Are Recessions Good for Your Health Behaviors?

Impacts of the Financial Crisis in Iceland

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Introduction

The seemingly flourishing economy of Iceland suffered a major meltdown during the first days of October 2008, when the three largest banks collapsed and became nationalized. In a televised address, Prime Minister Geir Haarde stated: "There is a very real danger, fellow citizens, that the Icelandic economy, in the worst case, could be sucked with the banks into the whirlpool and the result could be national bankruptcy." (Prime Minister's Office, 2008). The day of this landmark speech, October 6, 2008, has widely been viewed as the beginning of the economic crisis in Iceland. A period of economic and political turmoil followed, leading to uncertainty about the future prospects of the Icelandic people. During the following months, hundreds of firms in the country declared bankruptcy. Inhabitants of Iceland, a population of 320,000, who weeks earlier thought they were living in one of the world's richest nations, were now facing the prospects of unemployment as well as private and national debt. The announcement of the crisis triggered further unforeseen consequences, including the United Kingdom government's decision to invoke anti-terrorism legislation to freeze the assets of one of the three large banks (Landsbanki), emergency funding from the International Monetary Fund, massive protests against the government, and political instability resulting in a cabinet change in February 2009. A sudden and dramatic macroeconomic shock of this magnitude and scope affects the entire population, particularly in a small open economy with its own currency and for which exchange rates and prices were suddenly and dramatically altered. Such a shock has the potential to affect multiple domains of wellbeing—financial, psychological, and physical.

A growing literature has focused on the effects of macroeconomic conditions on health in developed countries. Pioneering work by Ruhm (2000) found that although there is considerable evidence that long-term economic growth promotes population health, short-term downturns in

economic activity in the United States counter-intuitively lead to reduced mortality rates. That research has spawned a wave of studies investigating the relationships between business cycles and health that has no doubt been fueled in recent years by the Great Recession in the U.S. and more general global economic decline. Ruhm (2003) found that individuals are less healthy during economic expansions, with the strongest negative effects for those who are of working age, employed, and male; that the negative health effects of economic expansions persist or accumulate over time, are larger for acute than chronic ailments, and occur despite a protective effect of income and a possible increase in the use of medical care; and that mental health appears to be better during expansions, a pattern opposite from that for physical health.

Economic theory and past research point to several mechanisms by which recessions may affect health. At the macro level, recessions may improve health through improvements in the physical environment (e.g., through reductions in air pollution or traffic) or social environment (e.g., through greater social cohesion in times of crisis). However, recessions could also compromise health through changes in the social environment (e.g., social activities may become limited because of widespread inability to afford them) or deteriorations in public service infrastructure (e.g., reductions in health services or essential services such as police and firefighting). At the micro level, recessions could affect health behaviors through changes in prices, wealth, income, and time constraints. This particular relation is the focus of this paper. The direction of the effects would depend on the specific behaviors and pathways, but some studies have found that behaviors improve during recession. In addition, recession may lead to reduced job-related health risks (e.g., a construction worker who becomes unemployed may no longer be working with dangerous machinery). However, losing a job, income, and/or real wealth may cause stress, leading to worse health. Additionally, economic conditions may affect

environmental factors, such as availability of high-quality health care, leading to a reduction in health care utilization.

Background

Empirical literature

In considering the effects of macroeconomic fluctuations on health behaviors, researchers have focused on both health-compromising behaviors, such as binge drinking and smoking, and—to a lesser extent—on health-promoting behaviors, such as exercise. Although the body of research findings is growing, it is not yet clear whether and how various behaviors are affected. Pacula (2011), in a recent review of the literature on the effects of business cycles on excess alcohol consumption, highlights empirical challenges involved in isolating business cycle effects from other confounding factors.

In this study, we exploit the October 2008 financial crisis in Iceland—a severe and unexpected macroeconomic shock that can be pinpointed to a single day—to identify the effects of a macroeconomic downturn on a range of individual health behaviors. We use longitudinal survey data collected in 2007 (during the boom) and 2009 (during the bust) that includes pre- and post- reports of the same health behaviors as well as other relevant variables. We investigate the effects of the crisis on a range of health-compromising behaviors (smoking, heavy drinking, "junk food" consumption, and indoor tanning) and health-promoting behaviors (dental visits; consumption of fruits, vegetables, and other health-promoting foods; use of dietary supplements; and getting the recommended amount of sleep). Because we observe information on health behaviors as well as key hypothesized mechanisms (work hours, real income, and stress) on the same individuals over time, we are able to investigate mechanisms underlying changes in health behaviors. We are thus able to disentangle—at least to some extent—general effects of the

economic downturn overall from those arising from individuals' changes in circumstances that resulted from the shock.

The effects of the crisis on the various health behaviors are expected to differ by changes in time constraints, relative prices, and real income. All else equal, we expect that the crisis reduced health behaviors that are goods intensive, such as cigarette smoking, alcohol consumption or taking dietary supplements; increased health behaviors that are time intensive, such as getting the recommended amount of sleep; and reduced health behaviors with higher relative price increases (e.g., heavily imported goods such as alcohol or fruit, since a major effect of the crisis was the devaluation of the Icelandic krona). However, there may be offsetting effects through factors such as the overall economic and social environment.

The most studied health behaviors as outcomes of macroeconomic fluctuations are alcohol use and abuse.[1] Findings on the effects of the business cycle on problem or binge drinking remain mixed. For example, three studies using data from the U.S. Behavioral Risk Factor Surveillance System (BRFSS) survey to examine the impact of poor economic conditions on problem drinking have arrived at very different conclusions.[2] Ruhm and Black (2002) concluded that problem drinking decreases during recessions, while Dee (2001) concluded that problem drinking is countercyclical (that is, people drink too much in bad economic times) and Vilaplana, Labeaga and Jiménez-Martín (2006) concluded that drinking is unaffected by the business cycle. According to Pacula (2011), the discrepancies across studies result from the use of different empirical specifications, measures of key variables and inclusion or exclusion of key controls. A more recent study by Davalos, Fang and French (2011) using the National Epidemiological Survey on Alcohol and Related Conditions found results consistent with those

[1] Although light or moderate alcohol use is not necessarily a health-compromising behavior, some studies use overall consumption as a proxy for problem drinking.
[2] These papers serve as examples. See Pacula (2011) and Xu and Kaestner (2010) for fuller literature reviews.

of Dee—that increases in unemployment rates are positively related to binge drinking. Xu and Kaestner (2010) expanded on this line of research in a study of the effects of employment, work hours, and wages on health behaviors, using data on business cycles to identify those key variables of interest. They used the Current Population Survey (CPS) to estimate two-sample instrumental variables (TSIV) models in which work hours and wages were estimated from the CPS and health behaviors were estimated from the BRFSS. The authors found a small but significant negative effect of hours worked on binge drinking of low-wage working age men, suggesting that binge drinking may be somewhat countercyclical.

Findings for cigarette smoking are also mixed. For example, Ruhm (2005), using 1987-2000 BRFSS data, found procyclical effects (that is, that smoking declines during economic downturns). Xu and Kaestner (2010), using 1984-2005 BRFSS data augmented with data from the CPS and applying their TSIV methodology, found that wages, employment, and hours of work were all positively related to smoking among low-wage men, also providing some evidence that smoking may be procyclical. Charles and DeCicca (2008), using data from the 1997-2001 National Health Interview Surveys found that the effects of the MSA-level unemployment rate on men's smoking depend on whether they are likely to be unemployed. For the 10 percent of men most vulnerable to unemployment, higher unemployment rates were associated with higher rates of smoking (that is, smoking appears to countercyclical). For the 10 percent of men least vulnerable to unemployment, higher unemployment rates were associated with lower rates of smoking (that is, smoking appears to be procyclical). For the majority of men, unemployment rates were not associated with smoking.

As far as we know, only two studies have examined the effects of the macroeconomy on dietary behaviors. The first is the seminal study by Ruhm (2000), part of which used BRFSS data

from 1987 to 1995 to investigate the effect of state unemployment rates on daily fruit and vegetable consumption. He found a countercyclical but insignificant effect of state unemployment rates on daily consumption of fruits and vegetables. The other study, by Dave and Kelly (2011), investigated the effect of business cycles on the consumption of various types of "healthy" and "unhealthy" foods. Using BRFSS data from 1990-2007, they found countercyclical effects for unhealthy foods and procyclical effects for healthy foods. That is, a greater risk of unemployment was positively related to consumption of snacks and fast food but negatively associated with consumption of fruits and vegetables. The latter study focuses solely on food within a more recent time horizon, examines a broad array of different types of food, and controls for time-related trends by including indicators for month as well as linear, quadratic and cubic time trends.

Ásgeirsdóttir and Zoega (2011) used the same data as in the current paper to examine sleep behavior. While that paper is mostly theoretical and the empirical focus was not on effects of the economic collapse, the authors do report crude results that indicate increased sleep duration in 2009 as compared to 2007. Although analyses tailored to our crisis-specific research questions are needed to fully address the economic impact of the collapse on sleep, the findings of Ásgeirsdóttir and Zoega are in accordance with our theoretical prediction as the opportunity cost of sleeping is almost solely in terms of time and would thus have decreased as labor market opportunities and returns go down. Another recent study, Colman and Dave (2011), examined physical activity using the American Time Use Survey (2001 to 2010). The authors found evidence that unemployment increases recreational physical activity but reduces overall physical activity due to declines in work-related physical activity. They also found evidence that strong economic conditions (high employment) reduce sleep, particularly among women.

As far as we know, Dave and Kelly (2011) and Colman and Dave (2011) are the sole published studies that have attempted to elucidate specific pathways through which recessions affect health behaviors. In contrast, the bulk of the literature has focused on reduced form effects of the business cycles (e.g., most of the articles discussed above) or exploited macroeconomic fluctuations to address other questions (e.g., Xu and Kaestner 2010). A key objective of the Dave and Kelly study was to explore the extent to which individual variations in work status, real family income, food prices, and health insurance coverage affect "healthy food" consumption, holding constant the state unemployment rate (plus an interaction term for the state unemployment rate multiplied by a propensity score for the individual's probability of unemployment). They found that reduced family income and adverse mental health appear to be important channels underlying the procyclical nature of "healthy food" consumption. That is, these pathways explain about half of the negative effect of unemployment on "healthy eating," with the other half remaining unexplained. Colman and Dave study considered an individual's full-time work status as a pathway through which employment rates may affect exercise. They found evidence that the positive effect of employment rates on exercise was strongest among working-aged men who did not work full-time. That is, the effect of recessions on exercise operates, at least in part, through increases in available time.

Economic crisis in Iceland

The Icelandic banking sector had expanded dramatically in the years preceding its collapse. At the end of June 2008 the combined assets of Iceland's three largest banks (which, as mentioned earlier, collapsed and became nationalized in October 2008) were 14 times larger than the GDP of Iceland, making the Icelandic banking system one of the largest in the world in relation to GDP (International Monetary Fund 2008). According to Nanto (2009), the failure of

the banks may have been set in motion by the collapse of Lehman Brothers but that "at the heart of Iceland's banking crisis is a flawed banking model that is based on an internationally active banking sector that is large relative to the size of the home country's GDP and to the fiscal capacity of the central bank (p. 68)."

The unemployment rate increased from 2.3% in the 1st quarter of 2008 to 7.4% in the 4th quarter of 2010. It peaked in the 2nd quarter of 2009, at 9.1%, with the highest rate among young people 16–24 years old, at 21.9% (Statistics Iceland, 2011). Iceland is one of the world's smallest currency areas, making the krona very vulnerable. The real exchange rate fell by 36% between 2007 and 2009 despite considerable efforts to maintain the value of the krona, the most important action being the imposition of capital controls in late 2008 to hinder the sales of the local currency (Benediktsdottir, Danielsson and Zoega 2011). The depreciation in the exchange rate had a significant effect on prices, especially for imported goods. Overall, the Consumer Price Index (CPI) increased by 27% between 2007 and 2009. Thus everyone, regardless of the effect of the crisis on their individual labor market position, suffered the effects of the crisis through the price changes. Price changes for various commodities relevant to the health behaviors that are central to this study are listed in the Appendix. The prices of domestically-produced goods such as fish oil and dental visits went up by much less than the CPI overall (20.9% and 18.6%, respectively), while those for goods that are primarily imported, such as alcohol, cigarettes, and fruits, went up by considerably more than the CPI overall (49.2%, 40.6%, and 87.8%, respectively) (Statistics Iceland, 2011).

During the crisis, a large portion of the populace lost their savings and others were left with serious debt. When financing their homes, families had taken loans in foreign currency due to lower interest rates and consequently found themselves trapped in negative equity when the

Icelandic krona plummeted. The same goes for those who had taken price indexed Icelandic loans, as the fall of the local currency resulted in considerable inflation.

The financial crisis in Iceland, with its sudden onset and intensity, likely produced shock effects that are distinct from regular business cycle effects. More generally, ambient economic conditions can have many different causes, take on many different forms, and have effects that depend on the specific social and institutional contexts. As such, to understand the effects of economic conditions it is important to compare results across situations, settings, and outcomes. Each additional study adds new information to the picture being painted by the emerging literature. We are aware of only one published study on health effects of the Icelandic economic collapse. Guðjónsdóttir et al. (2011) found an increase in the total number of visits to the cardiac emergency department in general and specifically due to ischaemic heart disease in the days following the address by the Prime Minister. However this effect was not sustained over time and the authors concluded that this was a short-term stress reaction.

Contributions of this study

The unique features of the Icelandic economic collapse in terms of a distinct beginning, magnitude, and velocity, along with the opportunity of obtaining unusually comprehensive, individual-level, nationally representative data on the same Icelanders before and after the country's economic downturn provides a unique opportunity to investigate the effects of a macroeconomic shock on a wide array of health behaviors. The Icelandic financial crisis is a very strong "treatment" in that the nation's economy rapidly went from boom to bust as a result of an unprecedented shock that was unanticipated by most people but affected everyone in some way. That is, the study is distinctively different from the well known state-to-state differences and/or over-time fluctuations. In addition, we are studying a very short time interval during

which the crisis clearly dominated, precluding the need to account for confounding trends—something that has been a persistent methodological challenge in this literature. Furthermore, because about two thirds of Icelanders live in or near Reykjavik with the rest dispersed across the country in small cities and towns, there is essentially one market involved; the findings, therefore, cannot be confounded by regional migration. Finally, because we observe both work hours and income and observe sufficient variation in both, we can directly examine those two potentially important pathways whereas Dave and Kelly (2011) were only able to examine income but not work hours vis-à-vis food consumption, Colman and Dave (2011) were only able to examine full-time employment vis-à-vis exercise, and Kaestner and Xu (2010) did not have access to substance abuse measures and potential mediating variables for the same individuals. For all of these reasons, the financial crisis in Iceland presents us with a "clean and well-stocked laboratory" in which to study the effects of a macroeconomic downturn on health behaviors.

Analytic Framework

We base our analyses on the Grossman-derived demand for health behaviors as described in Xu and Kaestner (2010). In this framework, the demand for a health-related "input" is a function of the price of that input (P_i), the prices of a vector of other health-related inputs (P_j), the prices of a vector of non-health related goods (P_x), the time inputs for these goods (t_i, t_j, t_x), and other arguments as follows: T_w represents work time, or the time not available to consume; Y represents real income; Z represents personal characteristics including tastes and preferences; and e is the person's health endowment.

(1) $D_i = D_i (P_i, P_j, P_x, t_i, t_j, t_x, T_w, Y, Z; e)$

As discussed above, the financial crisis in Iceland affected the real and relative prices of most goods, employment, and real income. In addition, the economic crisis may have affected

the individual's health (e) if the stress caused by the economic change directly affected mental or physical health. Holding constant real income, an increase in the price of any health-related input would be expected to reduce the demand for that input. As discussed above, the relative price increases were strongly affected by the devaluation of the krona between 2007 and 2009, so that heavily imported items, such as fruits, experienced price increases of almost two-fold, whereas local products, such as fresh haddock and lamb, increased by only 18% and not at all, respectively. All else equal, the large increases in some prices would reduce demand for those goods, whether those goods are health promoting (such as fruit) or health compromising (such as cigarettes).

Changes in relative prices may affect substitutions of one good for another as well. For example, an increase in the price of fresh (and imported) fruits may have reduced the demand for them relative to other health-promoting items such as locally-produced dairy products, such as skyr. A decrease in work time may increase the demand for goods-intensive health inputs, such as home-cooked meals relative to fast food.

Recession-induced decreases in income, through employment or wealth, would be expected to decrease the demand for all but inferior goods, all else equal. Thus, reductions in income would reduce the consumption of both health compromising inputs, such as sweetened soft drinks or indoor tanning and health-promoting inputs, such as dental checkups. For all of the price and income effects, the magnitudes would be a function of the own price, cross-price, and income elasticities of demand.

The recession could affect other arguments in Equation 1 as well. As discussed earlier, there are many pathways other than behaviors through which the recession could affect health which may then affect the demand for health-related inputs. For example, the stress of long hours

of work (during the boom) or the stress of financial insecurity (during the bust) could increase the demand for an unhealthy input such as binge drinking or cigarette smoking.[3]

Data

The data used for this study come from a health and lifestyle survey "Heilsa og líðan" carried out by the Public Health Institute of Iceland in both 2007 and 2009. The questionnaires were mailed on November 1st in each year and almost all returned questionnaires were sent back in November or December of that same year. The survey contained questions about health, illnesses, use of drugs, smoking and drinking, dental care, diet, height and weight, accidents, exercise, sleep, and quality of life and other lifestyle related issues, as well as demographics and work related factors such as work hours and income. A stratified random sample of 9,807 Icelanders, ranging in age from 18 to 79 years of age, was drawn. The net response rate in 2007 was 60.8%. The participants from 2007 who agreed to be contacted again also received the 2009 questionnaire and 69.3% of the 2007 respondents participated in 2009. A total of 42.1% of the original sample thus took part in the survey both in 2007 and 2009. Due to the stratification in the sampling process, the sample is somewhat older than the adult population of Iceland overall and more likely to live outside the capital region. There were six age groups by two residential groups, forming a total of 12 strata and all results presented here use sample weights to make the sample nationally representative (Jonsson, Gudlaugsson, Gylfason and Guðmundsdóttir 2011).

In our analyses, all time varying variables are based on survey questions that were asked in both 2007 and 2009. Respondents were asked numerous questions about their health-related behaviors. For substance use, we created measures of smoking and alcohol consumption. Individuals were coded as being a smoker if they answered the question, "Do you smoke?" with

[3] For example, Barnes and Smith (2009) found that, holding income constant, greater financial insecurity is related to a greater probability of continuing to smoke, and Deb at al. (2011) found that job loss is associated with more problem drinking, especially for individuals who are prone to be heavy drinkers.

a yes. Given the general nature of the question, it captures not only cigarettes, but also cigars and pipes. In terms of cigarettes specifically, individuals were asked, “How much do you usually smoke?” Six positive categories ranged from less than one cigarette per day to 35 or more cigarettes per day. The bottom category was coded as 1 cigarette and the top category was coded as 40 cigarettes; the other categories were coded at their midpoints. Respondents were asked how often during the past 12 months, if ever, they had consumed at least 5 alcoholic drinks in one day; that information was used to create a variable for having consumed at least 5 drinks in one day at least once a month during the past 12 months..

The data also include information on dietary behaviors. Respondents were asked about their consumption of a variety of foods, with the question: “How often do you eat the following categories of food?” We focus on daily consumption of dairy (milk or cultured dairy products), fruit or berries, and cooked or raw vegetables as health-promoting behaviors, and daily consumption of sugar-containing soft drinks and sweets as health-compromising behaviors. Respondents were also asked about the consumption of fast food. We consider weekly consumption of fast food, either at a fast food restaurant or taken home, as a health-compromising behavior. Respondents were asked about consumption of fish liver oil or fish oil capsules and vitamins, minerals, or other food supplements or health food products, both of which we consider health-promoting behaviors (coded as daily, versus not daily).

The measure of preventive health care that is available for our analyses involves dental checkups. Respondents were asked how often they go to the dentist for a check-up, which we considered a health-promoting behavior (coded as “at least once a year” or more, versus less than once a year). In this context it is useful to get an idea of how the Icelandic health-care system is financed and how dental care is generally financed. Iceland has a single-payer health-care

system, financed by general taxation, in which the patient pays modest user fees at the time of service. Around 80% of total expenditures on health care in Iceland are publically financed; the remaining 20% are financed almost exclusively by out-of-pocket payments. Due to the extensive public provision of medical services, private and employer-provided health insurance is rare. Dental care is generally provided outside of the single-payer system, with an important exception being that dental care is subsidized for children and the elderly or if the treatment is due to birth defects, oral diseases or injuries. As a result, dental care comprises a large portion of private expenditures on health in Iceland (Ásgeirsdóttir 2012).

Finally, we consider indoor tanning and getting the recommended amount of sleep. Specifically, respondents were asked how often within the last 12 months they sunbathed with indoor tanning lamps or tanning beds while "scantily dressed in order to receive as much sun or radiation as possible," which we considered a health-compromising behavior (coded as ever, versus never), and "For how many hours a night do you generally sleep?" Based on the U.S. Centers for Disease Control and Prevention (2012) recommendation of 7-9 hours of sleep per night as optimal from a health perspective, we coded individuals as engaging in a health-promoting level of sleep if they reported generally sleeping between 7 and 9 hours.

In our analyses, we include demographic characteristics, either as fixed (age, gender, educational attainment) or time-varying covariates: marital/cohabitation status, household composition (including other adults and children), rural residence (an area of fewer than 1,000 inhabitants), and homeownership. In terms of homeownership, the question was: "Do you live in a home you own, in rental housing or in another form of housing?" The respondent was coded as a homeowner if he/she indicated "in a home I own." The question on educational attainment was improved between waves and asked differently in 2009. Thus we chose to treat education as time

invariant based first and foremost on the 2009 answers. As educational attainment is fairly stable, and generally used to proxy socio-economic status, we do not expect this to harm our analysis.

As discussed earlier, we are interested in specific pathways through which the crisis may have impacted health behaviors. Specifically, in mediation analyses, we explore the roles of work hours, income, and stress.

Our measures of labor market activity are based on two questions. In the first, respondents were asked to describe their work arrangements. We coded individuals as not working if they answered, "I do not work." In the second, respondents were asked how many hours they generally spend each week doing paid work. They were given 13 response options, including 0, less than 1 (coded as 1), ten categories ranging from 1-3 hours to 50-59 hours, and a top code of 60 hours or more. We used the mid-point of the range up through the 50-59 hour category and top coded the 60 hours or more response as 60.

We measure income using the following question: "In what range do you estimate the total income of all household members (e.g. spouse, children and parents) in your household (including yourself) to have been generally…" within the past month or within the past 12 months. The respondents were told that this amount should include "all pre-tax income, such as salaries, overtime, differentials, bonuses, interest and dividends, grants/benefits, and pensions." Icelandic benefits come in multiple forms including as child benefits, housing benefits, and interest relief. The benefits generally depend on the individual's labor-market income. In the survey, income was reported in ten annual-income categories, which we measure in millions of krona. The ten categories began with "less than .9 million krona" and went up to a top category of "more than 18 million krona." We coded at the mid-point of a given range, except for the top range for which we coded the 18 million plus category as 19.75 million krona. Those living

alone were not asked to answer this question. For those individuals, we imputed the responses to a question on individual income and treated those responses similarly with regard to inflation adjustments. As discussed earlier, the price level in Iceland changed considerably between 2007 and 2009, largely as a result of the crisis. According to the consumer price index (CPI) published by Statistics Iceland, prices rose by 27% between the two waves of the study (Statistics Iceland, 2011). We calculate real household income using 2009 krona, adjusting 2007 income by multiplying by 1.27.

To capture stress, we created a measure of "anxiety or poor mental health" based on responses to the following two questions: (1) "Has having any of the following conditions interfered with your daily life in the past 12 months?" One of the response choices was anxiety. (2) "What is your general assessment of your mental health? Do you feel that it is very good, good, fair or poor?" If the respondent reported that anxiety interfered with his/her daily life in the past 12 months or that he/she considered his/her mental health to be poor, we coded him/her as having anxiety or poor mental health.

Observations with missing data are excluded from the analyses.

[CONDUCT ATTRITION ANALYSES]

Descriptive Analysis

The mean age of the sample was 45 years in 2007; about one quarter (26%) had the equivalent of a high school education or less, 38% had the equivalent of a some college education (but not a four year degree), and 25% had the equivalent of a four year college education in the U.S. (demographics not shown in tables). These and all subsequent descriptive statistics and regression estimates are weighted to be nationally representative of the Icelandic population.

The top panel of Table 1 presents the mean values and sample sizes for the health-compromising behaviors we are studying, for both 2007 and 2009, with p-values indicating significant differences in means. The second panel presents the corresponding information for the health-promoting behaviors we are studying. The third panel shows means for the time varying-covariates we include in certain models. These are factors, such as the individual's household composition, that could have changed as a result of the crisis. The last panel of Table 1 presents means for potential pathways by which the crisis would be expected to affect health behaviors—work hours, household income, participation in the labor market, anxiety or poor mental health, and prices.

All of the health-compromising behaviors decreased between 2007 and 2009, with at least borderline significant differences across the board except for mean cigarettes per day. Most health-promoting behaviors were also significantly lower in 2009 than in 2007, with the two exceptions being consumption of daily fish oil and getting the recommended amount of sleep, which increased significantly between 2007 and 2009. The vast majority (over 95%) of respondents who reported amounts of sleep outside the recommended range received too little sleep (result not shown). If all observed changes in health behaviors were due to the financial crisis, the 2009 levels minus the 2007 levels of the various behaviors would represent the average effects of the crisis on those behaviors. The observed differences are consistent with studies finding procyclical effects of health-compromising behaviors such as smoking and alcohol consumption (e.g., Ruhm, 2005, Ruhm and Black; 2002), as well as the recent work of Dave and Kelly (2011), which found countercyclical effects on consumption of fruits and vegetables. Our results are also consistent with the work of Colman and Dave (2011) which found countercyclical effects on sleep.

The only time-varying covariates, of those we considered, that changed significantly between 2007 and 2009 are marital and cohabitation status; marriage increased and cohabitation decreased. There were no significant or substantive differences in rates of co-residence with children, co-residence with an adult other than one's partner, rural residence, or homeownership. The complete lack of change in homeownership rates in Iceland contrasts with the situation in the U.S., where homeownership rates dropped from 68.4% to 67.2% (representing a decline of 1.8%) between the first quarter of 2007 and the last quarter of 2009, but is likely due to government interventions in Iceland, aimed at helping people stay in their homes.[4]

Considering variables that represent potential pathways, we find labor supply fell on average after the crisis. The proportion of adults working fell from .83 to .77 (a drop of 7.2%), while average work hours dropped from 30.4 to 28.0 (a drop of 7.9%). Although nominal household income increased somewhat (about 3.2%), real household income decreased substantially (by 18.7%). The proportion of individuals reporting anxiety or poor mental health increased from 25% in 2007 to 28% in 2009. All of these differences are large and statistically significant. Finally, as indicated earlier, prices increased almost 27% between 2007 and 2009 based on Iceland's overall Consumer Price Index, ranging from less than 20% for dental checkups to 88% for fruits (as shown in Appendix). In contrast, the U.S. experienced a 3.4% increase in overall prices during the same two year period.[5]

Multivariate Analyses

Our estimation strategy exploits the 2008 economic crisis in Iceland as an exogenous shock. First, we pool the observations from the two survey waves—2007 (before the crisis) and 2009 (after the crisis) and use an indicator for 2009 to estimate the effects of the crisis on health

[4] Source: http://www.census.gov/hhes/www/housing/hvs/qtr411/q411ind.html [accessed 3/15/12].
[5] Source: ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt [accessed 3/21/12].

behaviors controlling for basic demographic characteristics. Second, exploiting the fact that we observe the same individuals before and after the crisis, we estimate individual fixed effects models that implicitly control for any unobserved time-invariant individual-level characteristics.

For our evidence to be credible, it is necessary to demonstrate that the estimated effects of the crisis are capturing shocks rather than continuations of ongoing long-term trends. Figures 1-4 show pre-crisis trends in four of the health-related behaviors of interest. Data on alcohol sales are available from 1980 through 2007. Survey data on smoking are available from 1994 through 2010 and on fruit and vegetable consumption are available from 1960 through 2010. As shown in Figure 1, alcohol sales had been rising in Iceland since the early 1990s. From Figure 2 we can see that smoking had been declining until about 2004, then started to plateau, and then appeared to resume its decline after the crisis hit.[6] Figures 3 and 4 show clear long-term upward trends in fruit and vegetable consumption through 2007 and then sudden and sustained drops after the crisis. We will consider our estimated effects in light of these baseline trends.

Estimates from the pooled and fixed effects models of the crisis on various health-compromising and health-promoting behaviors are presented in Tables 2a and 2b, respectively. For each behavior, the first column presents coefficients, standard errors, and marginal effects from a pooled probit model that includes demographic characteristics (age, age squared, gender, and education) as controls, and the second column presents the estimated effect of the crisis from an individual fixed effects model that includes no control variables but by virtue of its formulation controls for all time-invariant individual-level characteristics.

[6] Between 2001 and 2004, before the boom or the crisis, daily smoking decreased from 22.9% of the population to 19.8%--over 3 percentage points. Between 2004 and 2007, during the boom, daily smoking decreased from 19.8% to 19.0%--a decline of less than one percentage point. In the subsequent years, from 2007 to 2010, daily smoking fell to 14.2% of the population—a decline of almost 5 percentage points.

From the top row of Table 2a, we can see that the coefficient for 2009 indicator, the estimated effect of the crisis, is negative and significant for all health-compromising behaviors—smoking; heavy drinking; consumption of sugared soft drinks, sweets, and fast food; and indoor tanning. The estimated effects are quite similar in the probit (or OLS, for number of cigarettes) and fixed effects models, and both sets of estimates are quite similar to the corresponding mean differences in Table 1. Thus, the effects of the crisis on health-compromising behaviors are largely independent of observed and unobserved time-invariant individual-level characteristics. In terms of the covariates themselves, men are more likely than women to engage in heavy drinking and fast food consumption, and women are more likely than men to use indoor tanning facilities. In addition, individuals with lower levels of education are more likely to smoke, eat fast food, and use indoor tanning facilities.

From the top row of Table 2b, we can see that the crisis also significantly reduced most health-promoting behaviors. Specifically, the crisis reduced dental visits as well as consumption of dairy, fruits, and vegetables. In contrast, the crisis increased consumption of fish oil and recommended sleep. There were no significant effects of the crisis on consumption of vitamins/supplements. As before, probit and fixed effects models produced estimates that are quite similar. In general, men are less likely than women to have dental checkups, eat fruits and vegetables, consume fish oil, and get the recommended amounts of sleep, while women are less likely than men to consume dairy on a daily basis and to take vitamins or supplements. In general, more educated individuals are more likely than those with less education to engage in health-promoting behaviors.

[EXPLAIN THAT ESTIMATES ARE INSENSITIVE TO ALTERNATIVE MEASURES; E.G., FOR STRESS]

[GO BACK TO FIGURES 1-4 AND CONSIDER ESTIMATES IN LIGHT OF THE RELEVANT TRENDS]

Next, we consider the effects of the financial crisis on the potential mediating factors of interest--work, income, and stress. These results are presented in Table 3. Considering each of these variables as outcomes (operationalized as hours of work, real household income, and anxiety or poor mental health as defined earlier), we estimated (1) OLS or probit models of the effects of the crisis (2009 indicator) that included the demographic controls used in the pooled OLS or probit models in Table 2, (2) unadjusted individual fixed effects models, and (3) individual fixed effects models that included the set of time-varying covariates listed in Table 1 and described earlier. Controlling for demographic characteristics, Icelanders worked 2.4 fewer hours, experienced a 1.6 million krona drop in real family income (expressed in 2009 krona), and were 3.2 percentage points more likely to report anxiety or poor mental health (an increase of about 12%) after the crisis. Both sets of fixed effects estimates were very similar to the pooled OLS or probit estimates, as well as to the corresponding mean differences in Table 1. That is, neither time-invariant factors nor observed time-varying factors have any bearing on our estimated effects of the crisis on these potential mediating factors.

Finally, we explore the potential roles that labor hours, real household income, and anxiety or poor mental health play in explaining the effects of the crisis on the various health behaviors. The estimates in the top rows of Tables 4a and 4b are from unadjusted fixed effects models of the effects of the crisis (2009 indicator); that is, they are duplicates of the estimates from the second model for each health behavior in Tables 2a and 2b. The estimates in the second row of each panel (4a and 4b) are from fixed effects models that also include our basic set of

time-varying covariates.[7] As such, these estimates represent the effects of the crisis holding constant changes in marital and cohabitation status, household composition, rural residence, and homeownership. As in Table 3, including the time-varying covariates does not appreciably affect our estimates of the effects of the crisis on health behaviors. The estimates in the third, fourth, and fifth rows are from fixed effects models that include the time-varying covariates plus, alternately, each of the three potential mediator of interest—(time-varying) hours of work, real household income, and anxiety or poor mental health, respectively. The estimates in the last rows are from fixed effects models with our basic set of time-varying covariates plus all three potential mediators.

For smoking, we find that including hours of work as a mediator reduces the effect of the crisis (2009 indicator) from 3.5 percentage points to 3.3 percentage points (or by about 6%). Including changes in real income instead, the effect of the crisis is reduced by .3 percentage points, or 9%. Including our measure of anxiety or poor mental health instead does not change the estimated effect of the crisis on smoking. Including all three potential mediators reduces the estimated effect of the crisis by .4 percentage points, or by about 11%. Considering health-compromising behaviors across the board, it appears that the most important mediator (in terms of explaining effects of the crisis) is real household income. The three mediators, together, reduce the estimated effects of the crisis on health-compromising behaviors from 4% (for sweets) to about one-quarter (for heavy drinking). Given that such a substantial portion remains unexplained by the most obvious individual pathways and that the shock was so strong and universal, it is likely that the shock operated, at least to some extent, through the broader environment (i.e., though changes that affected everybody, such as price increases).

[7] It is important to point out that the set of factors we refer to as "time-varying covariates" potentially mediate the effects of the crisis. However, these are not the mediators of particular interest in this study

The corresponding results for health-promoting behaviors, presented in Table 4b, are more complex than those for health-compromising behaviors in Table 4a. For having a dental check-up in the past year, the impact of the crisis (2009 indicator) is reduced by about 35% (from -.017 to -.011) after accounting for changes in real income. The pattern is of results for dental checkups is similar to that for vitamins and supplements, for which the estimated effect of the crisis is reduced about 27% with the addition of all three potential mediators and appears to be operating to some extent through real household income. A similar pattern is found for vegetable consumption, although the mediators explain even less of the crisis effect in that case. For each of the health-promoting behaviors, a large share of the estimated effect of the crisis remains unexplained.

The results for dairy and fruit consumption, which were also negatively impacted by the crisis, are somewhat surprising. For these behaviors, the estimated effects of the crisis were larger in magnitude when including the mediators, particularly real household income. That is, the effects of the crisis on consumption of these two "goods" decreased even more, after accounting for changes in real income. This finding suggests that those with the largest drops in dairy and fruit consumption were individuals whose real household income was not negatively impacted by the crisis, and that those with the smallest drops in fruit and dairy consumption were individuals whose family incomes were the most adversely impacted by the crisis.

For two health-promoting behaviors—consumption of fish oil and getting the recommended amount of sleep—the crisis had a positive effect. After controlling for all three potential mediators, particularly real family income, the effect of the crisis on fish oil was reduced about 27%, potentially reflecting a negative income elasticity (e.g., that fish oil is an inferior good) or a post-crisis "back-to-basics" societal shift. For recommended sleep, we find

that, holding constant work hours, real household income, and/or anxiety or poor mental health, the estimated impacts of the crisis become larger, suggesting that those who experienced the largest drop in work hours, the largest drop in real household income, and increases in anxiety/poor mental health were less likely to benefit from the crisis in terms of getting recommended sleep compared to individuals for whom the crisis took less of a toll in terms of employment, income, and/or mental health. Overall, our results strongly suggest that the economic shock affected health behaviors not just through changes in individuals' circumstances, but also through changes in the broader environment.

Tables 5a & b through 7a & b present estimates corresponding to those in Tables 4a & b, for select subsamples. In Tables 5a & b, we restrict the analysis to individuals of working age—those aged 25-64 years in 2007—who should be most affected by changes in work hours. The age restriction at the top end is based on the statutory retirement age in Iceland of 67.[8] As expected, effects of the crisis on health-compromising behaviors were generally stronger for the working-age population than for the adult population overall. For example, fast food consumption decreased by about 7 percentage points (Table 5a) compared to about 5.2 percentage points for the overall population (Table 2a). The comparative contributions of the mediators (for the working-age population in comparison to the population overall) varied by behavior. For health-promoting behaviors, the biggest difference is for dental visits. For working-age adults, the crisis reduced the probability of having a dental check-up .7 percentage points (Table 5b), as compared to 1.7 percentage points for the population overall (Table 4b), and the effect is no longer statistically significant. The crisis also had a stronger positive effect on recommended sleep for working-age individuals than for the population overall, and

[8] Source: http://www.aarpinternational.org/map_country/map_country_show.htm?doc_id=545826

including the mediators increased the impact of the crisis on recommended sleep for this group by 38%--indicating less positive (or more negative) effects of the crisis on sleep for working-age individuals who experience the greatest drop in hours and real income, and the greatest increase in anxiety or poor mental health.

The next two tables present estimates corresponding to those in Tables 4a & b, but limiting the sample to men (Tables 6a & b) and women (Tables 7a & b). We find that the crisis had stronger negative (favorable) effects on cigarettes per day, heavy drinking, soft drink consumption, and fast food consumption for men than for women, while it had stronger negative (favorable) effects on consumption of sweets and indoor tanning for women than for men. The crisis reduced dental visits and dairy consumption more for men than for women, while reducing fruit and vegetable consumption more for women than for men. For fish oil consumption, the positive effects of the crisis were much stronger for women than men, and not statistically significant for men when including time-varying covariates. In contrast, the beneficial effects of the crisis on sleep were concentrated among men. In analyses that included the potential mediators (not shown), we continue to find that the work hours, real household income, and anxiety or poor mental health do not explain the observed behavioral changes to any substantively meaningful extent.

[RECONCILE FINDINGS FOR PATHWAYS TO PAST LITERATURE AND MAKE INFERENCES ABOUT ROLE OF PRICES]

Conclusion

[TO BE WRITTEN]

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TABLE 1: Sample Means (weighted)

	N	2007	2009	p-value
Health-Compromising Behaviors				
Currently smokes cigarettes or other tobacco product	2681	.21	.18	.00
Usual # of cigarettes/day, mean	2658	3.15	1.83	.12
		(.15)	(.08)	
5+ alcoholic drinks in one day at least one time/month (past year)	2679	.22	.19	.00
Daily sugared soft drink	2704	.08	.07	.06
Daily sweets	2694	.09	.06	.00
Weekly fast food	2720	.32	.26	.00
Indoor tanning (past 12 mos.)	2583	.18	.14	.00
Health-Promoting Behaviors				
Dental visit past year	2647	.72	.70	.05
Daily dairy	2698	.54	.51	.03
Daily fruit	2715	.37	.35	.04
Daily vegetable	2726	.29	.25	.00
Daily fish oil	2689	.38	.41	.01
Daily vitamins or nutritional supplement	2769	.88	.87	.09
Gets recommended sleep (7-9 hours/night)	2698	.73	.76	.00
Time Varying Covariates				
Married	2769	.56	.59	.00
Cohabiting	2769	.21	.18	.00
Child in household	2769	.40	.40	.13
Lives with adult other than partner	2769	.27	.26	.36
Lives in rural area	2769	.12	.11	.16
Homeowner	2769	.80	.80	.43
Potential Mediators				
Working in labor market	2769	.83	.77	.00
Hours of work (*.10), mean	2769	3.04	2.80	.00
		(.05)	(.05)	
Real household income (millions of 2009 krona/year), mean	2769	8.67	7.05	.00
		(.10)	(.08)	
Nominal household income (millions of krona/year), mean	2769	6.83	7.05	.00
		(.08)	(.08)	
Anxiety or poor mental health	2769	.25	.28	.00

Note: All figures are proportions unless indicated otherwise. Standard deviations in parentheses. P-values are from t-tests for differences in means between 2007 and 2009.

TABLE 2a: Effects of the Financial Crisis on Health-Compromising Behaviors

	Smoking		Cigarettes/day		Heavy Drinking		Daily Sugared Soft Drink		Daily Sweets		Weekly Fast Food		Indoor Tanning	
	Probit	FE	OLS	FE	Probit	FE	Probit	FE	Probit	FE	Probit	FE	Probit	FE
2009 Indicator	-.130*** (.025) [-.035]	-.035*** (.007)	-1.32*** (.125)	-1.32*** (.125)	-.100*** (.032) [-.027]	-.027*** (.009)	-.089** (.045) [-.010]	-.011* (.006)	-.176*** (.043) [-.024]	-.025*** (.006)	-.189*** (.034) [-.059]	-.053*** (.010)	-.173*** (.035) [-.036]	-.035*** (.007)
Age	.041*** (.011) [.011]		.218*** (.036)		-.042*** (.011) [-.011]		-.051*** (.015) [-.006]		-.014 (.015) [-.002]		-.035** (.014) [-.005]		-.032** (.013) [-.007]	
Age squared	-.001*** (.000) [.000]		-.002*** (.000)		.000** (.000) [.000]		.000 (.000) [.000]		.000 (.000) [.000]]		.000*** (.000) [.000]		.000 (.000) [.000]	
Male	-.043 (.062) [.-.012]		.017 (.220)		.693*** (.060) [.019]		.389*** (.082) [.046]		-.011 (.075) [-.002]		.415*** (.071) [.055]		-.448*** (.071) [-.093]	
High School or Less	.547*** (.110) [.164]		3.544*** (.342)		.122 (.109) [.034]		.239* (.141) [.031]		-.133 (.134) [-.017]		.444*** (.159) [.069]		.478*** (.135) [.112]	
Some College	.256** (.109) [.071]		1.902*** (.271)		.068 (.103) [.019]		.021 (.144) [.002]		-.024 (.128) [-.003]		.344** (.160) [.048]		.364*** (.131) [.079]	
College Graduate	.027 (.118) [.007]		.641** (.265)		-.003 (.112) [-.001]		-.306* (.161) [-.032]		.025 (.043) [.003]		.346** (.168) [.052]		.142 (.134) [.030]	
N	5362		5316		5358		5408		5388		5374		5166	

Notes: FE = individual fixed effects. Figures are probit or FE coefficients with standard errors in parentheses and marginal effects in brackets. Sampling weights are applied. OLS = Ordinary Least Squares. *p < .10; **p < .05; ***p<.01.

TABLE 2b: Effects of the Financial Crisis on Health-Promoting Behaviors

	Dental Visit Last Year		Daily Dairy		Daily Fruit		Daily Vegetable		Daily Fish Oil		Daily Vitamins/ Supplements		Recommended Sleep	
	Probit	FE	Probit	FE	Probit	FE	Probit	FE	Probit	FE	Probit	FE	Probit	FE
2009 Indicator	-.054* (.028) [-.018]	-.018** (.009)	-.070** (.030) [-.028]	-.028** (.012)	-.059** (.030) [-.022]	-.021** (.010)	-.107*** (.033) [-.035]	-.034*** (.010)	.079*** (.029) [.030]	.028*** (.010)	-.065 (.040) [-.012]	-.012 (.008)	.110*** (.032) [.035]	.035*** (.010)
Age	.068*** (.010) [.023]		-.040*** (.009) [-.016]		.019** (.009) [.007]		.029*** (.011) [.010]		.011 (.010) [.004]		-.30** (.012) [-.006]		-.001 (.009) [.000]	
Age Squared	-.001*** (.000) [.000]		.000*** (.000) [.000]		.000 (.000) [.000]		.000* (.000) [.000]		.000** (.000) [.000]		.000 (.000) [.000]		.000 (.000) [.000]	
Male	-.258*** (.054) [-.087]		.169*** (.048) [.067]		-.638*** (.051) [-.233]		-.462*** (.053) [-.150]		-.146*** (.050) [-.056]		.575*** (.069) [.110]		-.102** (.051) [-.033]	
High School or Less	-.422*** (.099) [-.149]		-.212** (.089) [-.084]		-.293*** (.088) [-.105]		-.418*** (.090) [-.126]		-.316*** (.088) [-.118]		-.015 (.115) [-.003]		-.233** (.092) [-.077]	
Some College	-.080 (.097) [-.027]		-.178** (.086) [-.071]		-.167* (.085) [-.061]		-.208** (.088) [-.067]		-.198** (.085) [-.075]		-.070 (.105) [-.013]		-.132 (.090) [-.042]	
College Graduate	-.084 (.103) [-.028]		-.207** (.091) [-.082]		-.097 (.090) [-.036]		-.008 (.092) [.003]		-.135 (.091) [-.051]		-.152 (.111) [-.030]		.026 (.096) [.008]	
N	5294		5396		5430		5452		5378		5202		5396	

Notes: FE = individual fixed effects. Figures are probit or FE coefficients with standard errors in parentheses and marginal effects in brackets. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

TABLE 3: Effects of Financial Crisis on Hours of Work, Real Household Income and Anxiety or Poor Mental Health

	Hours of Work*.10			Real Household Income			Anxiety or Poor Mental Heath		
	OLS Coefficient (SE)	FE Coefficient (SE)	FE Coefficient (SE)	OLS Coeffficent (SE)	FE Coefficient (SE)	FE Coefficient (SE)	Probit Coefficient (SE) [ME]	FE Coefficient (SE)	FE Coefficient (SE)
2009 Indicator	-.238*** (.045)	-.238*** (.045)	-.248** (.045)	-1.621*** (.077)	-1.621*** (.077)	-1.641*** (.076)	.100*** (.034) [.032]	.031 (.011)	.031*** (.011)
Age	.301*** (.013)			.341*** (.032)			.015 (.009) [.000]		
Age squared	-.004*** (.000)			-.004*** (.000)			.000*** (.000) [.000]		
Male	.748*** (.069)			.739*** (.162)			-.208*** (.050) [-.067]		
High School or Less	-1.117*** (.114)			-4.380*** (.310)			.419*** (.093) [.144]		
Some College	-.887*** (.100)			-3.324*** (.311)			.210** (.090) [.069]		
College Graduate	-.564*** (.106)			-.2.326*** (.331)			.104 (.100) [.034]		
Time-Varying Covariates		No	Yes		No	Yes		No	Yes
N	5538			5538			5538		

Notes: OLS = Ordinary Least Squares. FE = individual fixed effects. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

TABLE 4a: Effects of Financial Crisis on Health-Compromising Behaviors-- Fixed Effects Models

	Smoking	Cigarettes/day	Heavy Drinking	Daily Sugared Soft Drink	Daily Sweets	Weekly Fast Food	Indoor Tanning
Effect of 2009 Indicator on Behaviors in FE Model with:	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
No Time Varying Covariates	-.035*** (.007)	-1.32*** (.125)	-.027*** (.009)	-.011* (.006)	-.025*** (.006)	-.053*** (.010)	-.035*** (.007)
Time Varying Covariates	-.035*** (.007)	-1.344*** (.127)	-.027*** (.008)	-.011* (.006)	-.025*** (.006)	-.052*** (.010)	-.035*** (.007)
Time Varying Covariates + Hours of Work	-.033*** (.007)	-1.32*** (.127)	-.026*** (.009)	-.010 (.006)	-.024*** (.006)	-.050*** (.010)	-.035*** (.008)
Time Varying Covariates + Real Household Income	-.032*** (.007)	-1.404*** (.138)	-.020** (.010)	-.010 (.006)	-.024*** (.007)	-.047*** (.011)	-.032*** (.008)
Time Varying Covariates + Anxiety or Poor Mental Health	-.035*** (.007)	-1.344*** (.127)	-.027*** (.009)	-.011* (.006)	-.025*** (.006)	-.051*** (.010)	-.035*** (.008)
Time Varying Covariates + Hours of Work + Real Household Income + Anxiety or Poor Mental Health	-.031*** (.007)	-1.389*** (.138)	-.020** (.010)	-.008 (.006)	-.024*** (.007)	-.046*** (.011)	-.033*** (.008)
N	5362	5316	5358	5408	5388	5440	5166

Notes: FE = individual fixed effects. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

TABLE 4b: Effects of Financial Crisis on Health-Promoting Behaviors--Fixed Effects Models

	Dental Visit Last Year	Daily Dairy	Daily Fruit	Daily Vegetable	Daily Fish Oil	Daily Vitamins/ Supplements	Recommended Sleep
Effect of 2009 Indicator on Behaviors in FE Model with:	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
No Time Varying Covariates	-.018** (.009)	-.028** (.012)	-.021** (.010)	-.034*** (.010)	.028*** (.010)	-.012 (.008)	.035*** (.010)
Time Varying Covariates	-.017* (.009)	-.026** (.012)	-.020* (.011)	-.034*** (.010)	.030*** (.010)	-.014* (.007)	.036*** (.010)
Time Varying Covariates + Hours of Work	-.016* (.009)	-.027** (.012)	-.021** (.011)	-.033*** (.010)	.028*** (.010)	-.014* (.008)	.037*** (.010)
Time Varying Covariates + Real Household Income	-.011 (.010)	-.038*** (.013)	-.030*** (.012)	-.033*** (.011)	.022* (.011)	-.011 (.008)	.038*** (.012)
Time Varying Covariates + Anxiety or Poor Mental Health	-.018* (.009)	-.025** (.012)	-.020* (.010)	-.033*** (.010)	.030*** (.010)	-.015* (.007)	.037*** (.010)
Time Varying Covariates +Hours of Work + Real Household Income + Anxiety or Poor Mental Health	-.011 (.010)	-.037*** (.013)	-.031*** (.012)	-.031*** (.011)	.022* (.011)	-.011 (.008)	.040*** (.012)
N	5294	5396	5430	5452	5378	5202	5396

Notes: FE = individual fixed effects. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

TABLE 5a: Effects of Financial Crisis on Health-Compromising Behaviors --Fixed Effects Models for Subsample Aged 25-64 Years

	Smoking	Cigarettes/day	Heavy Drinking	Daily Sugared Soft Drink	Daily Sweets	Weekly Fast Food	Indoor Tanning
Effect of 2009 Indicator on Behaviors in FE Model with:	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
No Time Varying Covariates	-.041*** (.007)	-1.37*** (.149)	-.029*** (.005)	-.013** (.006)	-.027*** (.007)	-.071*** (.011)	-.039*** (.008)
Time Varying Covariates	-.040*** (.007)	-1.386*** (.151)	-.028*** (.010)	-.013* (.006)	-.026*** (.007)	-.070*** (.011)	-.039*** (.008)
Time Varying Covariates + Hours of Work	-.040*** (.008)	-1.368*** (.152)	-.026*** (.010)	-.011* (.006)	-.025*** (.007)	-.068*** (.011)	-.039*** (.008)
Time Varying Covariates + Real Household Income	-.039*** (.008)	-1.473*** (.170)	-.022** (.011)	-.011 (.007)	-.023*** (.008)	-.072*** (.012)	-.037*** (.009)
Time Varying Covariates + Anxiety or Poor Mental Health	-.041*** (.007)	-1.389*** (.151)	-.028*** (.010)	-.012* (.006)	-.026*** (.007)	-.070*** (.011)	-.040*** (.008)
Time Varying Covariates + Hours of Work + Real Household Income + Anxiety or Poor Mental Health	-.039*** (.008)	-1.462*** (.171)	-.021* (.011)	-.010 (.010)	-.023*** (.008)	-.071*** (.012)	-.037*** (.009)
N	3960	3926	3952	3958	3950	3976	3788

Notes: FE = individual fixed effects. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

TABLE 5b: Effects of Financial Crisis on Health-Promoting Behaviors--Fixed Effects Models for Subsample Aged 25-64 Years

	Dental Visit Last Year	Daily Dairy	Daily Fruit	Daily Vegetable	Daily Fish Oil	Daily Vitamins/ Supplements	Recommended Sleep
Effect of 2009 Indicator on Behaviors in FE Model with:	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
No Time Varying Covariates	-.010** (.010)	-.028** (.013)	-.017 (.012)	-.034*** (.012)	.029** (.012)	-.011 (.009)	.039*** (.011)
Time Varying Covariates	-.007 (.010)	-.026* (.014)	-.017 (.012)	-.034*** (.012)	.030** (.012)	-.013 (.009)	.039*** (.011)
Time Varying Covariates + Hours of Work	-.007 (.010)	-.026* (.014)	-.018 (.012)	-.032*** (.012)	.028** (.012)	-.013 (.009)	.040*** (.011)
Time Varying Covariates + Real Household Income	-.006 (.011)	-.043*** (.015)	-.024* (.014)	-.032** (.013)	.018 (.014)	-.010 (.010)	.052*** (.014)
Time Varying Covariates + Anxiety or Poor Mental Health	-.007 (.010)	-.025* (.014)	-.017 (.012)	-.032*** (.012)	.031** (.012)	-.013 (.009)	.041*** (.011)
Time Varying Covariates + Hours of Work + Real Household Income + Anxiety or Poor Mental Health	-.006 (.011)	-.041*** (.015)	-.024* (.014)	-.030** (.013)	.017 (.014)	-.010 (.010)	.054*** (.014)
N	3946	3948	3970	3986	3932	3832	3934

Notes: FE = individual fixed effects. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

TABLE 6a: Effects of Financial Crisis on Health-Compromising Behaviors--Fixed Effects Models for Males

	Smoking	Cigarettes/day	Heavy Drinking	Daily Sugared Soft Drink	Daily Sweets	Weekly Fast Food	Indoor Tanning
Effect of 2009 Indicator on Behaviors in FE Model with:	Coefficient (SE)	Coefficients (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
No Time Varying Covariates	-.035*** (.010)	-1.523*** (.200)	-.043*** (.014)	-.016 (.010)	-.018** (.009)	-.073*** (.010)	-.025*** (.010)
Time Varying Covariates	-.035*** (.011)	-1.554*** (.204)	-.040*** (.014)	-.019* (.010)	-.020** (.009)	-.071*** (.015)	-.023** (.009)
N	2572	2536	2572	2594	2586	2616	2480

Notes: FE = individual fixed effects. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

TABLE 6b: Effects of Financial Crisis on Health-Promoting Behaviors--Fixed Effects Models for Males

	Dental Visit Last Year	Daily Dairy	Daily Fruit	Daily Vegetable	Daily Fish Oil	Daily Vitamins/ Supplements	Recommended Sleep
Effect of 2009 Indicator on Behaviors in FE Model with:	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
No Time Varying Covariates	-.024* (.014)	-.032* (.017)	-.006** (.014)	-.028** (.014)	.039*** (.014)	-.012 (.009)	.066*** (.015)
Time Varying Covariates	-.022 (.014)	-.029* (.017)	-.004 (.014)	-.029** (.014)	.015 (.015)	-.014 (.009)	.064*** (.015)
N	2536	2588	2614	2616	2606	2520	2590

Notes: FE = individual fixed effects. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

TABLE 7a: Effects of Financial Crisis on Health-Compromising Behaviors--Fixed Effects Models for Females

	Smoking	Cigarettes/day	Heavy Drinking	Daily Sugared Soft Drink	Daily Sweets	Weekly Fast Food	Indoor Tanning
Effect of 2009 Indicator on Behaviors in FE Model with:	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
No Time Varying Covariates	-.035*** (.008)	-1.119*** (.151)	-.010 (.009)	-.006 (.006)	-.032*** (.008)	-.033*** (.012)	-.046*** (.011)
Time Varying Covariates	-.036*** (.008)	-1.163*** (.153)	-.011 (.010)	-.004 (.006)	-.030*** (.008)	-.033*** (.012)	-.046*** (.011)
N	2790	2780	2786	2814	2802	2824	2686

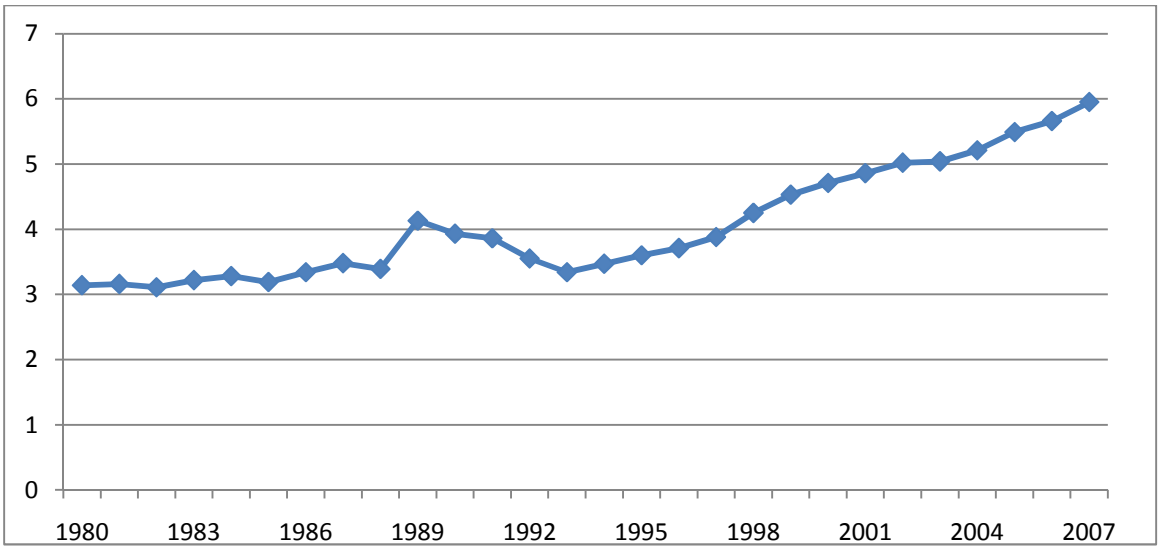
Notes: FE = individual fixed effects. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

TABLE 7b: Effects of Financial Crisis on Health-Promoting Behaviors--Fixed Effects Models for Females

	Dental Visit Last Year	Daily Dairy	Daily Fruit	Daily Vegetable	Daily Fish Oil	Daily Vitamins/ Supplements	Recommended Sleep
Effect of 2009 Indicator on Behaviors in FE Model with:	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
No Time Varying Covariates	-.012 (.011)	-.023 (.016)	-.037** (.015)	-.040*** (.015)	.039*** (.014)	-.012 (.012)	.004 (.013)
Time Varying Covariates	-.013 (.012)	-.024 (.016)	-.036** (.015)	-.041*** (.015)	.042*** (.014)	-.015 (.012)	.003 (.013)
N	2758	2808	2816	2836	2772	2682	2806

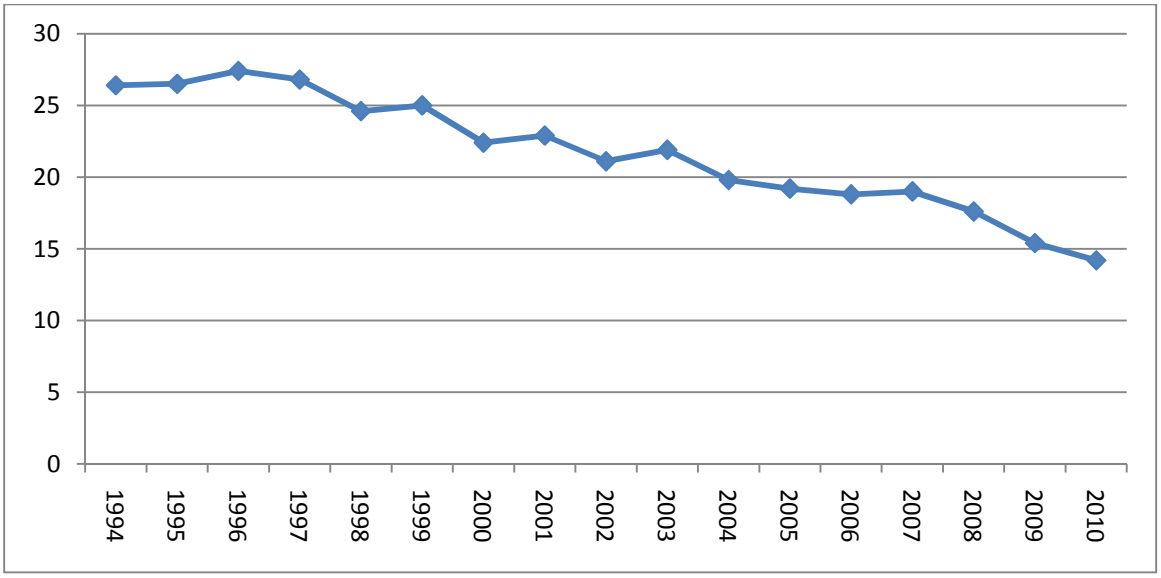
Notes: FE = individual fixed effects. Sampling weights are applied. *p < .10; **p < .05; ***p<.01.

Figure 1: Alcohol Sales in Iceland (liters per capita)



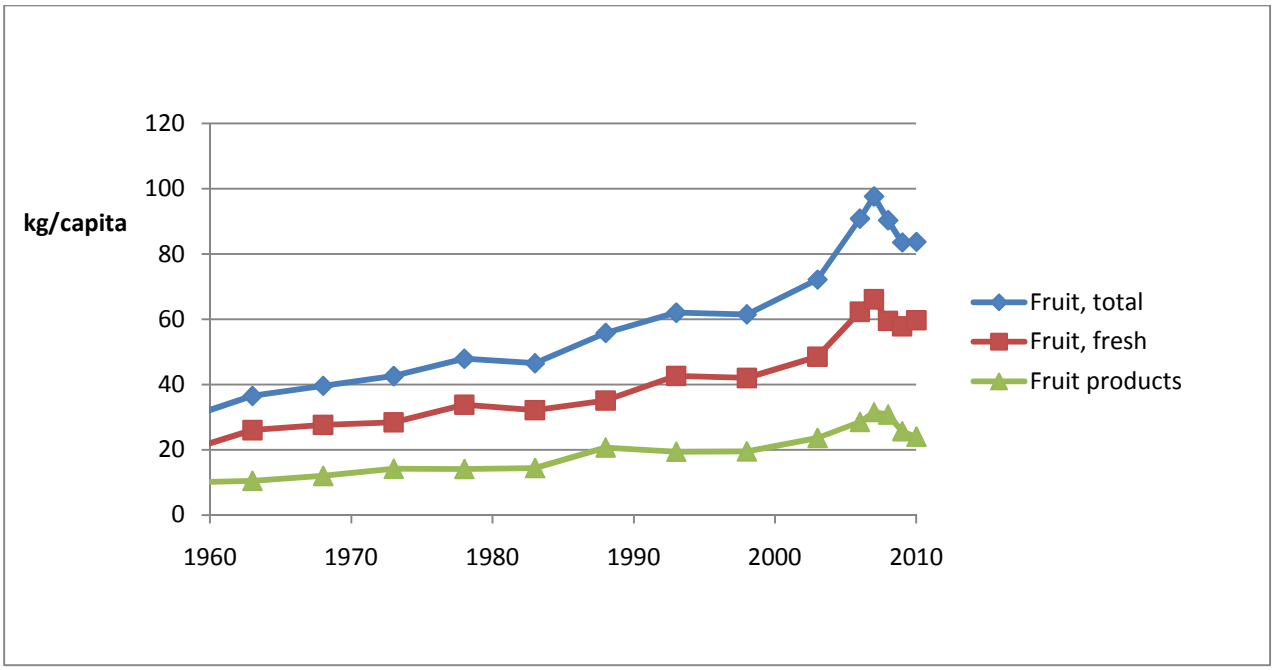
Source: The State Wine, Spirit and Tobacco Authority, Statistics Iceland (2012). Retrieved 5 April 2012. http://www.statice.is/?PageID=1253&src=/temp_en/Dialog/varval.asp?ma=VIS05120%26ti=Consumption+of+alcoholic+beverages+1980%2D2007+++%26path=../Database/visitolur/neysla/%26lang=1%26units=Litres

Figure 2: Percent of Icelanders Who Smoke Every Day



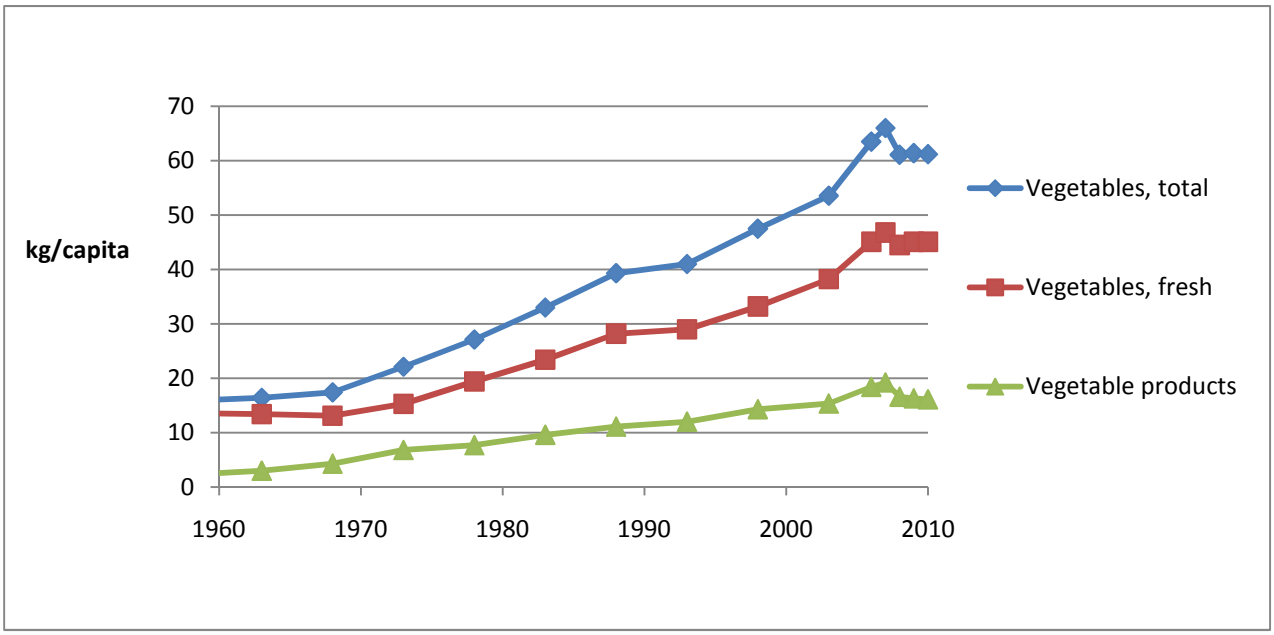
Source: Statistics Iceland (2012) Retrieved 6 April 2012. http://www.statice.is/?PageID=1282&src=/temp_en/Dialog/varval.asp?ma=HEI07102%26ti=Smoking+habits+by+sex+and+age+1994-2010++%26path=../Database/heilbrigdismal/afengiogreyk/%26lang=1%26units=Percent%20distribution

Figure 3: Fruit Consumption in Iceland



Source: The Public Health Institute of Iceland (2012a). Retrieved from: http://www2.lydheilsustod.is/rannsoknir/matur-mataraedi-holdafar/frambod-og-sala-a-matvoru/nr/2905

Figure 4: Vegetable Consumption in Iceland



Source: The Public Health Institute of Iceland (2012a). Retrieved from: http://www2.lydheilsustod.is/rannsoknir/matur-mataraedi-holdafar/frambod-og-sala-a-matvoru/nr/2905

APPENDIX: Price changes of various commodities in Iceland between 2007 and 2009

Commodity	Price Change
Cigarettes	40.6%
Alcohol	49.2%
Soft drinks	46.6%
Fast food	27.7%
Dental visit	18.6%
Dairy foods	40.7%
Fruits	87.8%
Vegetables	38.1%
Fish Oil	20.9%
Consumer Price Index	27.0%

Note: Data are from Statistics Iceland, except for fish oil which were collected by the authors from individuals in Iceland working in those industries.