SPOUSAL HEALTH SHOCKS AND LABOR SUPPLY

Abstract: *Previous studies in the literature have focused on the investigation of adverse health events on people's labor supply. However, such health shocks may also have spillover effects on people's spouses. Examining whether such effect exists should help us gain more insights into the well-being of families with two earners. In my study, I use a difference-in-difference model which controls for individual and survey wave fixed effects and data from the Health and Retirement Survey to analyze the relationship between spousal health shocks and labor supply. My findings generally suggest that women seem to exhibit the Added Worker Effect, whereas men tend to reduce their labor supply. This difference can be attributed to the different specialized roles that women and men take on in families. I also offer two heterogeneity analyses of how the effects of spousal health shocks may differ depending on the level of wealth and income and the level of the shocks' severity.*

I. Introduction

The older population is a group that is more likely to be affected by severe diseases and health conditions. The National Council on Aging reported that 92% of older adults have at least one chronic disease. The older adults who participate in this survey are people who are 50 years old and above. Among the chronic diseases, heart disease, cancer, stroke and diabetes cause almost two-thirds of all deaths each year. In addition, 90% of Americans who are 55 and above are at risk for high blood pressure. Such conditions can lead to serious limitations to older people in the workforce. They may need to reduce their working hours in order to seek treatment or retire early to retain their health and spend time to enjoy the last years of their life. Researchers in the literature have focused extensively on this issue of health shocks – how health shocks affect people's own labor supply – and they generally found that people tend to reduce their labor supply and lose their earning power. However, we may wonder if the effect of a health shock only stops there or it also creates a significant spillover effect on a spouse's labor supply in a two-person household. If there is a drop in income in a household due to a reduction in labor supply by a sick husband, his wife may want to substitute for that loss in income by increasing her labor supply. In this case, the wife will act as an insurance to sustain the household's stable flow of income against negative events. On the other hand, because of the health shock, the wife's value of the time spent together with her husband may increase now that his expected lifespan is shortened and he may need more physical assistance in his daily activities. As a result, the wife may decide to retire early or reduce her working hours to take care of her husband. Therefore, the consequence of spousal health shocks on people's labor supply is ambiguous and it can be different between husbands and wives because of their specialized roles in a household.

While older workers are at the end of their lifetime earnings profiles, they are faced with an increasing chance of having severe health shocks which can limit their earning power even further. Due to the high costs of treatment for serious health conditions, this group of people may struggle financially and become more likely to get into poverty. For that reason, the US government have designed various assistance programs to help the elderly weather negative physical and financial events. We have Social Security to offer retirement benefits, Medicare to help cover medical expenditures, and Medicaid and Supplemental Security Income to provide stipends for low income seniors. If these programs have provided financial support effectively enough to the elderly in need, we should not see any change in the labor supply of people with spouses who suffer from health shocks. If they need to increase their labor supply, it means that these programs have not provided sufficient support. However, if people are dropping out of the labor force, it means that these programs might be providing redundant assistance. Therefore, it is important to understand how people respond to their spouses' health shocks so that we can evaluate the welfare of elderly two-people households and their decision-making process, which in turn helps us design appropriate social programs to assist them.

My analysis is related to the literature which examines the effects of health shocks among the elderly. The existing literature has mostly focused on the effects of health shocks on one's own labor supply and retirement decisions. Some studies rely on self-reported health to proxy for health shocks (Hanoch and Honig 1983, Boskin and Hurd 1978, Gordon and Blinder 1980, and Quinn 1977) and have found a large negative relationship between health shocks and the affected people's labor supply. However, the endogeneity problem can be serious if we use self-reported health to measure health shocks because it is subjective. People who are less motivated to go to work may be more likely to put the blame on their bad health. Furthermore, people can be more likely to report themselves as being disabled so that they can get early retirement benefits if their rewards from continuing to work are low. In addition, there can bias due to measurement error when people evaluate their own health status. We cannot expect people's judgement of their own health to be comparable from person to person. As a result, self-reported health is not an ideal proxy for health shocks to use for the study of spousal health shocks on labor supply.

Other studies use more objective measures of health shocks to estimate its effect. For example, Garcia-Gomez et al. (2014) use linked Dutch hospital and tax register data to estimate the effect of acute hospital admissions on people's own labor supply. McClellan (1998) and Coile (2003) use diagnoses of severe health conditions such as cancer, stroke, heart diseases, etc. in the Health and Retirement Survey to estimate their effect on also people's own labor supply. These measures are more appealing than self-reported health as proxies for health shocks because they are based on doctors' reports, which should help to mitigate measurement error bias and endogeneity problems. These studies also find a negative relationship between health shocks and affected people's labor supply, some with larger magnitude and some with smaller magnitude compared to studies which use self-reported health.

The analysis of spousal health shocks on labor supply is more limited in the literature. Coile (2003) estimate the effect of spouses' diagnoses of severe health conditions on labor supply among the elderly in the Health and Retirement Survey to find that there is no significant relationship between spousal health shocks and people's probability of exiting the labor force. Although diagnoses of severe health conditions are more objective compared to self-reported health, Coile's assumption of them being exogenous shocks may fail to acknowledge possible endogeneity problems that are associated with the onset of such conditions. Husbands and wives may have similar characteristics which influence both their chance of having health shocks and their labor supply decisions. Therefore, the OLS estimates may not account for such bias. Moreover, Coile does not view health shocks as having a permanent effect on people's health capital, which may fail to capture the permanent effects of spousal health shocks on people's labor supply.

Jeon and Pohl (2016) use Canadian administrative data from multiple sources to provide the estimates for the effect of spouses' cancer diagnoses on individuals' employment. They found evidence that when the spouses are diagnosed with cancer, there is a significant decline in people's employment by 2.4 percentage point. The effect is small, possibly because they look at a younger group of people – people who are between 28 and 64 years old. The decision-making process with regard to labor supply for this group of people can be very different from people who are closer to the retirement age. Younger individuals may find it harder to leave the labor force because they would not get any retirement benefits and their loss of lifetime earnings is substantial. Benefits from social programs would not be sufficient to cover for medical expenditures for severe health shocks such as cancer. However, for older individuals, when they are closer to their retirement age and are already at the end of their earnings profiles, the benefits of them continuing to work for a few more years may be low and they can afford to reduce their labor supply.

The purpose of my study is to investigate the effect of spousal health shocks on labor supply. The first contribution of my paper is to formulate a generalized difference-in-difference (D-in-D) model based on individual and wave fixed effects to perform this study. My measure of spousal health shocks is based on a similar measure used by Coile (2003), which are diagnoses of severe health conditions. To mitigate the endogeneity problem associated with this measure, I utilize individual fixed effects. People may have unobservable different lifestyles which increase their spouses' chance of incurring severe health shocks and increase their chance of leaving the labor force. The bias caused by these intrinsic characteristics can be factored out when we control for individual fixed effects. Although people can recover from their health shocks, their health capital cannot be the same with the period before the health shocks. As a result, I assume health shocks to have a permanent effect on people's health capital at the onset of their health shocks. Thus there are distinct pre and post periods for individuals with health shocks. In addition to individual fixed effects, I also control for survey wave fixed effects so I can utilize both cross-sectional and cross-time variations of health shocks to form my D-in-D model.

Individuals may respond to their spouses' health shocks differently based on their wealth and income. People in households with low wealth may need to rely on their earnings to pay for their spouses' medical treatments. Hence we should expect people with low wealth to be less likely to retire at higher levels of earnings when their spouses get sick. The same effect for the group of people with high wealth might be smaller because they have extra financial resources to pay for medical expenditures. On the other hand, people who earn low income may have a higher propensity to retire at higher levels of wealth. Because of their low earnings, their opportunity costs of retiring are low. Now that their spouses are sick, the value of the time spent with their spouses are higher. With a high level of wealth, people can afford to stay home to take care of their spouses. As a result, the benefits of retiring are higher than the costs, and we should expect these people to be more likely to retire. We might expect the same effect to be less pronounced for people with high earnings because they are faced with a higher opportunity costs of retiring. Therefore, another contribution of my paper is to analyze the heterogeneity effect of how people respond to spousal health shocks at different levels of wealth and earnings. It is useful for policy makers to understand this mechanism to identify which households are in more urgent need of financial assistance or make sure that the financial assistance is not redundant in certain households.

The last contribution of my paper is an examination of how spousal health shocks affect labor supply at different levels of severity of the health shocks. Individuals may be more likely to retire if their spouses get seriously sick and need someone to take care of them constantly. At the same time, they might be less likely to retire if medical expenses are so high for more severe conditions and need to increase their labor supply to pay for such expenses. Thus the effect of spousal health shocks may vary depending on how severe the shocks are. Therefore, I will use various functional limitation indices as indicators for how severe spousal health shocks are to analyze this heterogeneity effect. Understanding the relationship between different levels of severity of spousal health shocks and labor supply can be important for policy makers if they need to formulate some criteria to provide different levels of aids to the households in need.

The results of my study indicate that in the events of spousal health shocks, men and women respond differently. Women increase their working hours by 80 hours a year, whereas men are 4 percentage point more likely to retire and reduce their working hours by 70 hours a year. While both men and women are less likely to retire and exit the labor force at higher levels of earnings, the effect is larger for women. Higher levels of wealth do not seem to play a significant role in people's labor supply decisions. Lastly, women seem to be more likely to increase their labor supply when their spouses' health shocks are more severe, whereas men seem to be more likely to reduce their labor supply in the same situation.

II. Estimation Strategy

The data set that I will use for my analysis is the Health and Retirement Survey (HRS). This survey was started in 1992 and is collected on a biannual basis. The survey only collects information on the elderly who have to be at least 50 years old. There are six cohorts: Initial HRS cohorts (born between 1931 and 1941), AHEAD cohort (born before 1924), Children of Depression cohort (born between 1924 and 1930), War Baby cohort (born between 1942 and 1947), Early Baby Boomer cohort (born between 1948 and 1953), and Mid Baby Boomer cohort (born between 1954 and 1959). This data set has information on retirement, labor force participation, working hours, wealth, and health conditions for both respondents and their spouses for every wave. I will use 11 waves for my study, which is from 1992 to 2012.

The framework of my estimation strategy in a D-in-D model which utilizes cross-sectional and cross-time variations of spousal health shocks to estimate their effects on labor supply between women and men. Men and women may face different opportunity costs and have different specialized roles in a household. Men generally have higher earnings than women, so they may face higher opportunity costs if they retire early. Moreover, men may value the time they spent with their sick spouses differently compared to women. In addition, women may be more specialized in home-making tasks, while men may take on the bread-winner roles in households. As a result, when a health shock hits, men and women may have to allocate their time into the tasks of the other person in the household accordingly to keep the balance.

Therefore, it is more appropriate to examine the effect of spousal health shocks for men and women separately.

I will use diagnoses of severe health conditions as the proxy for spousal health shocks. However, there is an endogeneity problem associated with spousal health shocks which can cause bias in the estimates of their effects on labor supply if we only use and OLS model. For example, people whose spouses have health shocks may have different lifestyles from people whose spouses do not. People who are more caring and pay more attention to their spouses' physical well-being may take better care of their spouses, which reduces the probability of their spouses suffering from adverse health events. At the same time, because of their caring personality, they may be more likely to adjust their labor supply to sustain the welfare of their families when their spouses have health shocks. They might be more likely to increase their labor supply to make sure their spouses have enough money to cover for treatment expenditures. In contrast, they might also be more likely to reduce their labor supply to stay home to make sure their spouses receive the best personal care. To address this endogeneity problem, I will control for individual fixed effects in my model so I can partial out the time-invariant characteristics of individuals. This constitutes the cross-time variation dimension of spousal health shocks in my D-in-D model.

Although people can recover from their health shocks, the health shocks should have a permanent effect on people's health capital. For example, people can have cancer and it can go into recession after treatment, but the treatment cannot bring their physical capacity back to the same level as before. Thus I define spousal health shocks as permanent shocks to spouses from the onset of the shocks. Based on this definition, the control group in my analysis includes people whose spouses do not experience a change in health status throughout their survey durations. This means that their spouses either have no diagnoses of severe health conditions or the spouses already have some diagnoses from the first wave when they enter the survey. The treatment group includes people whose spouses experience a change in health status from being healthy to being struck by new health shocks. Because health shocks are permanent, people with spousal health shocks have two distinct pre and post periods relative to the shocks. Therefore, I can exploit this change in spouses' health status to estimate the effect of spousal health shocks on people's labor supply in the context of a D-in-D model.

In addition to controlling for individual fixed effects, I also control for survey wave fixed effects so I can partial out factors that affect all individuals in a certain wave similarly. In other words, I can compare how the effect of spousal health shocks differ from individual to individual in a given wave. As a result, I can exploit the cross-sectional variation dimension of spousal health shocks in my D-in-D model. Therefore, the construction of my D-in-D model is complete with a treatment group and a control group, a pre-period and a post-period, and cross-sectional and cross-time variations. The model is as follows:

$$LS_{it} = \beta_0 + \beta_1 SpHealth_{it} + \beta_2 Health_{it} + \beta_3 X_{it} + \beta_4 SpX_{it} + u_i + v_t + \varepsilon_{it} \qquad (1)$$

Where LS_{it} stands for person *i*'s labor supply response in wave *t*, $SpHealth_{it}$ is a dummy variable for whether person *i*'s spouse suffers from a major health condition, $Health_{it}$ is a dummy variable for whether person *i* actually suffers from a major health condition, X_{it} is a set of variables that controls for person *i*'s age and wealth holdings, SpX_{it} controls for the spouse's age, u_i controls for individual fixed effect, v_t controls for time fixed effect, and ε_{it} is an error term. The dependent variable LS_{it} measures three types of labor supply response: probability of retirement, probability of labor force exit, and working hours. The HRS has a question on retirement which asks people whether they are fully retired, partially retired, or not retired.

People are partially retired when they switch from working full-time to working part-time and begin to draw retirement benefits. Based on this question, I define people to be retired if they are fully retired or partially retired. There is another question in the HRS which asks people about their labor force status. People can answer whether they work full-time, part-time, are unemployed, retired, partially retired, disabled, or not in the labor force. I define people to have exited the labor force if they are retired or not in the labor force. If they work full-time, part-time, are unemployed, or partially retired, they take a value of zero for that variable. I exclude disabled people from the analysis because we cannot determine whether they have exited the labor force. The coefficient of interest is β_1, which captures the effect of spousal health shocks on labor supply. Health conditions for person i's spouse include seven severe health conditions: cancer, heart attack, stroke, lung diseases, arthritis, diabetes, and injuries from accidents. Health conditions for person i is defined in the same way. People's wealth holdings include: values of all mortgage payments, businesses, individual retirement account, certificate of deposit, stock and bond holdings, and other sources of wealth. I also include a quadratic term and a cubic term to control for people's age and a dummy to control for whether they are 65 years old because 65 is the full retirement age and when they are eligible for Medicare, which may have influence on their retirement decisions.

There are three sample restrictions that I put on my sample. Individuals with spouses who change their health status need to be observed for at least two waves: the wave before the shocks occur and the wave when the shocks occur. Similarly, people with spouses who do not have any change in their health status should also be observed for at least two waves. This ensures that we can get more meaningful information from spousal health shocks for our analysis while still preserving a sufficient sample size. Because I want to look at whether spousal health shocks increase the probability of people moving into retirement, I need to restrict my sample to include only people who are working in the first wave when they are surveyed. For the same reason, I exclude people who have stated that they have retired but come back to the labor force in later waves.

Table 1 displays an overview of spouses' probability of having a severe health condition for women and men at their waves of entry in the HRS. The statistics are similar across women and men. Both women and men are as likely to have spouses who have health shocks, which is about 50 percent. The chance of people whose spouses have cancer, stroke, lung diseases, and injury is low, while the chance of people whose spouses have heart diseases, diabetes, and arthritis are much more likely. Table 2 shows the summary statistics for women and men, which compares between people whose spouses experience a change in their health status (treatment group) and people whose spouses do not (control group), also at the wave of entry. We have about 5,992 individuals in the female sample and 6,845 individuals in the male sample. On average, individuals are followed over 6 waves. We notice that the treatment and control groups have very similar characteristics, which provides support for the validity of this control group as a good counter-factual group for the treatment group.

III. Results

Table 3 explores the effect of spousal health shocks on labor supply response among women and men in the framework of an OLS model. The results from this OLS model would serve as a good benchmark for the results of the difference-in-difference (D-in-D) model laid out in equation (1). We observe that there is no relationship between spousal health shocks and retirement or labor force exit among women. However, column 3 suggests that there is a positive relationship between spousal health shocks and women's working hours: if a man incurs a health shock, his wife is likely to increase her working hours by 56 hours per year. This is equivalent to an increase of about 1.5 weeks annually. Previous studies in the literature have found evidence that health shocks are associated with a decline in a person's own labor supply. Other studies (Gruber 2000, Lundberg 1985, Mincer 1962) have found that when there is a reduction in a man's labor supply, his wife tends to exhibit the "Added Worker Effect", a circumstance in which a wife increases her labor supply to make up for the loss in income from her husband. The wife's earnings would act as an insurance for any negative income shock that happens to her husband. This behavior is consistent with our result in the female sample. We observe a similar response in the male sample. Column 5 shows that a spousal health shock corresponds to a 1.4 percentage point decrease in the probability that a man leaves the labor force. This result gives rise to the speculation that the Added Worker Effect might also exist among husbands when their wives are sick. However, there is possible biasedness in the estimates in this OLS model because people may have unobserved characteristics that affect both the likelihood that their spouses have health shocks and their labor supply decisions. For example, if a woman is a caring person and takes good care of her husband, her husband may be less likely to have a health shock. Additionally, that woman also cares about the well-being of the family and is willing to increase her working hours if any negative financial shocks happen to the family. Therefore, there can be a bias in the coefficients estimated in the OLS model.

Table 4 displays the results from the D-in-D model as specified in equation (1). The results for the female sample are consistent with the ones from the OLS model. Spousal health shocks are associated with a positive relationship with wives' working hours. This result lends further support to the existence of the Added Worker Effect among wives. The coefficient is estimated to be an increase of 80 hours a year, which is larger than the coefficient estimated in the OLS model. This suggests that there is a possible downward bias in the OLS model as we suspected. Comparing with the mean annual working hours of 1,007 for women, this is an increase of roughly 8% a year. The results for the male sample in the OLS model is reversed in the D-in-D model. Although the estimate on labor force exit is no longer significant as shown in column 5, column 4 shows that a wife's health shock corresponds to a 3.9 percentage point increase in the probability that her husband retires. Given the average retirement rate for men being 50%, this is an increase of 7.8%, which is a large effect. This reduction in labor supply among husbands is reinforced by a decline of 70 working hours annually in column 6, which is a decline of 8.1% given the mean working hours being 856 a year. Therefore, we do not find evidence of the Added Worker Effect in the male sample using the D-in-D model. The OLS model may have masked characteristics of husbands which make them more likely to reduce their labor supply in the event of their wives' health shocks. Wives and husbands tend to have different roles in a household. Husbands are generally the main income earners in families, so when they have health shocks, their wives may manifest their caring personality by trying to sustain the families' financial situation by increasing their labor supply. On the other hand, wives are generally the main people in charge of home production in families, so husbands may manifest their caring personality by substituting for this loss of home production by reducing their labor supply.

Event Study

The assumption that we need for the estimate on $SpHealth_{it}$ to be an unbiased estimate of β_1 is that ε_{it}, which represents an individual's characteristics that change over time, is uncorrelated with their spouses' probability of getting a health shock and does not affect their labor supply decision. This assumption will be violated if people develop new habits or something happens and changes people's behaviors over the periods that they were surveyed. Furthermore, if there is another negative shock that happens at the same time with a spousal health shock, we will not be able to attribute all the effects on labor supply response to spousal health shocks. Additionally, if people could foresee the time of the spousal health shocks and change their labor supply beforehand, then the timing of the health shocks is not an unexpected source of variation anymore. Therefore, we need to check to make sure that during the period before the spousal health shocks occur, people do not change their behaviors in the labor market. We can check for this by doing an event study using the model as follows:

$$LS_{it} = \beta_0 + \sum_{k=-4}^{4} \beta_k SpHealth_{kit} + \beta_2 Health_{it} + \beta_3 X_{it} + \beta_4 SpX_{it} + u_i + v_t + \varepsilon_{it} \qquad (2)$$

I construct this model by modifying the original model as specified in equation (1). The original variable $SpHealth_{it}$ is replaced with a vector of dummy variables $SpHealth_{kit}$ which indicate whether year t is 2 years, 4 years, 6 years, and 8 years or more before and after a health shock happens to a spouse. In practice, the dummy which indicates whether year t is 2 years before the health shock happens is omitted to form the baseline group. As a result, β_k's capture the effects of spousal health shocks on labor supply at each period compared to the 2 years before the health shock occurs and the coefficient for $SpHealth_{kit}$ at this period is 0. Figures 1 to 6 plot the coefficients of this regression on each of the three measures of labor supply for the female and male sample. In each figure, the solid line represents the coefficients and the two dotted lines represent the 95% confidence interval. The vertical line denotes the time when health shocks occur to spouses. People report their change in health status in period t, but it could have happened anytime between periods t-2 and t. Figures 1, 2, 5, and 6 do not show any pattern of spousal health shocks over time in terms of women's retirement, women's labor force participation, men's labor force participation, and men's working hours. The coefficients are mostly not significant. However, figure 3 shows that there seems to be a sudden change in working hours for women from period t-2 to period t. The periods before the spousal shocks occur do not seem to show any significant trend. Figure 4 also shows a sudden change in the probability of retirement for men from period t-2 to period 2. Additionally, the coefficients for the periods before the spousal health shocks are practically 0, suggesting no pre-trend. These two figures support our findings in table 4.

Heterogeneity Analysis with respect to Wealth and Earnings

There might be substantial heterogeneity in the way individuals respond to spousal health shocks which we cannot observe if we only analyze the average effect of spousal health shocks on labor supply. People across various levels of wealth and earnings are likely to behave differently when their spouses get sick. If a person gets sick in a household with higher wealth, it is possible that the person's partner is more likely to reduce labor supply to spend more time to take care of his/her sick spouse because higher levels of wealth mean better financial protection and the partner can afford to retire early. On the other hand, if a person becomes sick while his/her partner has high earnings and the family may have to rely on such earnings to pay for medical expenses, the partner should be less likely to retire. To test for these hypotheses, firstly I add an interaction term between spousal health shocks and wealth level and then another interaction term between spousal health shocks and earnings into the original D-in-D regression. The unit for the level of wealth is in $100,000 and unit for the level of earnings is in $10,000. Table 5 shows no significant effect of spousal health shocks on labor supply across both the female and male samples even when the spousal health shocks occur in households with higher levels of wealth. It is possible that because most of people's wealth is tied up in their assets such as real estate, stocks, bonds, etc. and those cannot be easily converted into cash to pay for medical expenses, people may hesitate to reduce their labor supply in the wake of spousal health shocks. Table 6 displays how individuals react to spousal health shocks at different levels of earnings. In the female sample, we find evidence that in a household with a sick husband, a $10,000 increase in the wife's earnings is associated with 1.8 percentage point reduction in the probability that she retires and a 1.3 percentage point reduction in the probability that she leaves the labor force. This is consistent with our speculation above. However, we do not observe such behavior in the male sample. They do not seem to change their labor supply at higher levels of earnings when their wives get sick.

To investigate further the heterogeneity in labor supply response across wealth and earning levels in the event of spousal health shocks, I will split the samples by the median of the wealth level and the median of the earning level. The median household wealth is $123,000, the median earning for women is $22,000 a year, and the median earing for men is $36,500 a year. Individuals with a level of wealth lower than the median wealth are defined to have low wealth, and individuals with earnings lower than the median earning are defined to have low earnings. Let us compare between two agents who want to maximize their utility of consumption and leisure over two periods based on their financial resources. In the first period their spouses get sick and in the second period they have to find ways to take care of their spouses. Assume also that Person 1 has low wealth and Person 2 has low income. For Person 1, if his spouse becomes sick, he needs to pay for medical expenses in the next period. If he retires now, his low wealth and pension may not be enough for him to cover medical expenses for his spouse's treatment in the second period. At the same time, he will also incur disutility from less consumption in that period. Therefore, he needs to rely on his earnings to take care of his spouse and maintain his level of consumption because the price of leisure is too high. As a result, people with low wealth should be less likely to retire at higher level of earnings. On the other hand, because Person 2 has low earnings – possibly from a part-time job – his price of leisure is low. Now that his spouse is sick, the value of his leisure should increase and he would get disutility from working to earn a low salary. If he has accumulated a higher level of wealth over time and can manage to pay for medical expenses for his sick spouse, he should be more likely to retire and give up the low salary. His consumption in the second period will not be affected so much because he is old and his pension and wealth should be enough for him to maintain his consumption level until his death. Thus, we expect to see people with low earnings to be more likely to reduce their labor supply at higher level of wealth when their spouses are sick. Therefore, I will use the interaction term between spousal health shocks and earnings to look more closely into the group of people with low wealth and use the interaction term between spousal health shocks and wealth for the group of people with low earnings.

Table 7 shows the D-in-D results of how spousal health shocks affect men and women's labor supply at different levels of earnings in households with low wealth (less than $123,000). As we can see in column 1, a $10,000 increase in annual earnings is estimated to decrease the probability that a wife retires by 3.1 percentage point when her husband is faced with a health shock. The effect is also significant and has similar magnitude when we look at labor force exit in column 2. In column 3, working hours for women is expected to reduce by 58 hours a year for every $10,000 increase in their earnings when their husbands become ill. These findings further strengthen the presence of the Added Worker Effect among women. Looking at the male sample in columns 4 and 5, we see that wives' health shocks also exhibit a negative relationship with men's labor supply at higher levels of earnings, although the magnitude of the effect is only about half of the female sample. Men generally earn higher salaries than women. As we can see, the median earning for men in the sample is $36,500 per year, which is about 1.7 times the median earnings for women at $22,000 per year. Therefore, the men may be less responsive to an increase of $10,000 in their earnings compared to the women. I also examine how individuals react to spousal health shocks along the spectrum of earnings for the other group of people with high wealth, or people who possess more than $123,000 in wealth. We would expect the relationship to be less strong in this group of people because the marginal value of an additional $10,000 a year in earnings should be lower than the group of people with low wealth. Columns 1 and 2 in table 8 show that the negative relationship between spousal health shocks and labor supply at higher levels of earnings is still maintained among women, but the magnitude is reduced by more than half compared to the group of women in households with low wealth, which is what we expected. Looking from column 4 to column 6 of table 8, we see that such a relationship does not exist among men. With a high level of wealth already, additional earnings do not change the men's behavior in the labor market when their wives have health shocks.

In table 9, we find the results of how spousal health shocks impact men and women's labor supply at different levels of wealth among the group of people with low income (less than $22,000 a year for women and $36,500 for men). In the female sample, we do not find evidence of a significant relationship between spousal health shocks and retirement or labor force exit at higher levels of wealth as shown in columns 1 and 2. There seems to be a positive relationship for working hours in column 3. However, the unit of wealth is in $100,000, which means that a $100,000 increase in wealth corresponds to only a 7-hour increase in annual working hours for a wife when her husband is sick. Given that the median wealth level is $123,000, the magnitude of this estimate is practically zero. For the male sample, column 4 suggests that there is a significant positive relationship between spousal health shocks and retirement at higher levels of wealth. This is consistent with our prediction that people with low earnings are more willing to reduce their labor supply to take care of their sick spouses if they have more wealth. However, a $100,000 increase in wealth is associated with only a 0.2 percentage point increase in the probability that a man retires, which is again a rather small effect. Most people hold their wealth in the form of illiquid assets such as real estate, stocks, bonds, etc. which cannot be converted to cash conveniently, which may explain why people are not willing to reduce their labor supply when their spouses have health shocks even though the price of leisure is low given the low earnings. The low earnings may still be a reliable and fast financial resource for medical expenses. I also investigate the effects of spousal health shocks on labor supply at higher levels of wealth for the group of people with high earnings (women who earn more than $22,000 a year and men who earn more than $36,500 a year) in table 10. We observe that there is no relationship between spousal health shocks and labor supply regardless of the level of wealth in this group of individuals. Again, the explanation for this lack of response is the illiquidity of the forms of assets that these people hold as wealth.

Heterogeneity Analysis with respect to Functional Limitation

Individuals can make different labor supply decisions depending on how severe their spouses' health shocks are. Health shocks can be so severe that people may need to stay home to take care of their spouses constantly. Health shocks can also be so severe that medical treatment gets expensive and people need to increase their labor supply in order to earn more money to pay for the treatment costs for their spouses. Therefore, in this section I will analyze how individuals respond to spousal health shocks based on different levels of the health shocks' severity. I use the Functional Limitation Indices from the HRS as proxies for the level of severity of health shocks, which includes four indices: Mobility Index, Large Muscle Index, Gross Motor Index, and Fine Motor Index. The Mobility Index indicates whether people have difficulty walking one block, walking several blocks, walking across a room, climbing one flight of stairs, and climbing several flights of stairs. The Large Muscle Index reports whether people have difficulty sitting for two hours, getting up from a chair, stooping, kneeling or crouching, and pushing or pulling large objects activities. The Gross Motor Index indicates whether people have difficulty walking one block, walking across a room, climbing one flight of stairs, getting in or out of bed, and bathing. The Fine Motor Index reports whether people have difficulty picking up a dime, eating, and dressing.

I run an OLS regression of the effects of each of the seven types of health shocks on each of these functional limitation indices. I use a cross sectional sample which includes only the observation when a person gets a health shock for the first time. Table 11 shows the estimates of the effects that each health shock has on each index. The results suggest that all of the seven types of health shocks contribute significantly to the functional limitations that people with health shocks face. Then I use these estimated coefficients to construct the level of severity that these health shocks have on each individual as follows:

$$Severity_i = \hat{\beta}_1 Stroke_i + \hat{\beta}_2 Cancer_i + \hat{\beta}_3 Heart_i + \hat{\beta}_4 Lung_i + \hat{\beta}_5 Diabetes_i + \hat{\beta}_6 Arthritis_i + \hat{\beta}_7 Injuries_i \qquad (3)$$

A person may have only a stroke, or a combination of a stroke and cancer, etc. I gather the level of severity that health shocks have on each individual, and categorize people with health shocks with high functional limitation if their levels of severity are higher than the 3rd quarter's value, and categorize people with health shocks with low functional limitation if their levels of severity are lower than the 75th percentile's value. In order to analyze the heterogeneity in individuals' labor supply response to their spouses' health shocks at different levels of severity, I use two interaction terms: spousal health shocks interacted with high functional limitation and spousal health shocks interacted with low functional limitation. I replace the independent variable "Spousal Health Shocks" with these two interaction terms in equation (1) to form a new D-in-D model as follows:

$$LS_{it} = \beta_0 + \beta_1 SpHealth_{it} \times High_{it} + \beta_2 SpHealth_{it} \times Low_{it} + \beta_3 Health_{it}$$

$$+\beta_4 X_{it} + \beta_5 SpX_{it} + u_i + v_t + \varepsilon_{it} \qquad (4)$$

The dependent variable and all the other covariates are defined similarly to the original D-in-D model. We are interested in estimating β_1 and β_2 in this model. By replacing the variable "Spousal Health Shocks" with the two interaction terms, we are comparing the effects on labor supply from spousal health shocks with high functional limitation and spousal health shocks with low functional limitation against the omitted group of people without health shocks. At the same time, by comparing the magnitude of β_1 and β_2, we can assess whether spousal health shocks with higher functional limitation create a larger impact on labor supply.

Table 12 displays the results of the regressions of retirement on spousal health shocks with high and low limitation across the five functional limitation indices for the female sample. As we can observe in columns 1 and 2 for the Mobility and Gross Motor indices, husbands' health shocks with high functional limitation are associated with a decrease of around 5 percentage point in the probability that their wives retire. There seem to be no effects on retirement if the shocks only generate low limitation to husbands. Table 13 does not show any significant relationship between husbands' health shocks and wives' probability of exiting the labor force. Table 14 shows that husband's health shocks are likely to have a significant and positive relationship with wives' working hours regardless of the shocks' severity across all the indices. Except for the Large Muscle index where spousal health shocks with high and low limitation seem to affect working hours similarly, results for the other three indices suggest that more severe spousal health shocks tend to make women work more hours annually. Therefore, the results in tables 12 and 14 generally indicate that more severe spousal health shocks are likely to increase women's labor supply. In other words, the Added Worker Effect seems to be stronger for women when their husbands' physical activities are seriously restrained by the health shocks. It is likely that the husbands may have lost their working capacity due to the shocks, and their households incur a major income loss. Additionally, such catastrophic health shocks may call for expensive medical treatment. Both of these factors may induce their wives to increase their labor supply to provide enough financial protection for their families.

Tables 15 to 17 display the equivalent results for the impact of spousal health shocks with high and low functional limitations on labor supply for the male sample. Looking at table 15, we see that except for the Mobility index where only less severe wives' health shocks seem to affect husband's retirement, the results for the other three indices suggest that wives' health shocks with high limitation tend to induce the husbands to retire by a larger magnitude compared to wives' health shocks with low limitation. Although table 16 shows no significant relationship between spousal health shocks and men's labor supply regardless of the health shocks' severity, the results in table 17 are consistent with the ones in table 15. Except for the Mobility index where spousal health shocks with high and low functional limitation seem to reduce men's working hours by the same extent, we observe that for the rest of the indices, more severe spousal health shocks tend to reduce men's annual working hours by a larger magnitude. We notice that the results for the male sample are the opposite of those for the female sample: men are more likely to reduce their labor supply when their wives incur more severe health shocks, whereas women are more likely to increase their labor supply in the same situation. This further suggests that men do not seem to exhibit the Added Worker Effect.

Robustness Checks

My definition of retirement is based on a question in the HRS which asks people whether they are fully retired, partially retired, or not retired. People are considered to be retired if they are fully retired or partially retired. However, the other question which asks people about their labor force status, which I use to construct the variable labor force exit, also contains information on their retirement status. Therefore, to examine whether the probability of retiring is consistent with an alternative definition, I construct another variable for retirement based on people's answers to this question. I define people to be retired if they are fully retired or partially retired, and not retired if they are working full-time or half-time. Table 18 shows the results of the regression of this new definition of retirement on spousal health shocks for the female and male samples. Columns 1 and 3 display the regression results using the original definition of retirement for comparison. We observe in columns 2 and 4 that the regression results for the alternative definition of retirement are consistent with the original definition.

In table 19, I use another specification which controls for people's age and their spouses' age in a more flexible way. I define bins of 5 years to indicate whether people' age is within 50-55 years old, 56-60 years old, and so on. Based on equation (1), I add in a vector of dummies which indicate which age group people belong to, and a similar vector for their spouses. Comparing table 19 to table 4, we find the results to be similar. Men's working hours seem to lose significance with this specification but its magnitude is very close to the original D-in-D regression.

There might be issues with the regression results because of sample attrition. The HRS only surveys people who are 50 years old and above, which means that these individuals are very likely to exit the survey because they die. If someone dies after their spouses get a health shock, we cannot observe how their labor supply decisions would be if they were alive. Furthermore, if someone loses their spouse because of a fatal health shock, their labor supply decisions after the incident would be very different from someone who still has to take care of their spouse. Therefore, I restrict my sample to exclude people who exit the survey because of death or people who lose their spouses because their spouses die. The results with this restriction are shown in table 20. In comparison with the original results in table 4, we see that the results in this table are consistent although slightly more magnified. Therefore, sample attrition due to death does not seem to affect our results.

There are people in the sample who change their spouses during the period when they are surveyed. Although this does not happen often in the sample, we might be worried about people who had a healthy spouse but change to a spouse with a health shock. In addition, the relationship with the new spouse may have different dynamics which influence people's labor supply decisions. To check for the sensitivity of the regression results with respect to this situation, I restrict my sample to only people who have the same spouses over the period when they are surveyed and produce table 21. The results are very close to the original results, which alleviates our concerns about people's change in marital status.

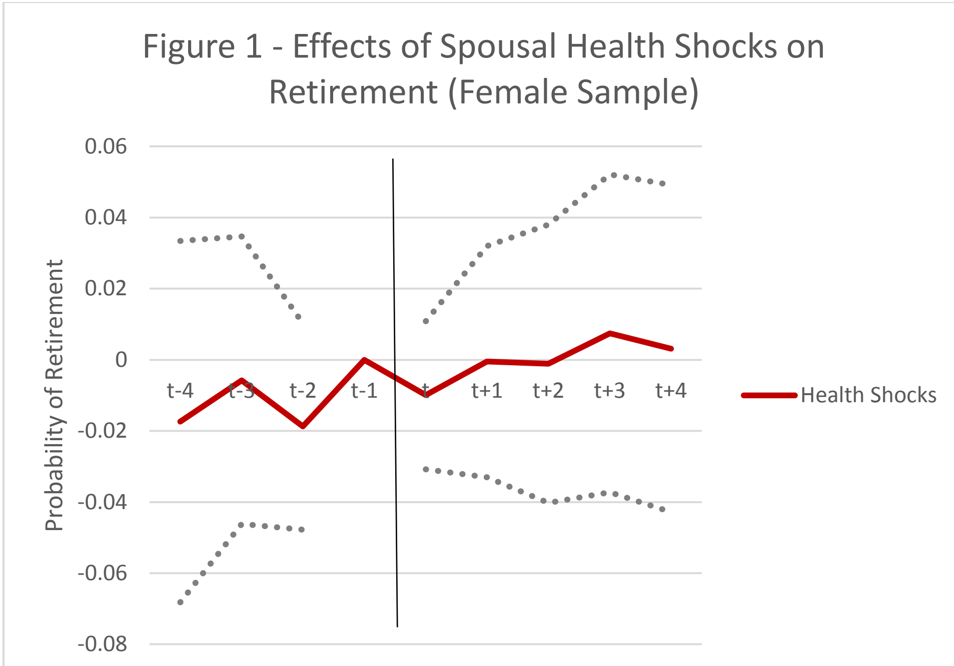
The control group in our original D-in-D model is defined as people who never change their health status during the period when they are surveyed. This includes both people who are healthy from the beginning of the survey or people are already sick. We might be concerned that people who are already sick may face incomparable labor supply decisions with people in the treatment group who are healthy when they enter then get a health shock. People who are sick when they enter the survey may develop characteristics over time which make them more likely to retire compared to people who are healthy for the whole period. Thus people who are healthy for the whole survey period seem to form a better counter-factual group. In order to test this hypothesis, I redefine the control group to include only this group of people. Table 22 displays the regression results with this alternative control group. The results do not show any significant change in the estimates compared to the original regression results. Therefore, we can affirm the validity of our original definition of the control group.

IV. Conclusions

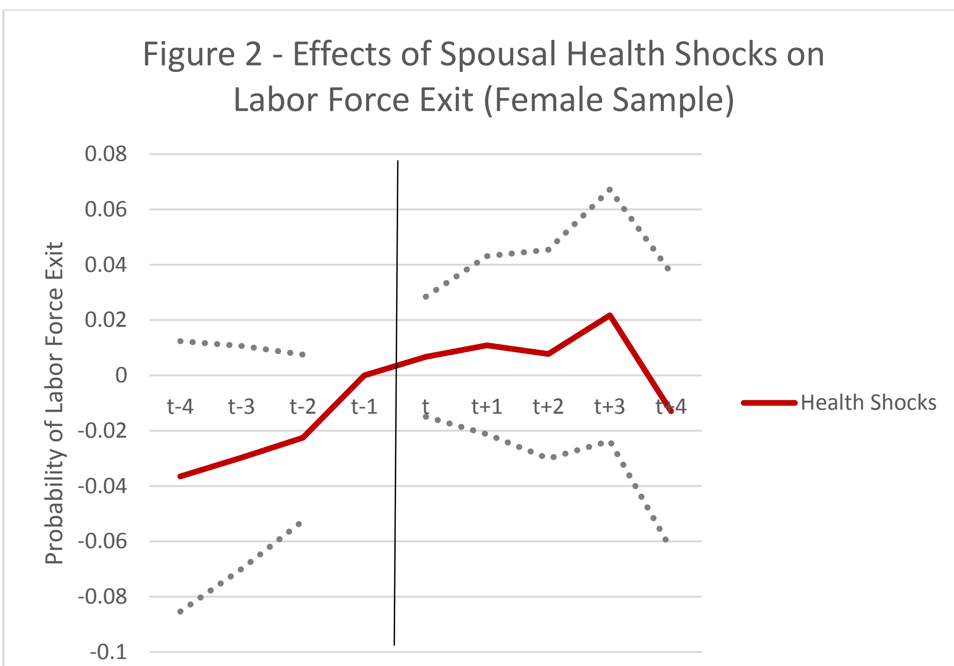
My study provides an analysis of spousal health shocks on labor supply for women and men among the elderly. My findings suggest that in most cases, women and men respond differently to spousal health shocks in the labor market. Women are more likely to increase their labor supply whereas men are more likely to reduce their labor supply. Women tend to increase their labor supply by a larger magnitude when spousal health shocks are more severe, whereas the opposite is true for men: they tend to reduce their labor supply at higher levels of the shocks' severity. Women and men respond more similarly when their spouses have health shocks and they have higher levels of earnings, although the effect seems to be larger for women. In general, only women seem to exhibit the Added Worker Effect. Such difference in the response between the two groups can be attributed to the different roles in a household that a woman and a man take on. Women may need to substitute for the loss of income, whereas men may need to substitute for the reduction in home production.

Because women have to increase their labor supply, current social programs may not be providing sufficient aid to households where men, who are more likely to be the bread-winners of families, have health shocks. Therefore, policy makes may want to conduct further studies to test whether they need to provide more assistance to households where the main income earners are severely sick. On the other hand, they may also want to do research into the financial conditions of households where men reduce their labor supply upon their wives' health shocks. We need to make sure that their well-being is sustained with such a decision, otherwise we should create incentives for them to stay in the labor force to prevent unforeseeable negative financial consequences.

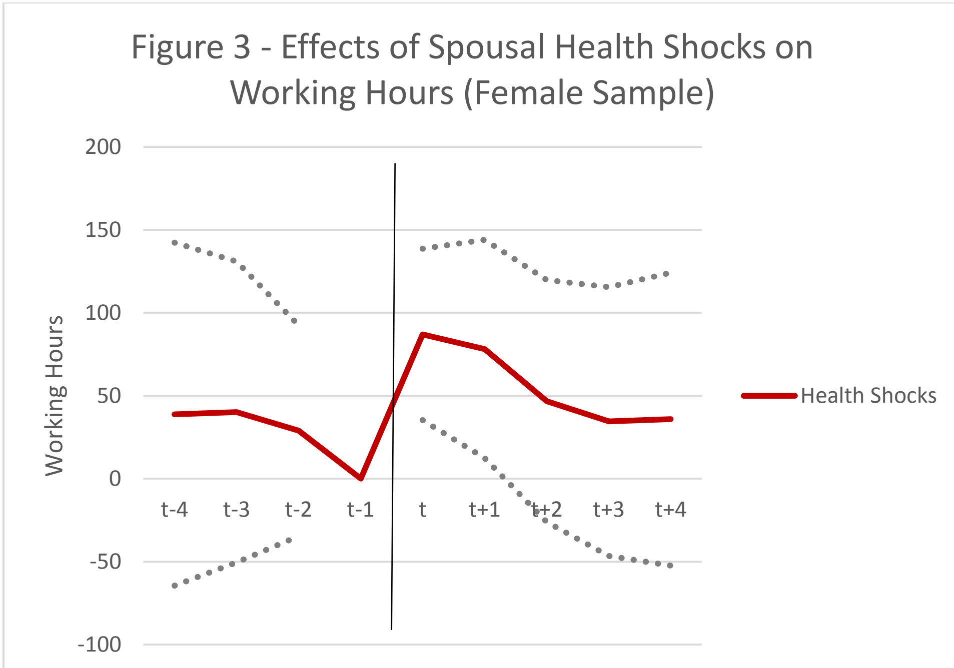
V. Appendix



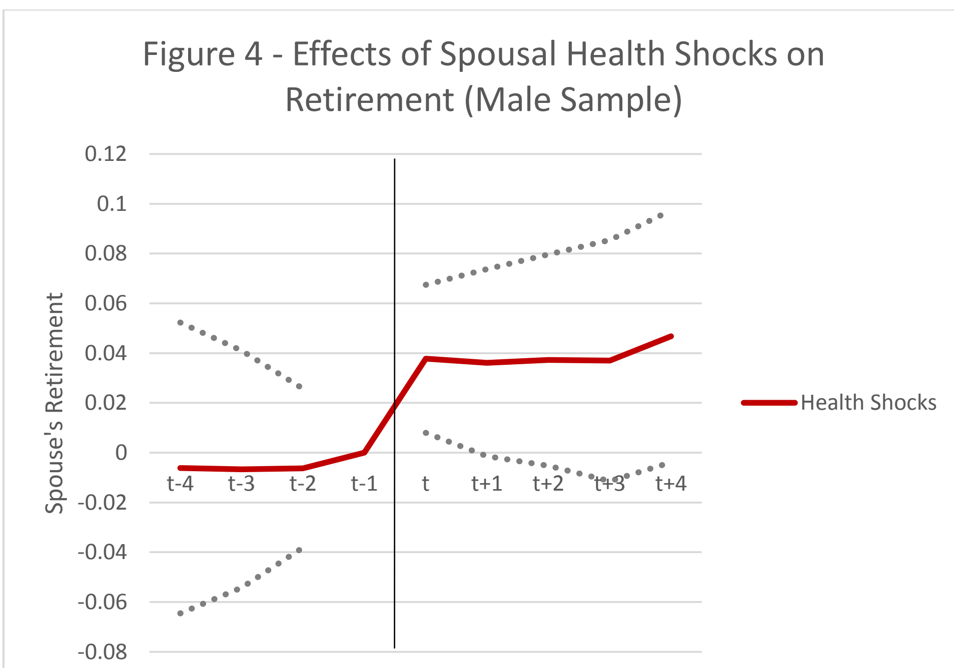
Notes: Data from HRS from 1992 to 2012, collected biannually. Figures show coefficients of event study with baseline group being t-2. Health shocks occur any time between t-2 and t. Individuals' health conditions have to be observed from at least t-2 to t. All regressions include age, people's own health shocks, wealth, and individual and wave fixed effects.



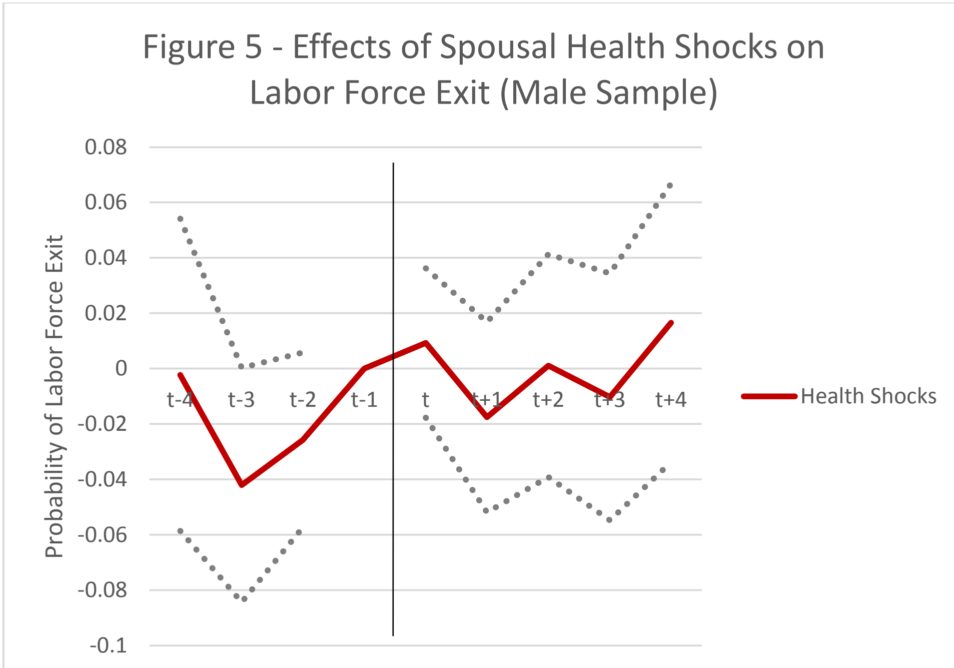
Notes: See note for Figure 1.



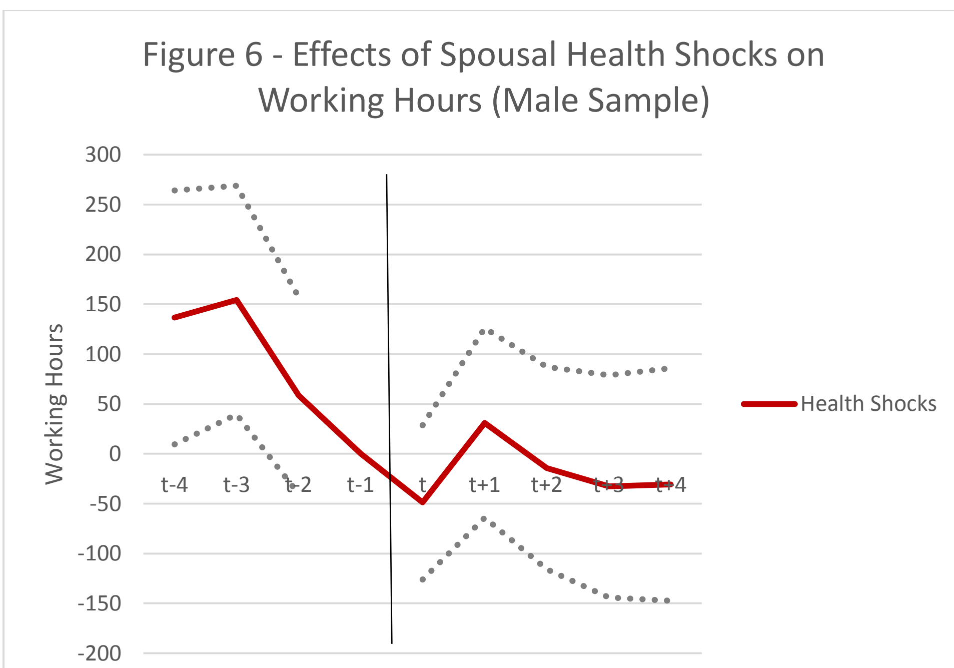
Notes: See note for Figure 1.



Notes: See note for Figure 1.



Notes: See note for Figure 1.



Notes: See note for Figure 1.

Table 1 - DESCRIPTIVE STATISTICS
(Health Condition at Wave of Entry)

	Female Sample (2)	Male Sample (3)
Spouse's health condition		
Any health shock	0.5091	0.4748
	(0.5000)	(0.4994)
Cancer	0.0422	0.0678
	(0.2011)	(0.2514)
Stroke	0.0326	0.0193
	(0.1775)	(0.1375)
Heart Diseases	0.1462	0.0859
	(0.3534)	(0.2802)
Diabetes	0.1259	0.0934
	(0.3317)	(0.2910)
Lung Diseases	0.0553	0.0555
	(0.2285)	(0.2290)
Arthritis	0.2874	0.3180
	(0.4526)	(0.4657)
Injury	0.0746	0.0454
	(0.2627)	(0.2082)
Number of observations	5,992	6,845

Notes: Data from HRS from 1992 to 2012, collected biannually. Summary statistics are from cross-sectional observations at the waves of entry for individuals.

Table 2 - DESCRIPTIVE STATISTICS (At Wave of Entry)

	Female Sample		Male Sample	
	Without Spousal Health Change	With Spousal Health Change	Without Spousal Health Change	With Spousal Health Change
	(1)	(2)	(3)	(4)
Age	52.37	51.92	55.22	55.89
	(6.33)	(6.27)	(6.02)	(6.47)
Spouse's age	55.93	55.33	52.18	52.35
	(6.68)	(5.95)	(7.03)	(7.18)
Wealth	264,000	283,000	300,000	292,000
	(622,000)	(540,000)	(790,000)	(499,000)
Earnings	27,000	24,000	46,000	40,000
	(30,000)	(23,000)	(91,000)	(42,000)
Number of observations	4,411	1,581	4,912	1,933

Notes: Data from HRS from 1992 to 2012, collected biannually. Summary statistics are from cross-sectional observations at the waves of entry for women and men, between people who do not change their health status for the whole duration they are surveyed and people who change their health status later in the survey.

Table 3 - Effect of Spousal Health Shocks on Labor Supply (OLS)

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	0.0013	0.0044	56***	-0.0092	-0.0140**	-6
	(0.0053)	(0.0055)	(14)	(0.0063)	(0.0059)	(17)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	22,727	23,674	24,441	19,667	25,221	20,858
R-squared	0.496	0.383	0.278	0.508	0.345	0.378

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 4 - Effect of Spousal Health Shocks on Labor Supply (D-in-D)

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	0.0012	0.0095	80***	0.0394**	0.0122	-70*
	(0.0133)	(0.0132)	(31)	(0.0157)	(0.0145)	(38)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	22,727	23,674	24,441	19,667	25,221	20,858
R-squared	0.756	0.745	0.712	0.78	0.738	0.732

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 5 - Effect of Spousal Health Shocks on Labor Supply (By Wealth)

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	-0.0027	0.0135	76**	0.0375**	0.0186	-66
	(0.0140)	(0.0134)	(32)	(0.0166)	(0.0147)	(40)
Wealth	0.0009	0.0006	-2	0.0000	0.0001	1
	(0.0008)	(0.0006)	(2)	(0.0013)	(0.0007)	(3)
Spousal Health Shocks*Wealth	0.0008	-0.0007	1	0.0003	-0.0011	-1
	(0.0012)	(0.0006)	(2)	(0.0011)	(0.0007)	(2)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	22,727	23,674	24,441	19,667	25,221	20,858
R-squared	0.756	0.745	0.712	0.78	0.739	0.732

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Household wealth is in $100,000.
*** p<0.01, ** p<0.05, * p<0.1

Table 6 - Effect of Spousal Health Shocks on Labor Supply (By Earnings)

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	0.0519***	0.0477***	39	0.0566**	0.0290	-118**
	(0.0186)	(0.0173)	(43)	(0.0226)	(0.0177)	(57)
Earnings	-0.0114**	-0.0091***	47***	-0.0086***	-0.0056***	18**
	(0.0046)	(0.0024)	(11)	(0.0029)	(0.0016)	(9)
Spousal Health Shocks*Earnings	-0.0184***	-0.0128***	14	-0.0050	-0.0046	15
	(0.0052)	(0.0042)	(13)	(0.0048)	(0.0029)	(12)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	22,727	23,674	24,441	19,667	25,221	20,858
R-squared	0.77	0.755	0.727	0.789	0.745	0.74

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Annual earnings are in $10,000.
*** p<0.01, ** p<0.05, * p<0.1

Table 7 - Effect of Spousal Health Shocks on Labor Supply (Low Wealth)

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	0.0807***	0.0766***	-133*	0.0693**	0.0427	-156**
	(0.0306)	(0.0274)	(73)	(0.0330)	(0.0279)	(79)
Earnings	-0.0097**	-0.0100**	41.95**	-0.0294***	-0.0223***	62***
	(0.0044)	(0.0042)	(19)	(0.0058)	(0.0048)	(16)
Spousal Health Shocks*Earnings	-0.0313***	-0.0301***	58**	-0.0152**	-0.0165***	28
	(0.0088)	(0.0072)	(23)	(0.0077)	(0.0062)	(18)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	9,110	9,533	9,592	8,265	9,784	8,836
R-squared	0.761	0.745	0.715	0.802	0.752	0.739

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Household wealth is in $100,000. Annual earnings are in $10,000. Low wealth is defined to be less than $123,000 (median wealth).
*** p<0.01, ** p<0.05, * p<0.1

Table 8 - Effect of Spousal Health Shocks on Labor Supply (High Wealth)

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	0.0550**	0.0490**	55	0.0533**	0.0279	-90
	(0.0275)	(0.0229)	(57)	(0.0263)	(0.0229)	(59)
Earnings	-0.0105*	-0.00843***	39***	-0.0086***	-0.0060***	21***
	(0.0060)	(0.0027)	(11)	(0.0023)	(0.0014)	(6)
Spousal Health Shocks*Earnings	-0.0152**	-0.0105**	8	-0.0014	-0.0015	4
	(0.0064)	(0.0043)	(13)	(0.0040)	(0.0025)	(9)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	10,549	11,187	11,097	9,931	11,556	10,422
R-squared	0.767	0.750	0.734	0.785	0.745	0.76

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Household wealth is in $100,000. Annual earnings are in $10,000. High wealth is defined to be more than $123,000 (median wealth).
*** p<0.01, ** p<0.05, * p<0.1

Table 9 - Effect of Spousal Health Shocks on Labor Supply (Low Income)

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	0.0148	0.0262	43	0.0028	0.0188	-32
	(0.0205)	(0.0205)	(46)	(0.0235)	(0.0221)	(54)
Wealth	(0.0009)	0.0006	-4	-0.0026*	-0.0008	10***
	(0.0026)	(0.0009)	(5)	(0.0015)	(0.0014)	(4)
Spousal Health Shocks*Wealth	0.0010	-0.0016	7**	0.0024*	-0.0005	-5
	(0.0027)	(0.0010)	(3)	(0.0014)	(0.0014)	(4)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	10,690	11,515	11,468	9,418	11,758	10,103
R-squared	0.748	0.737	0.691	0.778	0.735	0.731

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Household wealth is in $100,000. Annual earnings are in $10,000. Low income for women is defined to be less than $22,000 (median earnings), and for men to be less than $36,500 (median earnings). *** p<0.01, ** p<0.05, * p<0.1

Table 10 - Effect of Spousal Health Shocks on Labor Supply (High Income)

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	-0.0226	-0.0035	44	0.0744***	0.0032	-116*
	(0.0235)	(0.0200)	(55)	(0.0253)	(0.0225)	(61)
Wealth	0.0022	0.0021	-3	0.0030*	-0.0004	-6
	(0.0021)	(0.0016)	(5)	(0.0017)	(0.0012)	(4)
Spousal Health Shocks*Wealth	0.0018	-0.0008	0	-0.0025	-0.0002	4
	(0.0022)	(0.0014)	(5)	(0.0016)	(0.0012)	(3)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	8,969	9,205	9,221	8,778	9,582	9,155
R-squared	0.747	0.724	0.709	0.773	0.732	0.745

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Household wealth is in $100,000. Annual earnings are in $10,000. High income for women is defined to be more than $22,000 (median earnings), and for men to be more than $36,500 (median earnings). *** p<0.01, ** p<0.05, * p<0.1

Table 11 - Effect of Health Shocks on Functional Limitation Indices

	(1) Mobility	(2) Large Muscle	(3) Gross Motor	(4) Fine Motor
Stroke	0.108***	0.114***	0.108***	0.121***
	(0.0342)	(0.0369)	(0.0224)	(0.0174)
Cancer	0.0648***	0.0640**	0.0874***	0.0773***
	(0.0235)	(0.0253)	(0.0154)	(0.0119)
Heart Diseases	0.120***	0.0745***	0.0874***	0.0521***
	(0.0214)	(0.0232)	(0.0140)	(0.0109)
Lung Diseases	0.244***	0.141***	0.162***	0.0334**
	(0.0285)	(0.0308)	(0.0186)	(0.0145)
Diabetes	0.0886***	0.0562**	0.0720***	0.0551***
	(0.0215)	(0.0232)	(0.0141)	(0.0109)
Arthritis	0.133***	0.230***	0.122***	0.0841***
	(0.0176)	(0.0190)	(0.0115)	(0.00897)
Injuries	0.204***	0.235***	0.205***	0.139***
	(0.0187)	(0.0202)	(0.0123)	(0.00955)
Observations	6,220	6,220	6,220	6,220
R-squared	0.081	0.076	0.092	0.055

Notes: OLS regression of cross-sectional data at the wave when people first have a change in health status.
*** p<0.01, ** p<0.05, * p<0.1

Table 12 - Effect of Spousal Health Shocks on Retirement (Female Sample)

	(1) Mobility	(2) Large Muscle	(3) Gross Motor	(4) Fine Motor
Spousal Health Shocks*High	-0.0562*	-0.0203	-0.0508*	-0.0461
	(0.0291)	(0.0184)	(0.0304)	(0.0310)
Spousal Health Shocks*Low	0.0054	0.0058	0.0024	0.0008
	(0.0170)	(0.0222)	(0.0168)	(0.0167)
Mean of Dependent Variable	0.4362	0.4362	0.4362	0.4362
Observations	8,133	8,133	8,133	8,133
R-squared	0.752	0.752	0.752	0.752

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Functional limitation is high if size of severity is more than 75th percentile, and low if less than 75th percentile.
*** p<0.01, ** p<0.05, * p<0.1

Table 13 - Effect of Spousal Health Shocks on Labor Force Exit (Female Sample)

	(1) Mobility	(2) Large Muscle	(3) Gross Motor	(4) Fine Motor
Spousal Health Shocks*High	-0.0307	0.0106	-0.0240	-0.0223
	(0.0296)	(0.0190)	(0.0304)	(0.0309)
Spousal Health Shocks*Low	0.0242	0.0123	0.0211	0.0203
	(0.0164)	(0.0216)	(0.0163)	(0.0163)
Mean of Dependent Variable	0.3791	0.3791	0.3791	0.3791
Observations	8,272	8,272	8,272	8,272
R-squared	0.736	0.736	0.736	0.736

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Functional limitation is high if size of severity is more than 75th percentile, and low if less than 75th percentile.
*** p<0.01, ** p<0.05, * p<0.1

Table 14 - Effect of Spousal Health Shocks on Working Hours (Female Sample)

	(1)	(2)	(3)	(4)
	Mobility	Large Muscle	Gross Motor	Fine Motor
Spousal Health Shocks*High	207***	90**	168***	160**
	(66)	(42)	(64)	(66)
Spousal Health Shocks*Low	69*	111**	83**	85**
	(40)	(54)	(39)	(39)
Mean of Dependent Variable	1,007	1,007	1,007	1,007
Observations	8,862	8,862	8,862	8,862
R-squared	0.698	0.697	0.697	0.697

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Functional limitation is high if size of severity is more than 75th percentile, and low if less than 75th percentile.
*** p<0.01, ** p<0.05, * p<0.1

Table 15 - Effect of Spousal Health Shocks on Spouse's Retirement (Male Sample)

	(1)	(2)	(3)	(4)
	Mobility	Large Muscle	Gross Motor	Fine Motor
Spousal Health Shocks*High	0.0387	0.0776***	0.0573*	0.0584*
	(0.0311)	(0.0227)	(0.0327)	(0.0333)
Spousal Health Shocks*Low	0.0562***	-0.0077	0.0521**	0.0519**
	(0.0214)	(0.0301)	(0.0211)	(0.0211)
Mean of Dependent Variable	0.5053	0.5053	0.5053	0.5053
Observations	7,232	7,232	7,232	7,232
R-squared	0.762	0.763	0.762	0.762

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Functional limitation is high if size of severity is more than 75th percentile, and low if less than 75th percentile.
*** p<0.01, ** p<0.05, * p<0.1

Table 16 - Effect of Spousal Health Shocks on Labor Force Exit (Male Sample)

	(1) Mobility	(2) Large Muscle	(3) Gross Motor	(4) Fine Motor
Spousal Health Shocks*High	0.0363	0.0315	0.0308	0.0293
	(0.0341)	(0.0200)	(0.0341)	(0.0347)
Spousal Health Shocks*Low	0.0134	-0.0169	0.0151	0.0154
	(0.0187)	(0.0285)	(0.0187)	(0.0186)
Mean of Dependent Variable	0.3868	0.3868	0.3868	0.3868
Observations	8,484	8,484	8,484	8,484
R-squared	0.728	0.728	0.728	0.728

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Functional limitation is high if size of severity is more than 75th percentile, and low if less than 75th percentile.
*** p<0.01, ** p<0.05, * p<0.1

Table 17 - Effect of Spousal Health Shocks on Working Hours (Male Sample)

	(1) Mobility	(2) Large Muscle	(3) Gross Motor	(4) Fine Motor
Spousal Health Shocks*High	-111	-172***	-138*	-136*
	(74)	(52)	(78.86)	(81)
Spousal Health Shocks*Low	-119**	14	-113**	-114**
	(50)	(72)	(49.34)	(49)
Mean of Dependent Variable	856	856	856	856
Observations	7,707	7,707	7,707	7,707
R-squared	0.736	0.737	0.736	0.736

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Functional limitation is high if size of severity is more than 75th percentile, and low if less than 75th percentile.
*** p<0.01, ** p<0.05, * p<0.1

Table 18 - Alternative Definition of Retirement

	Female Sample		Male Sample	
	(1)	(2)	(3)	(4)
	Retirement (Original)	Retirement (Alternative)	Retirement (Original)	Retirement (Alternative)
Spousal Health Shocks	0.0012	0.00786	0.0394**	0.0331**
	(0.0133)	(0.0132)	(0.0157)	(0.0147)
Mean of Dependent Variable	0.4362	0.4419	0.5053	0.4853
Observations	22,727	21,615	19,667	23,338
R-squared	0.756	0.761	0.78	0.768

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects. Alternative definition is based on question about labor force status.
*** p<0.01, ** p<0.05, * p<0.1

Table 19 - Flexible Specification to Control for Age

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	-0.006	0.0057	93***	0.0323**	0.0108	-59
	(0.0130)	(0.0132)	(30)	(0.0157)	(0.0143)	(37)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	22,727	23,674	24,441	19,667	25,221	20,858
R-squared	0.766	0.749	0.716	0.791	0.744	0.740

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 20 - Exclude People who Die

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	0.0016	0.0049	85**	0.0447***	0.0166	-79**
	(0.0142)	(0.0140)	(33)	(0.0167)	(0.0152)	(40)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	18,930	19,369	20,253	17,798	22,391	18,830
R-squared	0.752	0.735	0.712	0.779	0.737	0.731

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 21 - Exclude People Who Change Spouse

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	0.0029	0.0112	81***	0.0393**	0.0117	-68*
	(0.0134)	(0.0133)	(31)	(0.0158)	(0.0145)	(38)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	22,469	23,393	24,159	19,582	25,112	20,768
R-squared	0.756	0.745	0.714	0.780	0.739	0.733

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 22 - Exclude People Who Are Sick from Wave of Entry

	Female Sample			Male Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Retirement	Labor Force Exit	Working Hours	Retirement	Labor Force Exit	Working Hours
Spousal Health Shocks	0.0015	0.0178	70**	0.0460***	0.0154	-80*
	(0.0145)	(0.0142)	(34)	(0.0177)	(0.0161)	(42)
Mean of Dependent Variable	0.4362	0.3791	1,007	0.5053	0.3868	856
Observations	12,263	12,534	13,213	10,807	12,939	11,475
R-squared	0.757	0.748	0.718	0.785	0.744	0.747

Notes: Standard errors in parentheses, clustered at the individual level. All specifications also control for age, people's own health shocks, wealth, and individual and wave fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

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