

Health and health behaviors during the great recession: a note on drinking, smoking, obesity, and physical activity

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Received: 15 September 2015 / Accepted: 21 February 2017 / Published online: 21 March 2017
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Abstract Previous studies have shown that recessions are typically associated with better health and health behaviors. With the exception of a few recent studies however, these studies focus on sample periods that end prior to the Great Recession. The few exceptions that extend the analysis period beyond the Great Recession suggest that the pro-cyclical relationship between macroeconomic conditions and mortality obtained in earlier studies might have weakened over time. In this paper, we revisited the relationship between state unemployment rate and a large set of outcomes of health and health behaviors using data from the Behavioral Risk Factor Surveillance System (BRFSS) between 1990 and 2014. Overall, our results suggest that state unemployment rate is weakly related to both health and health behaviors as our estimates are too small to have any meaningful implications, although they are largely imprecisely estimated. Finally, we tested whether the Great Recession played a significant role in influencing the pattern in the relationship between unemployment rate and health and health behaviors. Our results from this analysis do not reveal any measurable recession effect, although the estimates are again largely imprecise.

Keywords BRFSS · Health · Recession · Unemployment · Smoking · Obesity

JEL Classification E32 · I10 · I12 · I14 · I15

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1 Introduction

The most recent recession in the United States, commonly referred to as the “Great Recession” differs significantly from any other economic crisis since World War II, and closely resembles the Great Depression, particularly in terms of its severity and duration. The recession, which lasted for 18 months, officially ended in June 2009, but the recovery had been slow, particularly in job creation and the unemployment rate remaining stubbornly high until recently. The purpose of this paper is to provide a fresh examination of the relationship between macroeconomic conditions and health and health behaviors for a period that envelops the Great Recession. To accomplish this goal, we employ individual level data from the Behavioral Risk Factor Surveillance System (BRFSS) between 1990–2014. While the BRFSS was used previously to study the relationship between unemployment and health outcomes of individuals, our study is novel in terms of studying a large set of outcomes reflecting both health and health behaviors for a period that leads up to, coincides with, and follows the Great Recession.¹

Our empirical strategy closely follows the approach developed by Ruhm (2015, 2016). Ruhm (2015) revisited the aggregate mortality and unemployment relationship using data from multiple sources over the period between 1976 and 2010. He found that the strong procyclical pattern of mortality present in the 1970s and 1980s has largely disappeared or even become countercyclical in recent years. One exception to this was the deaths from cardiovascular disease and transport accidents. Interestingly, Ruhm (2015) showed that the decline in the procyclicality of mortality began long before the Great Recession and in fact increased slightly in the recession. In a follow-up study, Ruhm (2016) extended the analysis period to 2013 and confirmed the earlier findings of a declining procyclical fluctuation in U.S. mortality. Furthermore, this analysis also revealed that the two severe economic crises occurring at the beginning of 1980s and the Great Recession both had a protective effect on mortality that was about twice as large as that estimated by the higher unemployment rates experienced during such periods alone. In light of these recent studies, a relevant question to consider is whether and to what extent a similar pattern is present for health behaviors and the outcomes of health other than mortality.

2 Data

The Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (BRFSS) is an on-going health survey system tracking the health conditions and risk behaviors in the United States since 1984. Steadily expanding from 15 states in 1984, the BRFSS is a representative telephone survey that currently provides coverage of all 50 states and the District of Columbia. Over the course of each year, the BRFSS contacts over 200,000 individuals to create a repeated annual cross section. The present study focuses on the period from 1990 to 2014, for which the sample size totals around 2.36 million individuals after limiting

¹ A description of the literature on the relationship between macroeconomic conditions and health and health behaviors can be found in Tekin et al. (2013).

the analysis to individuals ages 25 to 55 and excluding missing observations on key variables.² Descriptive statistics for the health behaviors and all of our covariates are presented in Table 1.

Our measure of economic conditions is the state unemployment rate. This measure is obtained from the Local Area Unemployment Statistics (LAUS) of the Bureau of Labor Statistics (BLS). As shown in Table 1, the average state unemployment rate was 6.3% during our analysis period. We take the average of this measure over a 3-month period because contemporaneous values might not reflect the true economic conditions in a state, but rather capture short-term fluctuations. We also estimated our models using an alternative measure defined as the percentage of individuals employed at the state level. The implications of the results from the analysis using this alternative measure are very similar to those presented here.³

Topics included in BRFSS provide an extensive overview of a respondent's current health, health history, and health behaviors. We focus on smoking behavior as the first domain of outcomes in our study. The "Current Smoker" outcome is an indicator variable equal to 1 if the respondent is a current smoker, and 0 otherwise. BRFSS provides information on the smoking behavior based on whether the respondent smokes daily, some days, is a former smoker, or has never smoked. The current smoker variable indicates whether the respondent smokes daily or some days. Similarly, "Daily Smoker" indicates whether the respondent smokes every day.

Our next set of outcomes is related to alcohol consumption. Specifically, we examine three measures of alcohol use: being a current drinker, binge drinking, and chronic drinking. The outcome of being a "current drinker" measures overall alcohol use, with any reported use over the past month resulting in a value of 1. Being a "binge drinker" is measured by an indicator, which takes on the value of 1 if the respondent drank more than five servings of alcohol in one sitting during the previous month, and 0 otherwise. Lastly, the "chronic drinking" is defined as a binary indicator for drinking more than 60 alcoholic beverages per month.

In addition to changes in consumption patterns of potentially harmful products, the economic cycle can also affect physical activity patterns and dieting. We examine this potential channel through the "Physical Activity" and "Obesity" outcomes. In the BRFSS, the respondents are asked: "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" If the respondent reported any physical activity in the past 30 days other than that which he or she does while working, we defined a "Physical Activity" indicator that takes on the value of 1, and otherwise 0. Similarly, the "Overweight," "Obese," and "Severely Obese" outcomes are indicator variables equal to 1 if the respondent's self-reported height and weight result in a Body Mass Index (weight in kilograms/height in meters squared) greater than 25, 30, and 35, respectively.

Our next set of outcomes measures the respondent's reported health directly. The outcome of "General Health" captures the respondent's overall general health at the

² Note however that the sample size for each regression slightly differs from the baseline sample size due to the number of observations in the outcome variables.

³ The full set of results from the analyses using the employment measure are presented in Tekin et al. (2013).

Table 1 Descriptive statistics

Variable	Mean	Standard deviation
Outcomes		
Current smoker	0.230	0.421
Daily smoker	0.177	0.359
Current drinker	0.587	0.486
Binge drinker	0.156	0.401
Chronic drinker	0.057	0.233
Physical exercise	0.763	0.410
Overweight	0.599	0.472
Obese	0.240	0.452
Severely obese	0.087	0.282
General health	0.874	0.305
Excellent health	0.240	0.420
Poor health	0.029	0.121
Fair to poor health	0.126	0.331
Mental10: Poor mental health>10 days/month	0.142	0.333
Mental20: Poor mental health>20 days/month	0.078	0.248
Control variables		
State unemployment rate	0.063	0.024
Age: 25–29	0.164	0.352
Age: 30–34	0.185	0.385
Age: 35–39	0.170	0.367
Age: 40–44	0.177	0.388
Age: 45–49	0.153	0.367
Age: 50–54	0.151	0.375
Male	0.484	0.498
Married	0.638	0.479
Divorced	0.104	0.295
Widowed	0.012	0.098
Other marital status ^a	0.247	0.435
Less than high school ^a	0.105	0.291
High school	0.263	0.434
Some college education	0.273	0.443
College	0.358	0.487
White	0.664	0.475
Black	0.117	0.318
Other ^a	0.109	0.264
Hispanic	0.110	0.362

Note Data are from 1990 to 2014 years of the BRFSS. Number of observations are 2,362,954 for the summary statistics

^a Omitted category

time of the interview. While the original response is a categorical variable on a Likert scale from 1 to 5, we condense respondent's answers to a binary variable equal to 1 if the respondent is in very good or excellent health, and 0 otherwise. Likewise, the outcomes of "Excellent Health" and "Poor Health" are indicators if the respondent reports being in excellent or poor health, respectively. We also have an outcome to represent those individuals who report being in either "poor" or "fair" health. Finally, we consider two measures that capture the mental health status of the respondents. These outcomes are measured by indicator variables equal to 1 if the respondent reports poor mental health for more than 10 or 20 days in the past month, and 0 otherwise. About 87 percent of our respondents were in either good or excellent health.

Finally, we also supplement our analysis with a set of explanatory variables including binary indicators representing age, gender, race and ethnicity, marital status, and education. The descriptive statistics for all the variables in our analyses are presented in Table 1.

3 Empirical method

We estimate a series of regressions that relate changes in health and health behaviors to state unemployment rate along with a vector of individual level characteristics. Specifically, our basic empirical model is in the following form:

$$H_{ismy} = \alpha_0 + \alpha_1 UR_{smy} + \mathbf{X}_{ismy} \alpha_2 + \mu_s + \delta_m + \lambda_y + \rho sy + \varepsilon_{ismy}, \quad (1)$$

where H_{ismy} is one of our outcome measures for individual i living in state s interviewed in month m of year y . The vector \mathbf{X}_{ismy} represents exogenous individual characteristics displayed in Table 1. The variable of interest in Eq. (1) is UR_{smy} , the state's average unemployment rate.

In Eq. (1), we also control for state fixed effects, μ_s , which would account for permanent differences across states that may affect health and health behaviors, such as lifestyles associated with weather patterns, persistent smoking propensities, and state infrastructures on health care and education. Therefore, the identification of α_1 in Eq. (1) comes from within state variation in economic conditions over time, rather than fluctuations across states. The δ_m is a vector of month fixed effects, which accounts for the impact of seasonality that may exist in some of the health behaviors such as physical activity (Ruhm 2005). We also control for year fixed effects, λ_y , which would capture nationwide trends and shocks that may influence health behaviors, such as national fluctuations in food and cigarette prices, calorie content in national chain restaurants, the reduction in payroll tax in 2010, and federal regulations related to health. We further control for confounding factors that may trend linearly by adding a vector of state-specific linear time trends denoted by ρsy . Adding state-specific linear time trends help us account for unobserved factors that vary within states over time, such as social norms related to health behaviors like smoking and exercise. These trends also help us control for other state level time-varying factors such as changes in health care delivery services that closely follow tax revenues. The ε_{ismy} is an idiosyncratic random error term. We estimate linear probability models using Ordinary Least Squares (OLS) and report robust standard

errors clustered at the state level. All the regressions are weighted using the BRFSS sampling weights.⁴

4 Results

Table 2 presents the estimates of the relationship between state unemployment rate and health and health behaviors from Eq. (1). The first column corresponds to estimates from a specification with state, month, and year fixed effects along with time-variant state characteristics. The second column adds state-specific linear time trends to the list of controls in column 1. Robust standard errors clustered at state level are shown in parentheses.

The emerging pattern from Table 2 is that the coefficients are mostly small in magnitude and imprecisely estimated, and this pattern is largely consistent between columns 1 and 2. Focusing on the estimates in column 2, in which we account for unobserved differences across states that trend linearly, the only coefficients that are estimated with precision are those of the two smoking variables and both of them correspond to relatively small effect sizes. In particular, a one-percentage point increase in the state unemployment rate is associated with a 0.469 percentage-point decrease in the likelihood of being a current smoker and a 0.353 percentage-point decrease in the likelihood of being a daily smoker. These coefficients translate into an effect size of approximately 2% for both outcomes. The negative relationship between unemployment and smoking behavior obtained here is largely consistent with the previous literature (e.g., Ruhm 2005). The estimates on the other variables draw a mixed picture in terms of the direction of the relation. For example, chronic drinking appears to be negatively associated with unemployment while being a current drinker or a binge drinker is positively associated. Similarly, the relationship between unemployment rate and being overweight appears to be positive, but the pattern is the opposite for being obese or severely obese. Physical activity has a positive coefficient, suggesting that a rise in unemployment increases physical exercise. The point estimate translates into an effect size of 0.431 percentage point or less than one percent calculated at the sample mean of 0.763.

Regarding the self-reported health outcomes, the evidence in Table 2 is again mixed in terms of the direction of estimates. For example, unemployment rate appears to be negatively associated with both being excellent health and fair to poor health, but the estimates are economically and statistically insignificant in both cases. The pattern is similar for the two mental health outcomes, where the estimates are with opposite sign, but neither coefficient is significant nor sizeable. Note that the physical and mental health measures in BRFSS are self-assessed and therefore subject to reporting bias. For example, the response patterns to these questions may be influenced by economic conditions. The reporting bias may be even more severe if the responses of survey participants were also influenced by the physical and mental health of other people close to them. These potential measurement problems may be one reason for the inconsistency between the findings on health outcomes in our

⁴ Note that we also estimate unweighted regressions. These results are similar to those presented here and are available from the authors upon request.

Table 2 Estimates of the relationship between unemployment and health and health behaviors

Outcome	I	II
Current smoker	−0.382** (0.120)	−0.469** (0.136)
Daily smoker	−0.321** (0.085)	−0.353** (0.101)
Current drinker	0.083 (0.179)	0.026 (0.160)
Binge drinker	0.126 (0.145)	0.026 (0.083)
Chronic drinker	−0.060 (0.040)	−0.092 (0.057)
Overweight	−0.017 (0.077)	0.019 (0.076)
Obese	−0.009 (0.104)	−0.043 (0.089)
Severely obese	−0.012 (0.063)	−0.019 (0.039)
Physical activity	0.507* (0.240)	0.431 (0.246)
General health	−0.108 (0.119)	0.062 (0.069)
Excellent health	−0.052 (0.098)	−0.012 (0.072)
Poor health	0.045 (0.027)	0.024 (0.031)
Fair to poor health	0.108 (0.119)	−0.062 (0.069)
Mental health problems > 10 days	0.100 (0.083)	−0.016 (0.092)
Mental health problems > 20 days	0.119* (0.056)	0.047 (0.054)
Month fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
State fixed effects	Yes	Yes
State-specific linear trends	No	Yes

Note Standard errors are clustered at state. A * and ** indicate that the estimate is statistically significance at the 95 and 99 percent levels of confidence, respectively

analysis and the procyclical mortality obtained in the literature. Overall, nine of the 15 estimates, including the two statistically significant ones, imply that an increase in unemployment is associated with an improvement in health and health behaviors. Having said that, they are too small in magnitude to have any meaningful implications for any practical purposes.

It is not clear from the results discussed above whether the pattern in the relationship between health and health behaviors and state unemployment rate presented above has been stable during the entire period of our analysis or it has changed over time. To investigate this possibility, we followed the approach used by Ruhm (2015, 2016). In particular, we specified the analysis period for a fixed duration of 15-years, and sequentially estimated the specification in Eq. (1) for all alternative 15-year periods permitted by the data.⁵ For ease of exposition, we present the point estimates on the state unemployment rate from this analysis in a series of graphs. As shown in Fig. 1,

⁵ Note that we performed this analysis using 5-year and 10-year periods as well. While the overall pattern from these estimations are similar to those from the analysis using the 15-year year window, the estimates were somewhat noisier. This is consistent with Ruhm (2015), who concludes from his analyses of the relationship between unemployment and mortality using similar methods that the estimates could be too noisy to be informative when analysis periods are too short. The results from these estimations were presented in Tekin et al. (2013).

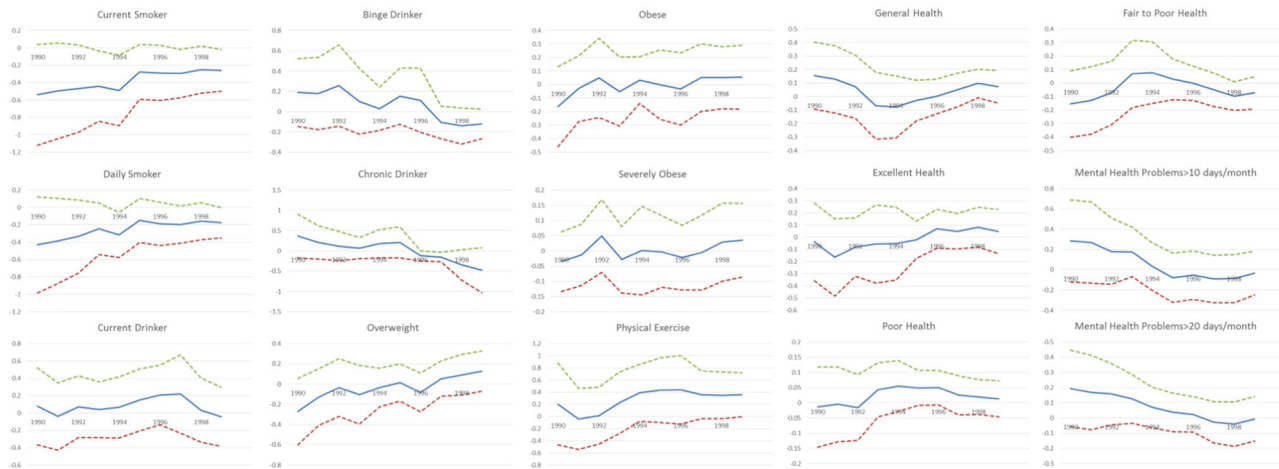


Fig. 1 Changes in the relationship between unemployment and health and health behaviors over time: 15-year windows. *Note:* The dotted lines represent the 95% confidence intervals

the majority of estimates are imprecisely estimated throughout the 15-year period, but the relationship appears to diminish steadily and get closer to zero over time for most of the outcome variables.

The results discussed above are drawn from a sample that envelops the period of the Great Recession. Given the severity of this recession, it would be interesting to examine whether the recession played any role in influencing any of our estimated relationships. To investigate this possibility, we performed two robustness analyses.⁶ First, we estimated our models adding a control for an indicator for the period of the Great Recession. In this analysis, the coefficients on the Great Recession indicator revealed no association between our outcomes and the recession. Second, we estimated models that not only contained an indicator for Great Recession, but also an interaction term between this indicator and the state unemployment rate. This analysis again revealed no particular change in pattern of the relationship between the outcome variables and macroeconomic conditions during the period of the Great Recession. However, the coefficients on the interaction terms are again imprecisely estimated with the exception of a few. It is important to note that year fixed effects had to be excluded from these two analyses in order to avoid perfect collinearity. Therefore, these estimates should be viewed with caution due to potential omitted variable bias.

The results discussed above assume that the relationship between macroeconomic conditions and health and health behaviors is identical for all demographic groups. Such an assumption may obscure potentially important differences in the cyclicity of the relationship across different population groups. In a recent investigation Ólafsdóttir and Ásgeirsdóttir (2015) document that the 2008 Icelandic economic collapse had significantly different effects on the drinking behavior between males and females. We investigated this issue by estimating our models by gender as well as race and ethnicity. The results from this analysis reveals minor differences across different and racial groups (see Tekin et al. 2013).

5 Conclusion

The relationship between macroeconomic conditions and health has been widely studied. A common finding in this literature is that health, typically measured as mortality, improve during economic downturns and worsen during economic booms. Another strand of research, which has focused on measures of health behaviors rather than mortality, has also documented a similar pattern in the relationship, although the consensus among these studies is not as strong. However, with the exception of a few recent studies that focus on mortality, the available evidence overwhelmingly come from analyses of data that predate the Great Recession. The few exceptions that extend the analysis period beyond the Great Recession suggest that the pro-cyclical relationship between macroeconomic conditions and mortality obtained in earlier studies might have weakened over time. In the current paper, we provide new estimates of the relationship between state unemployment rate and the outcomes of physical and mental health and a wide range of health behaviors using data from

⁶ These results from these analyses are presented in Tekin et al. (2013).

BRFSS between 1990 and 2014. Overall, our results indicate that state unemployment rate is weakly related to both health and health behaviors as our estimates are too small to have any meaningful implications. However, most of the coefficients in our analyses are imprecisely estimated. Furthermore, there is also some evidence that this relationship has been tightening around zero over time. Finally, we tested whether the Great Recession played a significant role in influencing the pattern in the relationship between unemployment rate and health and health behaviors. Our results from this analysis do not reveal any measurable recession effect, although the estimates are again largely imprecise. The reasons for the potential weakening in the relationship between macroeconomic conditions and health and health behaviors are not well-understood at the present and remain an important question for future research.

Acknowledgement Erdal Tekin gratefully acknowledges support from the Gary and Stacey Jacobs Fellowship.

Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interests.

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