How Do Incremental Wage Increases Affect Low-Wage Workers' Health Levels?

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Abstract

This paper estimates the demand for health among low-wage American workers. I incorporate theoretical assumptions and empirical findings from the fields of food and health economics to derive a utility-maximization framework, which posits health is a normal good. Using data from the Panel Study on Income Dynamics, I then regress an ordered probit random effects model to isolate the effect of income fluctuations on health over time. These results are statistically significant and robust to numerous specification checks, suggesting low-wage workers experience improved health levels as their wages increase. These findings deserve further inquiry to better-inform the current public debate over low-income workers' wages.

1 Introduction

The ongoing public debate over raising the minimum wage raises many questions about the relationship between wages and living standards in America. According to the Food Research and Action Center (FRAC), 32.6 percent of Black households with children and 28 percent of Hispanic households with children experienced food insecurity at some point since the Great Recession (FRAC, 2014). Furthermore, numerous public health agencies claim there are negative correlations between income and specific measures of health, including obesity rates, diabetes prevalence, and cardiovascular diseases (CDC, 2014; Rabi et al., 2006; WHO, 2015). These findings suggest higher-income workers spend more money to maintain their health levels; however, these cross-sectional analyses do not identify how specific individuals' health and consumption patterns change as their wages fluctuate.

This paper attempts to quantify the effect of incremental wage increases on workers' health levels over time. Because health is a normal good, there are two possible outcomes of wage increases on health. If wages are currently below the "live-able wage", then it is highly probable that workers would experience greater health levels as their wages rise. If, however, low-income workers do not respond to wage increases with higher levels of health, then low wages may not be directly responsible for health insecurity in America.

There is minimal literature on the longitudinal relationship between income changes and health levels of low-wage workers. In this paper, I utilize literature and empirical findings from the fields of both food and health economics to address this question, using empirically estimated income elasticities for different foods and numerous health measures. Then, I incorporate this information into a utility maximization framework with a short-run choice between consumption of health and non-health related goods. I test these theoretical assumptions using seven years of longitudinal data from the Panel Study on Income Dynamics (PSID), and find a statistically significant relationship between income increases and improved health. These results are robust to numerous specification checks, suggesting higher wages could improve workers' health levels.

2 Literature Review

A significant portion of the food economics literature focuses on income elasticities for total food expenditure and various food groups. Lanfranco, Ames, and Huang (2002) use the Nationwide Food Consumption Survey to look at food expenditure patterns of Hispanics in the United States. Specifically, they examine the relationship between total food expenditure and weekly income. They find an income elasticity for total food expenditure of 0.29, suggesting these consumers prioritize food consumption over other potential expenses. This result is economically significant, as 47.6 percent of the observed households were either at or below the poverty line. Similarly, Smith, Huang, and Lin (2009) use OLS to regress a log-log relationship between total food expenditure and income using the National Food Stamp Program Survey, and also find a coefficient of 0.29. They then modify their definition of income to include food stamp benefits, and find a statistically significant coefficient of 0.74.

Another portion of the literature focuses on income elasticities for specific types of foods. For example, Beatty and LaFrance (2005) find positive income elasticities for all nutrients, and these values increase with income. Kasteridis and Yen's (2012) Bayesian analysis finds a statistically significant relationship between higher education levels and both conventional and organic vegetable consumption. Their study uses education as a proxy for income because college-educated consumers earn more on average; thus, the results indicate that there is a positive relationship between income and organic vegetable consumption. According to the Guenther et al. (2013), vegetable consumption improves individuals' Healthy Eating Index[1] values, which are used to quantify health based on consumption patterns. These results closely follow Smith, Huang, and Lin's (2009) ordered logit regression. They find a 10 percent increase in food expenditure is associated with an increase in the log odds of vegetable consumption for food-stamp recipients, which would close the healthy food consumption-shortfall 7-8 percent.

Recent research also attempts to quantify the effect of income increases on various health measures. For example, Meltzer and Chen (2011) attempt to quantify the effect of income increases on health levels. They study the correlation between real minimum wage changes and workers' body mass indexes (BMI) over the period 1984-2006. Using over one million observations, they find a strong correlation between real minimum wage decreases and BMI increases; however, they do not find a causal relationship in the data. Additionally, Leahey et al. (2015) observed a randomized sample from the Shape Up Rhode Island (SURI) 2012 initiative, where participants were placed in three groups (all three received the same base SURI treatment): (1) Internet behavioral weight loss, (2) Internet behavioral weight loss and a monthly stipend of approximately $10, and (3) Internet behavioral weight loss and weekly group sessions. They find that the financial incentives induce more weight loss after three months, and groups (2) and (3) gained back less weight over the 12 months following the study.

[1] The Healthy Eating Index is the USDAs measure of diet quality

Boyce and Oswald (2012) use job promotions to longitudinally estimate whether peoples' health levels improve after receiving promotions. Although jobs are imperfect income proxies, they posit job promotions lead to wage increases, so their study should theoretically capture the immediate effects of higher income on health. They find several notable results. First, comparing managers, supervisors, and workers (in descending order of job-ranking), managers report average subjective ill-health scores[2] of 0.189 lower than supervisors, and supervisors report average subjective ill-health scores of 0.058 lower than their employees. Second, they do not find a statistically significant relationship between number of visits to the doctor and job-status. This indicates there could be a psychological effect confounding the relationship between self-reported health and job status, as managers might feel better solely because they are earning more money. Alternatively, it is possible that number of doctor visits is not an appropriate proxy for health, as wealthier people may visit the doctor because they can afford to do so (Boyce & Oswald, 2012), though their difference-in-difference results suggest physical health is not strongly correlated with job-status.

There are also several articles focusing on the Income Inequality Hypothesis, which argues higher levels of income inequality lead to heightened self-awareness and feelings of self-deprivation. This is often measured using the Yitzhaki Index, which calculates self-deprivation as a function of an individual's aggregate income deviation from their socioeconomic group's mean income. Kondo (2012) studies the increasing income inequality in Japan following its economic crisis during the period 1997-1998. Following the crisis, self-rated health levels of middle-class workers declined relative to those of higher-class workers. Kondo (2012) also notes that unemployed persons health levels twice as low as those of the highest class of workers. Adjaye-Gbewonyo and

[2]The subjective ill-health score is a measure of physical health based on self-reporting.

Kawachi (2012) summarize other Yitzhaki Index literature. They observe that in the US, higher Yitzhaki Indexes are associated with the following: lower self-reported health, higher probability of death, higher BMI, higher risk of mental health issues, and slightly worse pregnancy outcomes. They note that it is extremely difficult for these studies to control for absolute income effects, stressing the importance of quantifying these effects as well.

This paper contributes to the existing health economics literature in several ways. First, this is one of the few papers to measure health using self-reported health levels. This paper also controls for empirically grounded variables to longitudinally examine individuals' health perceptions over time. Using a new measure of health, this paper builds upon the recent scholarly attempt to derive the demand for health as a good. Additionally, this paper is one of the first to combine the fields of both health and food economics, as I use previous studies' theoretical derivations and conclusions to assist in my estimation of the demand for health.

3 Economic Framework

Theory suggests low income consumers experience healthier lives as they receive more income. These workers consume two goods: health and non-health consumption goods. The former primarily includes different types of food consumption, while the latter is composed of rent/mortgage payments, transportation costs, and education expenses. Because these consumers receive below-average wages, they have fewer consumption options, so I categorize their options into these two categories.

Following Korale-Gedara et al. (2012), this paper uses a modified version of the Stone-Geary utility function to model the decision-making process of low-income individuals. Equation 1 is the representative consumer's utility function:

$$U_{i,t}(C, H) = C_{i,t}^{\alpha} H_{i,t}^{1-\alpha} \tag{1}$$

where C is non-health consumption, H is health-related consumption, and α is a preference parameter subject to $0 < \alpha < 1$. Specifically, t is measured in months, as many low-income workers receive paychecks on a monthly basis, and the most significant non-health expense (rent) is paid each month.

Health is a function of healthy food consumption (G), unhealthy food consumption (J), and weight (W). Equation 2 shows this relationship:

$$H_{i,t} = \gamma_1 W_{i,t} + \gamma_2 W_{i,t}^2 + \gamma_3 G_{i,t} + \gamma_4 J_{i,t} \tag{2}$$

Theory suggests the following: $\gamma_1, \gamma_3 > 0$ and $\gamma_2, \gamma_4 < 0$. First, the effect of a weight change on health varies depending on weight: for low- and average-weight consumers, weight increases positively affect health; however, for overweight consumers, weight increases negatively affect health. Therefore, the weight-squared term should only have an economically significant result for overweight individuals. The inclusion of weight also accounts for exercise, so it is implicitly included in that equation. Second, Lin and Morrison (2002) find higher fruit and vegetable consumption lowers all consumers' body mass indexes, implying healthy food consumption positively affects health ($\gamma_3 > 0$). Third, the literature strongly concludes unhealthy ('junk') food negatively affects health ($\gamma_4 < 0$). Specifically, Cannon's (1992) meta-analysis of thirty years of public health and nutrition literature strongly supports this hypothesis. Chandon and Wansink's (2007) more recent paper also draws the same conclusion, though it more rigorously differentiates between 'good' and 'bad' foods based on nutrition levels.

Income constrains consumers' consumption habits. It is a function of prices and quantity consumed of unhealthy food, healthy food, and non-food consumption. Equation 3 summarizes this budget constraint:

$$I = P_J J + P_G G + P_C C, \qquad\qquad P_J < P_G < P_C \tag{3}$$

where P_J, P_G, and P_C denote the prices of nutritious food, junk food, and non-health consumption, respectively.

Theory also posits a categorical relationship between age and health. Robert and Li (2001) find a statistically significant relationship between age increases and number of chronic conditions reported. Elder consumers experience worse health levels as they age across numerous health measurements (Webster & Logie, 1976); however, this effect is insignificant in a year-over-year basis. Instead, Robert and Li (2001) categorize their observations into the following age groups: 25-39, 40-49, 50-59, 60-69, and 70 and older, in order better capture the varying effect of age increases on health.

Using both the economic theory and empirical health estimates discussed above, I derive the true equation to guide my empirical analysis:

$$H_{i,t} = \alpha_0 + \beta_1 Weight_{i,t} + \beta_2 Weight^2_{i,t} + \beta_3 PriceF_{i,t} + \beta_4 PriceG_{i,t} + \beta_5 TotalFood_{i,t} + \beta_6 \left(\frac{F_{i,t}}{G_{i,t}}\right) + \beta_7 Income_{i,t} + \beta_8 AgeCategory + \epsilon_{i,t} \tag{4}$$

Because this theory focuses on physical health, the guiding equation does not include an $income^2$ variable to account for a possible quadratic relationship between income and health. Boyce and Oswald (2012) stress the existence of a quadratic relationship between income and mental health only (as opposed to physical health). I elaborate on this decision when I challenge my main results in Section 5.3.

In this model, the representative consumers will increase consumption of both junk and nutritious food as their incomes rise. Non-food consumption may also slightly rise, but these increases will be insignificant because the model assumes consumers already have fixed prices for non-health related goods. Prices are implicitly included in Equation 4, as income is measured in real terms. These assumptions use Lundberg and Lundberg's (2012) analysis of low-wage workers in Europe. They observe higher income elasticities of food for higher-income groups, with the elasticities for nutritious food being higher than that of junk food. Their results support the theory because they demonstrate that low-income consumers will increase consumption of both types of booth, but the quantity of nutritious food consumed will increase faster than the rate of increase for junk food.

The theory concludes income increases usually improve the health of low-wage workers. Suppose the representative consumer receives a small raise. Her health should improve based on Lin et al.'s (2010) findings in their analysis of nutritious food consumption. Since calories consumed increases, both weight and food rise. If she is not overweight, then health improves. If she is overweight, then the model cannot definitively predict the outcome of her health, because the effects of weight and food consumption on health oppose each other. Regardless, she can consume more non-food goods, which should positively affect utility.

4 Summary Statistics

The theory suggests I need longitudinal data on individual persons' health levels, real income, expenditure information, weight, and age. This paper uses the University of Michigan's Panel Study of Income Dynamics (PSID) (2015), which began longitudinally tracking 18,000 individuals from 5,000 families in 1968. They continue to collect data on the original participants' ancestors as a means of observing cross-generational patterns of American citizens. Prior to 1997, interviews took place on an annual basis; however, they now occur every two years as of 1997 (PSID, 2015). The study contains household and individual-level information on dozens of categories, including: income, consumption, health, demographics, family size, mobility, region, and education (PSID, 2015). According to the study's website, almost 4000 publications cite these data, including journal articles, books, and dissertations.

This paper uses the PSID's self-reported health levels to measure individual health levels. Mavaddat et al. (2011) finds physical health primarily influences self-reported health levels. Since nutrition strongly affects physical health, I posit these statistics are appropriate for testing the theory. I restrict my analysis to the period 1999-2011 because the PSID consistently measured the variables relevant to this paper during that period. Specifically, all observations contain updated health, income, categorized expenditures, and residency information for each year. The PSID measures health on a scale of 1-5, where 1 is excellent health and 5 is poor health.

Using both nominal annual household income and residency information, I construct real wages using state-level price indexes. Aten (2007) constructs these indexes based on information from the 2000 Census, which contains state-, county-, and city-level prices of approximately 400 different items. These predicted Spatial Price Indexes (SPI) for States have a mean of 1, with Hawaii having the most expensive SPI (1.355) and North Dakota with the lowest (0.904). Although the range of values is relatively small, they are emblematic of observed rents by state, which suggests a large degree of accuracy (Aten, 2007). I then cross-reference this information with the PSID's state residency information to adjust the PSID's nominal family income to obtain real wages[3]. This wage accounts for the price of non-health consumption. I also use it to stand in for the prices of both types of food, because those data are unavailable.

Table 1 summarizes the data. The final data set contains $36,788$ observations, where each observation includes the head-of-household's self-reported health level, total household income, annual expenditures, weight, and age. The PSID defines household income as all household members taxable incomes and transfers. The balanced panel shows that over the seven year interval, the average health level fell 0.22 points, from 2.44 in 1999 to 2.66 in 2011. Additionally, real total household income rose approximately 35,000 dollars, from $51,000 in 1999 to $76,000 in 2011. As expected, weekly food consumption appears to increase with income over time.

[3]Approximately one-third of the observations do not have reported states, so I use nominal income in those cases.

5 Analysis

5.1 Estimation Issues

I make two adjustments to the guiding equation with respect to the three consumption variables due to data limitations. I combine the two food-consumption variables because the PSID only tracks total food consumed, but it does not collect more specific food consumption data. I also use rent/mortgage payments as a proxy for total consumption of non-health related items. This is the only variable I use measured on a monthly basis, so I multiply it by twelve to ensure all variables are measured in years, even though this opposes the theory's time frame. This should therefore account for price stickiness, as housing costs are generally set for either six or twelve months.

Software limitations also forced me to slightly modify the specification. Because the data are ordered and I track individual behavior over time, I preferred to regress an ordered multinomial probit fixed effects model to control for constant unobservable differences among the observations over time; however, existing software packages with ordered probit models can only control for random effects, so I use this method instead. I later challenge this decision in my robustness checks.

Multicollinearity is present between two sets of variables. I initially find a strong correlation between food expenditure and health using two tests. The pairwise correlation coefficient between these variablesis 0.8, but the Variance Inflation Factors test does not suggest the presence of strong multicollinearity. As expected, I also find multicollinearity between $weight$ and $weight^2$ using the VIF test, but I do not adjust this in my specification.

I regress these data with robust standard errors due to the presence of both serial correlation and heteroskedasticity. Using the Woolridge test for serial correlation in panel data, I reject the null hypothesis of no serial correlation. Due to the use of an ordered probit model, I cannot test the main equation for heteroskedasticity. Instead, I use a modified Wald Test for heteroskedasticity in fixed effects models as a psuedo-test, which leads me to reject the null of homoskedasticity. This results from the large effect of the Great Recession on low-income workers' wages, which I discuss further in Section 5.3

5.2 Main Results

I regress the data with an ordered multinomial probit model, controlling for random effects among the data. This specification controls for both temporal and unobservable differences among the observations. Equation 1 of Table 2 contains these results, all of which are statistically significant. There are several notable results. First, the coefficients on the log of real income is -0.14, suggesting that on average, a one percent increase in real income *increases* the log odds of moving up to the next-best health level by 0.14, as an 'Excellent' score is a one. This supports the theory's prediction of a positive relationship between real income and health. Second, the coefficient on weight is positive, while the coefficient on weight-squared is negative, which supports the theory's prediction of a quadratic relationship between weight and health; however, the theory predicts the signs should be switched on these two coefficients. Third, the theory accurately predicts an increasingly negative relationship between age and health, as the coefficients on the age groups are all increasingly positive.

I also include the results from the random effects ordered logit model (Table 2, Equation 2).

The results are extremely comparable. The primary difference between the two models is the ordered logit coefficients are almost exactly double the those of the ordered probit model. For example, the income coefficient is -0.242, suggesting that on average, a one percent increase in real income *increases* the log odds of moving up to the next-best health level by 0.242.

5.3 Robustness

I challenge the robustness of my findings using several different panel data methods and specification modifications. In Table 3, I demonstrate the results from the same specification, but using random effects (Equation 1), fixed effects (Equation 2), and between effects (Equation 3). I cannot regress equations (2) and (3) using ordered multinomial models, so I first run the random effects model using OLS to test whether my results are qualitatively similar to the main results. Because they are, I then regress the fixed and between effects models using OLS. The fixed effects model's results are qualitatively identical to those of the random effects model. All coefficients are statistically significant, but the coefficient on the log of real income decreases five times in magnitude. The between effects results are also qualitatively comparable to the main results with two exceptions: the income coefficient is much smaller in magnitude, and there is no longer a statistically significant relationship between food consumption and health.

After testing the validity of my results using different statistical techniques, I next run several specification checks to test for omitted variable biases in the main results. I initially run an ordered multinomial probit model with the inclusion of sex (Table 5, Equation 1). The coefficient is statistically significant, implying sex accounts for some of the variation among the self-reported health values. The coefficient on income also decreases in magnitude, though it remains statistically significant. I suspect this results from multicollinearity between family income and sex, as the demographic characteristics and health levels are for the head-of-house.

My results are also robust to potential correlations between the health levels of family members. First, I include the spouse's health level even though it is potentially multicollinear with family income, as well as possibly endogenous. As expected, the effect of real income on health drastically declines in magnitude (Table 5, Equation 2). The results also illustrate a negative relationship between the health levels of the spouse and head of household. Second, I test my results with the inclusion of parental income. Case and Paxson (2002) find a positive correlation between a child's health and their parents income, which opposes Cohen et al.'s (2010) hypothesis of a weak correlation between an individual's upbringing and their health as an adult. I include the result of this second-order specification check in Table 5 Equation 3. The inclusion of this variable does not affect my main results, but it is statistically significant and supports Cohen et al.'s (2010) hypothesis.

The only specification check that led to opposing results was the inclusion of income squared (Table 5, Equation 4). These results present a positive coefficient on income, and a negative coefficient on income squared, suggesting income increases reduce health levels until those individuals reach a large enough income to then experience improved health. I am skeptical of this specification for three reasons. First, the dependent variable is measured in terms of the log-odds of moving to a higher health level, so the relationship between income and health is already non-linear. Second, I suspect the income squared variable would be multicollinear with the weight variables because weight is somewhat a function of income. I would then struggle to isolate the income effect in my results. Third, the variable is not theoretically justified, which I discuss in Section 3 in the context of self-reported health being a function of *physical* health (Boyce & Oswald, 2012).

I also check for the Great Recession's effect on these results. Due to the significant changes in individuals' wages following the Great Recession, I re-run the ordered probit model with an additional dummy variable to account for the beginning of the Recession. Although I only have two time periods of data after the Recession (2009 and 2011), I suspect income to have a greater effect on health following the Recession. I include these results in Equation 5 of Table 5. The coefficient on log income slightly increases in magnitude to -0.149, which is qualitatively comparable to the initial result. Interestingly, the post-Recession coefficient is negative, suggesting overall health levels improved after 2007. I suspect this occurs because the significant change in the percent of the observations earning income following the Recession. In Table 4, I report the real income variable's summary statistics before and after the Recession, and note it increases $16,000 following the Recession; thus, the distribution of income is more right skewed than before the Great Recession. Additionally, the interaction term is positive, suggesting the returns to health from an additional one percent increase in wages decreased following the Great Recession.

Due to the large income variation among the observations, I regress the initial specification on three subsets of the data to test the validity of my results for individuals in different income brackets. I initially use a sample of individuals who earned less than $40,000 annually. The coefficient on log income is -0.07, which is significantly smaller in magnitude than the original coefficient

(Table 6, Equation 5). This demonstrates that lower-income workers do not increase health-related expenditure with higher wages. I also rerun these results on two other samples: $40,000-$70,000 annually, and $70,000 and above (Table 6, Equations 5 and 6). These results are both extremely comparable to the low-income sample's results.

6 Conclusion

This paper contributes to the minimal literature bridging the areas of food and health economics, and finds strong evidence that higher wages induce healthier lives. Although this paper's results are primarily focused on individual behavior for workers across the socioeconomic spectrum, the results suggest workers experience greater health levels as their wages increase. These results, which are robust to numerous specification checks, are also comparable for individuals across three income groups. My findings have strong implications for the ongoing public debate about the minimum wage. The sample observations demand greater health as their incomes rise, which reveals the strong possibility that the minimum wage remains below a live-able wage

These results generally support the utility maximization framework introduced in Section 3. The evidence supports the hypothesis that health is a normal good for all consumers; however, it is unclear whether self-reported health measures are an optimal measure of health. Specifically, I suspect this is because self-reported health is also a function of the psychological effect of achieving higher earnings. Additionally, my results could be biased because I do not have access to consumption data of the specific food groups defined in the theory. Instead, I use total food consumed as a proxy for the ratio of good vs. bad food consumed. The results could also be biased because the data are bi-annual, while the theory is monthly, providing consumers the opportunity to react to wage changes with housing expenditure changes.

Due to these data limitations, I am not entirely able to isolate the effect of incremental wage changes on health in the short-run. This leaves room for future research in several different areas. The most important issues to address are these significant data issues. Additionally, behavioral economics research could help quantify the psychological bias of higher earnings, and incorporate this estimate into a more accurate specification. Future research should also re-regress these specifications using a different dependent variable, such as an all-encompassing health measure from a medical professional, though this would be expensive to collect. With more time, I would attempt to construct a dependent variable using a ’health rating system’ from a medical resource, which would be an extensive yet plausible feat given the PSID’s extensive collection. I could then regress those data and compare to my initial results, which would provide a good estimation of the usefulness of self-reported health measures.

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Appendix

Table 1: Mean values for each variable in true equation by year

Year	Household Income	Health	Food	Weight	Age	Housing
1999	51217.19	2.44	1994.24	194.06	45	27831.53
2001	60105.06	2.46	1613.99	195.61	47	25109.724
2003	61185.51	2.48	1974.65	201.46	49	29356.634
2005	67637.57	2.59	1846.02	201.29	50	38133.22
2007	73934.69	2.56	2105.64	202.46	52	32402.306
2009	78689.35	2.63	2027.96	203.33	53	41239.885
2011	76083.61	2.67	2353.99	201.42	55	38799.499

Notes: Health Level is measured as follows: 1 = Excellent, 2 = Very Good, 3 = Good, 4 = Fair, 5 = Poor. Source: Panel Study of Income Dynamics (2015)

Table 2: Main results

	(1)	(2)
VARIABLES	Health	Health
log real income	-0.135***	-0.242***
	(0.008)	(0.015)
weight	0.005***	0.010***
	(0.000)	(0.001)
weight2	-0.000***	-0.000***
	(0.000)	(0.000)
food	0.000***	0.000***
	(0.000)	(0.000)
housing cost	0.000***	0.000***
	(0.000)	(0.000)
age35-50	0.447***	0.816***
	(0.026)	(0.047)
age50-65	0.888***	1.594***
	(0.032)	(0.058)
age65+	1.453***	2.610***
	(0.041)	(0.074)
constant	-1.461***	-2.565***
	(0.110)	(0.204)
Observations	36,788	36,788
Number of id	6,906	6,906
Prob > Chi2	0.000	0.000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Results correspond to (1) Random effects ordered probit and (2) ordered logit results. Health is measured in descending order from 1-5, so a *negative* coefficient suggests a *positive* relationship with health

Table 3: Re-regression of main results using OLS panel methods

VARIABLES	(1) health	(2) health	(3) health
log real income	-0.087***	-0.014***	-0.342***
	(0.005)	(0.005)	(0.010)
weight	0.003***	0.003***	0.005***
	(0.000)	(0.000)	(0.000)
weight2	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
food	0.000***	0.000***	0.000
	(0.000)	(0.000)	(0.000)
age35-50	0.258***	0.198***	0.367***
	(0.015)	(0.017)	(0.035)
age50-65	0.526***	0.404***	0.736***
	(0.019)	(0.023)	(0.035)
age65+	0.876***	0.609***	1.055***
	(0.024)	(0.033)	(0.037)
housing cost	0.000***	0.000***	0.000
	(0.000)	(0.000)	(0.000)
Constant	2.565***	1.818***	4.898***
	(0.064)	(0.082)	(0.117)
Observations	36,788	36,788	36,788
R-squared		0.019	0.268
Number of id	6,906	6,906	6,906

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Regression results are from: (1) Random effects, (2) fixed effects, and (3) between effects regressions

Table 4: Mean income before and after the Great Recession

Total Family Income	Pre-Recession	Post-Recession
Mean	61929.15	77435.69
Std. Dev.	83988.73	102689.93
25th percentile	23783.78	28956.52
50th percentile	45485.66	56938.78
75th percentile	77861.16	99096.88
99th percentile	309278.3	377932.1

Notes: Health Level is measured as follows: 1 = Excellent, 2 = Very Good, 3 = Good, 4 = Fair, 5 = Poor.

Source: Panel Study of Income Dynamics (2015)

Table 5: Specification checks for omitted variable bias using

VARIABLES	(1) health	(2) health	(3) health	(4) health	(5) health
log real income	-0.116***	-0.158***	-0.137***	0.167***	-0.149***
	(0.008)	(0.014)	(0.008)	(0.024)	(0.009)
weight	0.007***	0.007***	0.005***	0.006***	0.005***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
weight2	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
food	0.000***	0.000	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
housing cost	0.000***	-0.000	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
age35-50	0.447***	0.379***	0.413***	0.484***	0.379***
	(0.026)	(0.035)	(0.027)	(0.026)	(0.027)
age50-65	0.889***	0.734***	0.836***	0.937***	0.750***
	(0.032)	(0.042)	(0.033)	(0.032)	(0.034)
age65+	1.433***	1.171***	1.374***	1.468***	1.274***
	(0.041)	(0.054)	(0.042)	(0.040)	(0.043)
sex	0.583***				
	(0.040)				
health of spouse		0.608***			
		(0.012)			
log parent income			-0.132***		
			(0.014)		
inc2				-0.020***	
				(0.001)	
post recession					-0.101
					(0.138)
post recession * income					0.028**
					(0.013)
Constant	-0.826***	0.060	-1.647***	-0.420***	-1.733***
	(0.118)	(0.186)	(0.112)	(0.134)	(0.117)
Observations	36,788	36,788	36,788	36,788	36,788
Number of id	6,906	6,906	6,906	6,906	6,906
Prob > Chi2	0.000	0.000	0.000	0.000	0.000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Each equation corresponds to a main result specification with the inclusion of one additional variable: (1) sex, (2) spouse's health, (3) parent income (4) income squared, (5) a Great Recession dummy

Table 6: Re-regressions of main results using difference subsets of the data by income

VARIABLES	(1) health	(2) health	(3) health
log real income	-0.069***	-0.135***	-0.059*
	(0.010)	(0.008)	(0.035)
weight	0.005***	0.005***	0.011***
	(0.001)	(0.000)	(0.001)
weight2	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
food	0.000***	0.000***	0.000
	(0.000)	(0.000)	(0.000)
housing cost	0.000***	0.000***	0.000
	(0.000)	(0.000)	(0.000)
age35-50	0.557***	0.447***	0.492***
	(0.040)	(0.026)	(0.054)
age50-65	1.029***	0.888***	0.896***
	(0.048)	(0.032)	(0.061)
age65+	1.528***	1.453***	1.299***
	(0.054)	(0.041)	(0.084)
Constant	-0.958***	-1.461***	0.649
	(0.139)	(0.110)	(0.430)
Observations	14,873	36,788	12,469
Number of id	4,482	6,906	3,325
Prob > Chi2	0.000	0.000	0.000

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: The subsets and their results correspond to persons who *at some point* had an annual total family income of: (1) less than $40,000, (2) $40-70,000, and (3) greater than $70,000. Every observation's earnings fell within the middle income bracket during at least one year, which is why their are 36,788 observations for equation 2