were retained in terms of their earlier data. Those lost to follow-up were more likely to be smokers, have more positive attitudes and beliefs about smoking, and have parents and friends who smoked. Although these biases are small in magnitude, caution is warranted when making generalizations.

For the current study, we selected participants who completed the mailed survey in both 2005 and 2011 and who reported working at least part-time in 2005. Compared to those who were lost to follow-up from 2005 to 2011, those who were retained were more likely to be female, married, and have a college degree (all χ^2 -square p -values < .05), but there was no age difference. After excluding 201 individuals due to missing data on covariates or predictors, the final sample eligible for analyses was 3984 (55% female; mean age = 43.1, SD = 2.7, range 37 to 50). Compared to those who were excluded due to missing data, those who were retained were younger (t -test p < .05) and more likely to have a college degree (χ^2 -square p < .05), but there were no differences in sex and marital status. Characteristics of the final sample are shown in Table 1.

Measures

Demographics—Because demographic characteristics are known to influence health behaviors, we tested the relations between financial strain, change in working hours, and change in employment status and the health behaviors over and above sex, age, marital status, and educational attainment (see Table 1 for descriptive statistics). Marital status was dichotomized into currently married and unmarried, and educational attainment was dichotomized into less than a bachelor's degree and bachelor's degree or higher.

Health behaviors—We measured health behaviors with identical items in 2005 and 2011 (see Table 1 for descriptive statistics). For each analysis, the post-recession health behavior was used as the outcome variable and its pre-recession level was a predictor. Participants reported their current level of five health behaviors. First, participants reported their extent of agreement (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree) with the statement, “When buying a food product, I first check the ingredient label to make sure of its health value.” They also reported their frequency of deciding what to eat based on the health value of foods (never, rarely, sometimes, often, always), their frequency of vigorous exercise or participation in active sports or other similar activities (less than once a month, at least once a month, once a week, two to three times a week, more than three times a week), and their frequency of seat belt use when either driving or riding in a car (never, rarely, sometimes, often, always). Finally, participants reported the quantity of cigarettes usually smoked in a day.¹ As reported elsewhere, the validity of the self-reported smoking in this sample has been supported by using an unannounced bioassay (Chassin et al., 1990). Because of the distribution of the seat belt and the smoking measures (85.3% of participants were non-smokers and 87.5% of participants always wore a seat belt in 2011) and because completely abstaining from smoking and always wearing a seat belt are the standard behaviors for improving public health, we created dichotomous variables for these two health behavior outcomes.

Change in hours worked per week—In 2005 and 2011, participants reported the number of hours per week they usually worked. Response options were less than 10 hours, 10 to 20 hours, 21 to 30 hours, 31 to 40 hours, and more than 40 hours. For analyses, participants were grouped into those who reported no change in hours worked per week from 2005 to 2011 and those who reported any change, positive or negative, in hours worked per week. Because economic decline can result in fewer working hours (due to job loss or cut-back) or more working hours (due to taking a second job), we used any change in working hours as a predictor.²

Change in employment status—In 2005 and 2011, participants reported their employment status. Response options were no current paid employment, full time employment, part time employment, temporarily laid off, and student teaching assistantship, research assistantship, or fellowship. For analyses, participants were grouped into those who reported no change in employment status from 2005 to 2011 and those who reported any change in employment status.

Financial strain—In 2011, participants responded to three items to measure financial strain (Vinokur et al., 1996). The questions asked, “How difficult is it for you to live on your total household income right now?”, “In the next three months, how often do you think that you or your family will experience bad time such as poor housing or not having enough food?”, and “In the next three months, how often do you expect that you will have to do without the basic things that your family needs?” The three items were measured on five-

¹We conducted a separate analysis with number of cigarettes smoked in a day as the outcome selecting participants who were smokers in 2005 (N = 681). Educational attainment ($\beta = -1.820$, SE = .862, $p < .05$), marital status ($\beta = -1.886$, SE = .660, $p < .01$), smoking quantity in 2005 ($\beta = .604$, SE = .034, $p < .001$), and financial strain ($\beta = .700$, SE = .325, $p < .05$) were significantly associated with smoking quantity in 2011.

²We conducted additional analyses with this variable coded as negative versus all others, positive versus all others, and as a three level variable (negative change, no change, and positive change). Results were unchanged when we grouped participants into those who reported a negative change versus all others. That is, a negative change in working hours was not significantly associated with any health behavior. When we grouped participants into those who reported a positive change versus all others, change in working hours was significantly associated only with frequency of vigorous exercise ($\beta = .138$, SE = .055, $p < .05$). Similarly, when we used the three level variable, change in working hours was significantly associated only with frequency of vigorous exercise ($\beta = .097$, SE = .031, $p < .01$).

point scales and were averaged to create a financial strain score ($\alpha = .802$). Higher scores reflected more financial strain.

Data analyses

We first examined all bivariate relations among study variables. We computed phi coefficients for relations between two dichotomies, point-biserial correlations for relations between a dichotomous and a continuous variable, and Pearson correlations for relations between two continuous variables. We then used hierarchical multiple regression models to test the associations between the predictor variables and the five health behavior outcomes. Logistic regression was used for the two dichotomous outcomes, smoking and seat belt use. Sex, age, marital status, educational attainment, and the 2005 level of the health behavior were entered in the first block. To test the unique contribution of changes in working hours, changes in employment status, and financial strain over and above these demographic covariates and the 2005 level of the health behavior, change in hours worked per week and employment status and financial strain were entered in the second block. Finally, we tested the moderating effects of the demographic factors and the 2005 level of the health behavior on the association between changes in working hours and employment status and financial strain and the 2011 level of the health behavior. Therefore, three blocks of interactions were then entered into the regression models. The first block of interactions contained all of the two-way interactions between financial strain and the potential moderators, the second block of interactions contained all of the two-way interactions between change in hours worked per week and the potential moderators, and the third block of interactions contained all of the two-way interactions between change in employment status and the potential moderators. Interaction terms were computed with mean-centered variables. Non-significant interactions were trimmed from the final models. To probe significant interactions, we followed the methods of Aiken and West (1991), testing the relation between the predictor variable and the health behavior at 1 *SD* below the mean, at the mean, and at 1 *SD* above the mean of the moderator variable. In the case of dichotomous moderator variables, the relation between the predictor variable and the health behavior was tested at the two levels of the moderator variable.

Results

Overall, the sample demonstrated favorable changes between their 2005 reports and 2011 reports for all five health behaviors. Means and standard deviations for the continuous variables and numbers and percentages for the dichotomous variables are presented in Table 1. Paired sample t-tests for the continuous variables and McNemar tests for the dichotomous variables showed that all improvements in health behaviors from 2005 to 2011 were statistically significant (all *p*-values < .001).

Bivariate relations among study variables are presented in Table 2. In terms of demographic factors, females were more likely to check the ingredient label when buying food and choose foods based on health value, older participants were less likely to check the ingredient label and more likely to smoke on a daily basis, and those who were married and who had higher educational attainment were more likely to engage in all five healthy behaviors. Those who reported changes in hours worked and employment status were more likely to check the ingredient label when buying food, choose food based on health value, and smoke on a daily basis. Finally, those who reported more financial strain were less likely to engage in all five healthy behaviors.

Results of regression analyses testing the association between the five health behaviors and demographic variables, 2005 levels of the health behaviors, changes in working hours, and financial strain are presented in Table 3. This table shows the results after the final block,

with all predictors entered. As shown in Table 3, for all health behaviors, an individual's pre-recession level of the behavior was a significant predictor of their post-recession level of that behavior (all p -values $< .001$). In terms of demographic predictors, females were significantly more likely than males to check the ingredient label when buying food, choose foods to eat based on health value, and always use a seat belt (all p -values $< .01$). Participants who were married were significantly more likely to not smoke on a daily basis ($p < .01$). Finally, there was a significant association between educational attainment and all health behaviors (all p -values $< .001$) except always using a seat belt, such that those with a bachelor's degree or higher engaged in higher levels of the health behaviors.

The relations of most interest were between change in working hours, change in employment status, and financial strain and the health behaviors. As shown in Table 3, after adjusting for effects of pre-recession levels of the health behavior, sex, age, marital status, and educational attainment, financial strain was significantly associated with all health behaviors (all p -values $< .05$) except always using a seat belt. Participants who reported higher levels of financial strain engaged in lower levels of the health behaviors. However, there were no significant main effects of a change in the number of hours worked per week or a change in employment status on any of the health behaviors.

We were also interested in the moderating effects of the covariates on the relation between changes in working hours, changes in employment status, and financial strain and the five health behaviors. The significant interactions for each health behavior are shown in Table 3. In testing the behavior of checking the ingredient label when buying food, there were two significant interactions, financial strain by sex ($p < .05$) and financial strain by educational attainment ($p < .05$). Higher financial strain was significantly associated with less checking of ingredient labels for females ($\beta = -.112$, $SE = .022$, $p < .001$) but not for males ($\beta = -.038$, $SE = .027$, $p = .16$). In addition, higher financial strain was significantly associated with less checking of ingredient labels for those with less than a bachelor's degree ($\beta = -.112$, $SE = .021$, $p < .001$) but not for those with a bachelor's degree or higher ($\beta = -.018$, $SE = .031$, $p = .57$). In testing frequency of vigorous exercise, financial strain ($p < .001$) and change in hours worked per week ($p < .01$) both interacted with age. Financial strain was significantly associated with lower frequency of exercise at all ages (1 SD below the mean age: $\beta = -.091$, $SE = .037$, $p < .05$; mean age: $\beta = -.170$, $SE = .026$, $p < .001$; 1 SD above the mean age: $\beta = -.249$, $SE = .035$, $p < .001$), but the magnitude of the effect was larger as age increased. A different pattern was observed for change in hours worked per week. A change in working hours was significantly associated with higher frequency of vigorous exercise at 1 SD above the mean age ($\beta = .138$, $SE = .061$, $p < .05$), but not at the mean age ($\beta = .020$, $SE = .047$, $p = .67$) or at 1 SD below the mean age ($\beta = -.098$, $SE = .062$, $p = .11$). We also found an interaction between financial strain and the pre-recession level of frequency of vigorous exercise in testing post-recession frequency of vigorous exercise ($p < .05$). Financial strain was significantly associated with lower frequency of exercise at all pre-recession levels of exercise frequency (1 SD below the mean: $\beta = -.135$, $SE = .031$, $p < .05$; mean: $\beta = -.193$, $SE = .027$, $p < .001$; 1 SD above the mean: $\beta = -.250$, $SE = .041$, $p < .001$), but the magnitude of the effect was larger as the level of pre-recession exercise frequency increased. For the daily smoking outcome, we found an interaction between change in employment status and educational attainment. A change in employment status was associated with higher likelihood of not smoking for those with a bachelor's degree or higher ($\beta = .587$, $SE = .325$, $p = .07$) but lower likelihood of not smoking for those with less than a bachelor's degree ($\beta = -.332$, $SE = .219$, $p = .13$). Note that these effects did not reach statistical significance. Finally, for seat belt use, there were three significant interactions, financial strain by sex ($p < .01$), financial strain by the pre-recession level of seat belt ($p < .01$), and change in employment status by the pre-recession level of seat belt ($p < .01$). Financial strain was negatively associated with post-recession seat belt use for men ($\beta = -$

169, $SE = .092$, $p = .07$) but positively associated with post-recession seat belt use for women ($\beta = .207$, $SE = .112$, $p = .06$), but these effects were not statistically significant. For participants who always wore a seat belt before the recession, higher financial strain was associated with less seat belt use after the recession ($\beta = -.274$, $SE = .112$, $p < .05$). However, for participants who did not always wear a seat belt before the recession, the relation between financial strain and seat belt use was not statistically significant ($\beta = .103$, $SE = .082$, $p = .21$). A different pattern was observed for change in employment status. For participants who did not always wear a seat belt before the recession, a change in employment status was associated with an increased likelihood of always wearing a seat belt after the recession ($\beta = .388$, $SE = .196$, $p < .05$). However, for those who always wore a seat belt before the recession, the relation between change in employment status and post-recession seat belt use was not statistically significant ($\beta = -.389$, $SE = .237$, $p = .10$).

Discussion

The current study is the first to use longitudinal data to test the impact of financial strain, changes in working hours, and changes in employment status on multiple health behaviors assessed after the current economic downturn after controlling for pre-recession levels of the health behaviors. It is also the first to systematically test for moderation of the relation between financial strain and changes in working hours and employment status and health behaviors as a function of demographic factors and prior levels of the health behaviors. This is an important area of study because individuals who engage in healthy behaviors, despite the negative influence of an economic recession, are more likely to avoid preventable morbidity and premature mortality. For example, a prospective study found that high financial strain at baseline predicted higher levels of fasting glucose at follow-up, but only among those who reported low levels of physical activity (Puterman et al., 2012). Moreover, a better understanding of how the influence of a recession on health behaviors varies for different demographic sub-groups will aid in the development of targeted public health interventions to help high risk groups maintain healthy behaviors, even in the face of an economic downturn.

The first finding of note was that, overall, participants demonstrated higher levels of all five health behaviors after the economic downturn as compared to their pre-recession levels. This is a promising finding that, despite the global financial crisis, health behaviors improved in this large community-based sample of mid-life adults. This is consistent with other studies that have found positive population-level changes in health behaviors in the midst of economic downturns (Ásgeirsdóttir et al., 2012; McClure et al., 2012; Ruhm, 2005). The positive changes observed in the sample from the current study may reflect secular trends due to outcomes of public health education campaigns and policy-based initiatives. For example, national epidemiologic data from the U.S. show that the proportion of adult smokers has decreased from 2005 to 2010 (Centers for Disease Control and Prevention, 2005; 2010), and seat belt use rates have increased from 2005 to 2010 (National Highway Traffic Safety Administration, 2005; 2010). However, exercise and healthy eating behaviors have not similarly improved during this same time period (Centers for Disease Control and Prevention, 2005; 2010). Thus, the positive changes in these behaviors observed in this sample may be attributable to age-related changes in health behaviors.

Despite the overall improvement in health behaviors in this sample from 2005 to 2011, it is unlikely that all individuals in the sample experienced the same changes during a time period characterized by a major economic downturn. Therefore, the primary goal of this study was to test the association between three recession-related factors, change in hours worked per week, change in employment status, and financial strain, and the five health behaviors. For four of the five health behaviors considered, a higher level of financial strain

was associated with less engagement in healthy behaviors. That is, individuals who reported higher levels of financial strain were significantly less likely to make health-based decisions about food, exercise frequently, and abstain from smoking. The lack of a significant association between financial strain and seat belt use is not surprising considering that seat belt use is a relatively automatic behavior that does not require time or financial resources to routinely perform. These results are consistent with prior work that demonstrated an association between financial strain and smoking (Falba et al., 2005; Kendzor, et al., 2010; Nelson et al., 2008; Siahpush & Carlin, 2006). Our findings suggest that these relations hold true for other health behaviors as well. This is in line with findings from Rosenthal et al. (2012), which demonstrated an association between employment status and health behaviors. Importantly, the association between financial strain and reduced health behaviors found in the current study was present after controlling for demographic characteristics and pre-recession levels of these same health behaviors. By controlling for initial levels of the behaviors, the impact of financial strain was demonstrated over and above age-related changes in health behaviors.

We did not, however, find any significant associations between change in the hours worked per week or change in employment status and the five health behaviors. One explanation for this finding is that these changes could represent a positive or negative development. For example, a reduction in hours worked could be in response to downsizing but could also be a response to a spouse's increased compensation. Studies that have used unexpected job loss as the predictor variable demonstrated negative effects on health outcomes (Falba et al., 2005; Jin et al., 1995). Unfortunately, limitations in our data do not permit us to examine the reasons for a change in hours worked or employment status or changes in income at the family level. Another possible reason for this finding is the relatively long time period between measurements of hours worked per week and employment status. An individual may have experienced multiple changes in working status between 2005 and 2011, but we do not have data on changes that may have occurred between these two time points. One explanation that can be ruled out is that the lack of significant relations was due to our use of any change as the predictor variable. Additional analyses also generally found no significant associations between increased working hours or decreased working hours and the health behaviors. The only exception to this was a significant association between increased working hours, tested as a dichotomous variable and a three level variable, and greater frequency of vigorous exercise. Working more hours per week may provide additional income for a health club membership and/or increased access to exercise facilities at the workplace.

Our second goal was to test for moderation of the association between financial strain, changes in working hours, and changes in employment status and the health behaviors. There were two instances of moderation by age on frequency of vigorous exercise. First, financial strain had a more negative impact on exercise among the oldest participants in the sample. The older participants may have other financial responsibilities, such as college tuition payments for children, so that financial strain resulted in personal sacrifices related to spending money on health club memberships. Interestingly, a change in hours worked per week was associated with increased frequency of exercise only for the oldest participants. This suggests that, for the older participants, a change in hours worked that was not accompanied by an increase in financial strain may have provided more time for exercise (Ruhm, 2005). It is important to note that the age range of the sample (37 to 50) was relatively narrow, so our findings suggest that these moderating effects are not taking place just for very old versus very young individuals.

In terms of sex differences, financial strain was associated with checking the ingredient label when buying food only for females. This is likely due to females doing a larger share of

grocery shopping and being more likely to check food labels in general. Level of educational attainment moderated the association between change in employment status and cigarette smoking. A change in employment status was associated with higher likelihood of not smoking for those with a bachelor's degree or higher but lower likelihood of not smoking for those with less than a bachelor's degree. This finding suggests that a change in employment status may be more detrimental to those with less educational attainment. This is consistent with prior work that demonstrated a significant effect of job loss on increasing smoking (Falba et al., 2005). Finally, the pre-recession level of seat belt use moderated the relations between financial strain and change in employment status and the post-recession level of seat belt use. A negative association between financial strain and seat belt use was found only for those who had a high level of seat belt use before the recession. For participants who had a low level of seat belt use before the recession, a change in employment status was associated with an increased likelihood of always wearing a seat belt after the recession. Given financial sanctions for failure to obey seat belt laws, perhaps those who lost jobs increased their seat belt use to avoid financial penalties.

Although the current study makes an important contribution to the literature, there are limitations that must be considered. First, there were some demographic differences between participants included in these analyses and those lost to follow-up and those excluded due to missing data. In addition, the community from which this representative sample was drawn is predominantly white and well-educated. For these reasons, some caution is warranted in generalization. Also because of the racial and ethnic homogeneity, testing for moderating effects of race and ethnicity was not feasible. Second, the overall level of financial strain reported by the study participants was relatively low. Therefore, the findings may not generalize to other populations harder hit by the economic downturn. Third, we did not collect data at the household level, so we were unable to determine whether a change in working hours or employment status was due to a change in a spouse's working situation. However, the items in the financial strain scale ask about economic conditions at the level of the family. Fourth, the current study did not consider the role of potential mediators of the relation between the recession-related variables and the health variables. For example, stress may be a mediating factor in the relation we found between financial strain and smoking, especially considering the important role that stress plays in predicting smoking behavior (Richards et al., 2011). Fifth, because participants did not report financial strain in 2005, we were unable to test change in financial strain as a predictor of the health behaviors.

Despite these limitations, this study showed that financial strain reported during a major economic recession had a negative impact on a range of health behaviors. This adds to the substantial existing evidence that economic hardship is related to negative physical and mental health outcomes (Catalano et al., 2011; Goldman-Mellor et al., 2010). The results of the current study demonstrate the need for public health campaigns designed to promote and maintain healthy behaviors during difficult economic times and for social services to aid families experiencing financial strain. Moreover, although financial strain was related to diminishing four of five health behaviors, effects were pronounced for selected behaviors for participants who were older, female, and had less education. Thus, interventions targeted toward specific sub-populations may be more effective for promoting health behaviors during a recession.

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Highlights

- Tests the association between recession-related factors and five health behaviors.
- Financial strain was related to less engagement in all but one health behavior.
- Demographics moderated the relation between financial strain and health behaviors.
- Targeted public health campaigns are needed during difficult economic times.

Table 1

Sample characteristics and descriptive statistics of predictor variables and health behaviors (N = 3984)

Characteristic/Variable	Continuous variables			Dichotomous variables		
	Mean (Standard deviation)		Range	Number (Percent)		
<u>Demographics</u>						
Age	43.08 (2.75)		37 – 50	--		
Sex (female)	--		--	2185 (54.8)		
Marital status (married)	--		--	2846 (71.4)		
Educational attainment (BA or higher)	--		--	2049 (51.4)		
<u>Predictors</u>						
Change in hours worked per week (any change)	--		--	1627 (40.8)		
Change in employment status (any change)	--		--	905 (22.7)		
Financial strain ^a	1.62 (0.81)		1 – 5	--		
<u>Health behaviors</u>	<u>2005</u>	<u>2011</u>	<u>Δ 2005 to 2011</u>	<u>2005</u>	<u>2011</u>	<u>Δ 2005 to 2011^c</u>
Check ingredient label when buying food ^b	3.21 (1.10)	3.34 (1.10)	t = 8.18***	1 – 5	--	--
Choose foods to eat based on health value ^b	3.36 (0.91)	3.47 (0.89)	t = 8.50***	1 – 5	--	--
Frequency of vigorous exercise ^b	2.83 (1.43)	2.96 (1.47)	t = 6.03***	1 – 5	--	--
Daily smoking (nonsmokers)	--	--	--	--	3294 (82.9)	3396 (85.3) OR = 2.12***
Always use a seat belt (yes)	--	--	--	--	3125 (78.6)	3483 (87.5) OR = 4.45***

BA = Bachelor of Arts degree;

^aHigher values reflect more financial strain;^bHigher values reflect more positive health behaviors;^cMcNemar test result.***
p < .001

Table 2

Bivariate relations among study variables (N = 3984)

	Sex	Age	Marital status	Education	Change in hours worked	Change in employment status	Financial strain	Check label, 2005	Choose healthy foods, 2005	Exercise, 2005	Daily smoking, 2005	Seat belt use, 2005	Check label, 2011	Choose healthy foods, 2011	Exercise, 2011	No daily smoking, 2011	Seat belt use, 2011
Sex	1.00																
Age	-.026	1.00															
Marital status	.020	.001	1.00														
Educational attainment	0.14	-.085***	.100***	1.00													
Change in hours worked	.138***	.021	-.058***	-.041*	1.00												
Change in employment status	.166***	-.010	-.042**	-.039*	.528***	1.00											
Financial strain	.041**	.031*	-.204***	-.261***	.110***	.188***	1.00										
Check label when buying food, 2005	.162***	-.009	.020	.240***	.035*	.055**	-.103***	1.00									
Choose foods based on health value, 2005	.201***	-.005	.046**	.317***	.040*	.048**	-.152***	.645***	1.00								
Frequency of vigorous exercise, 2005	.014	-.010	.016	.254***	-.014	-.016	-.192***	.311***	.390***	1.00							
Daily smoking, 2005	.029	-.063***	.164***	.272***	-.063***	-.056***	-.254***	.170***	.221***	.164***	1.00						
Seat belt use, 2005	.247***	-.003	.076***	.218***	.041*	.036*	-.077***	.181***	.224***	.097***	.107***	1.00					
Check label when buying food, 2011	.191***	-.035*	.040*	.259***	.036*	.060***	-.138***	.613***	.525***	.242***	.170***	.179***	1.00				
Choose foods based on health value, 2011	.200***	-.007	.064***	.293***	.040*	.050**	-.167***	.523***	.617***	.307***	.200***	.212***	.654***	1.00			
Frequency of vigorous exercise, 2011	.016	-.014	.053**	.249***	-.009	-.015	-.218***	.237***	.298***	.532***	.138***	.088***	.277***	.391***	1.00		
No daily smoking, 2011	.016	-.055***	.174***	.264***	-.064***	-.062***	-.259***	.171***	.204***	.164***	.754***	.099***	.182***	.211***	.157***	1.00	
Seat belt use, 2011	.183***	.016	.047**	.107***	.024	.029	-.036*	.118***	.140***	.049**	.053**	.533***	.125***	.163***	.068***	.040*	1.00

Note. Phi coefficients for relations between two dichotomies; point-biserial correlations for relations between a dichotomous and a continuous variable; Pearson correlations for relations between two continuous variables.

* $p < .05$;
** $p < .01$;

Table 3

Results for full hierarchical regression models predicting engagement in health behaviors in 2011

Predictor	Continuous outcome variables ^a			Dichotomous outcome variables	
	Check ingredient label when buying food, β (SE) (n = 3980)	Choose foods to eat based on health value, β (SE) (n = 3976)	Frequency of vigorous exercise, β (SE) (n = 3975)	Do not smoke on a daily basis, AOR (95% CI) (n = 3982)	Always use a seat belt, AOR (95% CI) (n = 3981)
	Adjusted $R^2 = .40$	Adjusted $R^2 = .40$	Adjusted $R^2 = .31$	Pseudo $R^2 = .37$	Pseudo $R^2 = .21$
<u>Covariates</u>					
Sex (0=male, 1=female)	.211 (.028) ***	.152 (.023) ***	.025 (.040)	.95 (.72, 1.26)	1.53 (1.20, 1.95) **
Age	-.007 (.005)	.002 (.004)	.0005 (.007)	1.00 (.95, 1.01)	1.03 (.99, 1.08)
Marital status (0=unmarried, 1=married)	.010 (.030)	.030 (.025)	.057 (.044)	1.65 (1.24, 2.20) **	1.07 (.84, 1.37)
Educational attainment (0=less than BA, 1=BA or higher)	.241 (.029) ***	.177 (.024) ***	.282 (.041) ***	2.19 (1.61, 2.96) ***	.91 (.71, 1.16)
2005 level of health behavior	.558 (.013) ***	.546 (.013) ***	.498 (.014) ***	78.73 (59.28, 104.58) ***	23.98 (18.50, 31.09) ***
<u>Predictors</u>					
Change in hours worked per week (0=no change, 1=any change)	-.008 (.032)	.008 (.026)	.018 (.047)	.88 (.64, 1.22)	.93 (.71, 1.21)
Change in employment status (0=no change, 1=any change)	.073 (.039)	.049 (.031)	.046 (.055)	1.15 (.76, 1.73)	.86 (.58, 1.27)
Financial strain	-.060 (.019) **	-.068 (.015) ***	-.188 (.027) ***	.77 (.66, .90) **	.80 (.72, 1.05)
<u>Interactions^b</u>					
Financial strain by sex	-.076 (.034) *	--	--	--	1.50 (1.15, 1.96) **
Financial strain by educational attainment	.095 (.037) *	--	--	--	--
Financial strain by age	--	--	-.033 (.009) ***	--	--
Financial strain by 2005 level of health behavior	--	--	-.044 (.017) *	--	.69 (.52, .91) **
Change in hours worked by age	--	--	.047 (.014) **	--	--
Change in employment status by educational attainment	--	--	--	2.51 (1.23, 5.11) *	--
Change in employment status by 2005 level of health behavior	--	--	--	--	.54 (.30, .95) *

SE = standard error; AOR = adjusted odds ratio; CI = confidence interval; BA = Bachelor of Arts degree.

^aRange for continuous outcome variables was 1 to 5;^bNon-significant interactions were trimmed from models;*
 $p < .05$;**
 $p < .01$;

 $p < .001$.