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HEALTH SHOCKS AND COUPLES' LABOR SUPPLY DECISIONS

Courtney C. Coile

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ABSTRACT

Unexpected health events such as a heart attack or new cancer diagnosis are very common for workers in their 50s and 60s. These health shocks can result in a significant loss in family income if the worker reduces labor supply, but the family can also protect itself against this loss if the worker's spouse increases labor supply, generating an "added worker effect." In this paper, I examine the effect of health shocks on the labor supply of both spouses using the Health and Retirement Study (HRS). I find that shocks lead the affected worker to reduce labor supply dramatically, particularly if the shock is accompanied by a loss of functioning. I also find that the added worker effect is small for men and that there is no such effect for women. There is some evidence to suggest that families respond to health shocks in predictable ways depending on characteristics such as access to retiree health insurance. The study concludes that health shocks result in real financial losses for families and are an important source of financial risk for older households.

Courtney C. Coile
Department of Economics
Wellesley College
Wellesley, MA 02481
and NBER
ccoile@wellesley.edu

I. INTRODUCTION

For people of near-retirement age, unexpected negative health events are unfortunately quite common. For example, workers in their 50s and 60s in the Health and Retirement Study (HRS) have a 5% chance of having a heart attack, stroke, or new cancer diagnosis, a 10% chance of being diagnosed with a new chronic illness, and a 3% chance of having an accidental injury over a two-year period. These negative health events, or health shocks, are likely to lead some affected individuals to decrease their labor supply, resulting in a loss in lifetime income for the family.

To protect the family against this loss, the worker's spouse may increase his or her labor supply, effectively providing within-family insurance against the effects of the negative event. Yet this expected response may fail to materialize for several reasons. First, the response of both spouses to the health shock is likely to be complicated by the family's access to employer-provided and government benefits such as health insurance, disability insurance, and pensions. If the family's only access to health insurance is through the affected spouse's employer, for example, then the family may not be able to shift labor supply towards the healthy spouse; if the family has access to government-provided disability benefits, then this may "crowd out" the expected increase in the spouse's labor supply. Second, the health shock may change the value of time the spouses spend together, for example because the affected spouse needs more assistance with activities of daily living or has a shortened expected lifespan. Thus, the expected response to a health shock is theoretically ambiguous and may differ across families.

The purpose of this study is to explore the effect of negative health shocks, such as heart attacks or new cancer diagnoses, on the labor supply decisions of both spouses. Understanding these labor supply responses and their interaction with employer-provided and government benefits may provide insights into the well-being of young elderly families, the retirement decision-making process of two-earner households, and the optimal design of these benefit programs. This analysis is similar to studies such as Gruber and Cullen (2000) that look for an "added worker effect" (AWE) of wives' increasing their labor supply when husbands become unemployed, but explores the AWE in the context of a negative health shock rather than an unemployment shock. This analysis also provides a link between the large literature on the effect of health status and health insurance on retirement and the small but growing literature on couples' labor supply decisions by carefully considering the effect of health on labor supply in a family context.

The analysis uses the first six waves of the Health and Retirement Study (HRS), a recent, nationally representative survey of the young elderly with extensive information on health, labor force status, and demographics. The analysis proceeds in several steps. First, I examine the effect of health shocks on own labor supply and find that health shocks have a very significant effect, particularly a "severe" shock that is accompanied by a large decrease in functioning. An acute event such as a heart attack increases men's probability of labor force exit over two years by 35 percentage points if it is severe, or nearly double the 19 percent baseline average probability of exit. For women, the comparable effect is a 23 percentage point increase, which is very large relative to their 19 percent baseline exit rate.

Second, I estimate the aggregate spousal response to health shocks, which is expected to be positive due to the AWE in the absence of complicating factors such as those mentioned above. I find that a spouse's health shock elicits only a small labor supply increase for men and no significant increase for women; in fact, women decrease labor supply when their husband's shock is severe. This suggests that the average AWE in the work force as a whole is quite small and that families experience a real loss in lifetime income when they suffer a health shock.

Third, I interact the health shocks dummies with other characteristics, such as access to health insurance and retirement benefits, to test the hypothesis that families' responses to health shocks differ from what the simple AWE theory suggests in predictable ways that relate to these characteristics. The evidence for this is more mixed – in some cases, families respond as expected, for example by the husband exiting the labor force with greater probability when a sick wife is pension-eligible, but these effects are often not consistent for men and women or across benefit types. An explanation is proposed and tested for one of the gender differences, but other differences remain a puzzle.

The remainder of the paper is organized as follows. Section II describes the theoretical motivation for the analysis and previous literature on the topic. Section III discusses the data and empirical strategy. Section IV presents the empirical results, first for models incorporating only the effect of own health shocks, then for models that also incorporate the spouse's health shocks. Section V concludes by discussing the implications of the findings.

II. BACKGROUND

Theoretical Motivation

The theory of spousal labor supply as insurance against negative shocks is developed in the context of unemployment in papers by Ashenfelter (1980), Heckman and MaCurdy (1980) and Lundberg (1985), and is summarized by Gruber and Cullen (2000). In a simple model, the negative shock results in a loss of lifetime income, which will cause the spouse to increase their labor supply, assuming that their leisure is a normal good – this is known as the Added Worker

Effect (AWE). Furthermore, the increased time at home of the affected spouse may lower the opportunity cost of work for the other spouse if there is substitution in home production, strengthening the AWE. An additional reason to expect a spousal labor supply increase in the context of health shocks is that the family may be liquidity constrained if they have not reached the Social Security eligibility age and cannot tap in to retirement wealth to smooth consumption.

As discussed briefly above, there are several reasons why a negative health shock might not cause the spouse to increase their labor supply. First, there may be complementarity rather than substitution in spousal leisure; indeed, this is the conclusion of most studies on couples' retirement. Further, a negative health shock could strengthen complementarity of leisure if the affected spouse requires assistance with activities of daily living (and the family prefers to have the spouse provide this care) or has a shortened life expectancy. Second, the access of the family to employer-provided and government benefits may crowd out the spousal labor supply response. Thus the spousal labor supply response to a health shock is theoretically ambiguous and is expected to differ across families according to the importance of these factors.

Previous Literature

The large existing literature on health and retirement is relevant for this analysis. One method used in this literature is to include self-reported health status or work limitations in the retirement model. Studies using this method have found large effects of health on retirement.[1] However, this method is subject to measurement error, as individuals' subjective judgements of what constitutes poor health may vary substantially, and to endogeneity concerns, as self-reported measures may not be independent of labor force outcomes if people rationalize their

[1] See, for example, Diamond and Hausman (1984) or Hanoch and Honig (1983).

retirement status by claiming a health problem (the "justification hypothesis"), so estimates may understate or overstate the true importance of health. A second set of studies uses objective measures of health such as information on medical conditions or subsequent mortality.[2] These measures are imperfectly correlated with working capacity, making estimates subject to measurement error; studies using these measures find smaller effects of health on retirement. A third set of papers instrument for self-reported measures with objective measures.[3]

There is no consensus on the preferred method of estimating the effect of health on retirement. Although Dwyer and Mitchell (1999) report little evidence of the justification hypothesis or of measurement error in objective health measures, Bound (1991) finds evidence of both and shows that instrumenting for self-reported measures with objective measures may lead to bias in estimating the effect of other explanatory variables. Baker et. al. (2004) compares self-reports of objective measures of health such as cancer status with data from health records and finds that there is considerable error in the self-reports and that the error is correlated with labor force status, providing a further rationale against using objective measures .

McClellan (1998) uses negative health shocks that occur between waves 1 and 2 of the HRS, such as a heart attack or new cancer diagnosis, to estimate the effect of health on own labor supply, while Smith (2003) looks at the effect of health shocks on labor supply, medical expenditures, and family income and wealth. The appeal of this approach is that it exploits the arrival of unexpected new information about health to estimate the effect of changes in health on

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[2] See, for example, Anderson and Burkhauser (1985), Bazzoli (1985), and Chirikos and Nestel (1984).

[3] See, for example, Stern (1989) and Bound et. al. (1999).

changes in labor supply.[4] This approach avoids the justification hypothesis concern by not using self-reported health status and more generally addresses the potential problem of (time-invariant) unobserved heterogeneity that is correlated with both health and retirement. Shocks are defined based on objective health information, so this method is still subject to the concerns raised above about these measures.[5]

As this study explores labor supply in a family context, the literature on couples' retirement decisions is also relevant. Structural models of joint retirement are estimated in several studies, including Hurd (1990), Maestas (2001), and Gustman and Steinmeier (2000); these authors employ different models, but all find that complementarity of leisure is a key factor in explaining why husbands and wives often retire simultaneously. A second set of studies, including Baker (2002), Coile (2004), and Johnson and Favreault (2001), estimate reduced-form models exploring the cross effects of one spouse's characteristics on the other spouse's retirement decision; Coile (2004) finds that husbands are more responsive to wives' financial incentives for retirement than vice versa, so the symmetry of spousal labor supply responses will be examined here. A feature common to both sets of studies, however, is that they either do not control for health or do so using self-reported health status.[6]

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[4] An important assumption underlying this approach is that health shocks are, in fact, unexpected. Smith (2003) finds that gender, race, education, health status, body-mass index, and behaviors like drinking, smoking, and exercise are all significant predictors of future major health events such as heart attacks. Nonetheless, there will obviously be a good deal of uncertainty regarding whether any individual will have a health event conditional on his risk factors and even more uncertainty regarding the timing of the health event, assuming that individuals are even aware of the link between the risk factors and health events.

[5] However, much of the analysis here focuses on health shocks that are accompanied by a major loss in functioning, and Baker et. al. (2004) find that the probability of reporting error drops with the severity of the health condition.

[6] Johnson and Favreault (2001) control for both self-reported health status and an objective measure, the number of functional impairments, in the analysis. However, that study does not look at the change in functional impairments or in other health measures over time, as is done here, or explore whether the effect of health measures on the spouse's labor supply depends on factors such as the family's access to health insurance.

This paper offers a number of contributions relative to the previous literature. Along with McClellan (1998) and Smith (2003), this is the only paper in the retirement literature to utilize health shocks to estimate the effect of health on labor supply. But relative to these two studies, this paper utilizes more waves of the HRS data and provides a greater focus on how the labor supply response may depend on the severity of the shock, how spouses respond to health shocks, and how the labor supply response to health shocks may depend on the availability of employer-provided and government benefits. This focus is useful for assessing the effect of health shocks on family well-being, understanding the retirement decisions of two-earner households, and informing policy makers about the ideal design of benefit programs. This paper also extends the literature on the AWE by considering the extent to which spousal labor supply serves as within-family insurance against health shocks.

III. DATA AND EMPIRICAL STRATEGY

The data for the project is the Health and Retirement Study (HRS), which began in 1992 as a longitudinal study of persons born between 1931 and 1941 and their spouses, with re-interviews of these 7,500 households every two years. Data from the first six waves of the survey, 1992-2002, is used here (wave 6 data is preliminary). The principal advantage of the HRS is that it provides richly detailed information on health, labor supply, and demographic characteristics for a sample of near-retirement age households and follows them over time.

Samples of married male workers and married female workers are used in the analysis. The samples are constructed using the 4,617 married couples who are in the survey at wave 1 and are observed for at least two consecutive waves. Men (women) contribute a person-wave observation to the male (female) sample for every wave in which they are between the ages of 50 and 69 and were working at the previous wave.[7] The final sample size is 11,006 male person-wave observations and 9,592 female person-wave observations.

The empirical strategy is to exploit exogenous shocks to health between waves of the survey to explore the effect of health on one's own and one's spouse's labor supply. Specifically, I estimate regressions of the following form:

$$exitLF_{it} = \beta_0 + \beta_1 ownshock_{it} + \beta_2 spouseshock_{it} + \beta_3 ownX_{it} + spouseX_{it} + \varepsilon_{it} \qquad (1)$$

where: *exitLF* is a dummy variable for whether individual i who was working at the previous wave (time t-1) has retired by the current wave (time t), *ownshock* and *spouseshock* are dummy variables for whether the worker and his or her spouse have experienced a health shock since the previous wave, and X is a set of demographic characteristics including exact age dummy variables, education dummies, industry and occupation dummies, net worth and liquid assets, and wave dummies. This model is estimated separately for male and female workers. This model is also estimated for the same samples of workers with an alternative dependent variable, the change in hours since the previous wave, to incorporate the effect of health shocks on both the hours and participation decisions.[8]

Following McClellan (1998), three types of health shocks are examined: acute health events (heart attack, stroke, new cancer), onset of new chronic illnesses (diabetes, lung disease,

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[7] There are no person-wave observations from wave 1 in the sample because it impossible to determine whether health problems reported at wave 1 began within the past two years or at an earlier point in time. The sample is not conditional on the spouse working at the previous wave, so it is possible that a household will contribute a person-wave observation to the male sample but not the female sample or vice versa. The sample is conditioned on working at the past wave but does not exclude persons who have previously retired and re-entered the labor force, so it is possible that an individual may retire twice during the sample period. The effect of health on the labor-force re-entry decision is discussed in more detail below.

[8] An alternative specification defining labor force exit as switching from reporting oneself to be not retired or partly retired to completely retired yields qualitative similar results to the estimates of equation (1). Alternative analyses that are not conditional on work at the previous wave and analyses of labor force re-entry will be discussed below.

heart failure, and arthritis), and accidental injuries or falls.[9] Another key health variable is the functional impairment index. The index is based on whether the individual reports any difficulty in performing a series of seventeen activities of daily living (ADL), such as walking, climbing stairs, lifting ten pounds, and getting out of bed; the index ranges from 0 (difficulty in no activities) to 1 (difficulty in all 17 activities).[10] The analysis also makes use of the self-reported survival probabilities, as health shocks provide new information about mortality and this may influence labor supply decisions.

Table 1 shows the summary statistics for the male and female samples. Over a two-year period, the typical male worker has a 19% chance of exiting the labor force, and the average change in annual hours for men (including both labor force exits and marginal hours changes) is a decrease of 375 hours. Over a two-year period, nearly 7% of men experience acute health events, 11% are diagnosed with a new chronic illness, 4% are injured in an accident, and 19% have at least one of these health events. The typical male reports difficulty performing 10% of the 17 activities of daily living and has experienced a 1.5% increase in the ADL index during the past two years; he rates his odds of living to age 75 as 66%.[11] The average age of the male

[9] Measures are constructed so as to be as compatible across waves as possible. An analysis of health shocks by wave indicates that the incidence of shocks is fairly constant over time. Measures are also constructed to be similar to McClellan (1998); the most significant difference is the exclusion of back pain from chronic illness, due to implausibly large fluctuations in the number of new diagnoses in later waves.

[10] The number of difficulty categories offered to respondents for the ADL questions changes across waves. In creating the index, individuals reporting any level of difficulty are treated as impaired, as this is the only measure available for all waves. On average, individuals are 1-2% more disabled at each passing wave; however, individuals are 4% *less* disabled at wave 2 than wave 1, presumably due to the change in definition. To make the measure more comparable across time, I decrease each individual's wave 1 impairment index by one activity (roughly 6%).

[11] This corresponds well with the actual probability of living to age 75 from the life tables, which is 0.68 for the average man in the sample. Interestingly, men greatly overestimate their probability of living to age 85 (sample average of 0.45 vs. 0.32 from life tables), while women underestimate their probability of living to age 75 (sample average of 0.68 vs. 0.78 from life tables) but make an accurate predication regarding age 85; Hurd and McGarry (1995) have a similar finding. The change in the self-reported probability of living to 75 is flat in the sample; surviving an additional year is associated with a decrease in life expectancy of approximately 0.8 years for this sample, so that the probability of living to a given age should rise modestly as the individual ages.

sample is 60. The sample statistics for women are similar, except as noted. The average change in women's hours, a decrease of 284 hours, is somewhat smaller than that for men, though the rate of labor force exit is very similar, suggesting that women are more likely to engage in part-time work. Women have a slightly lower risk of an acute event or of any health shock and a higher average level of difficulty on the ADL index, 14%. The typical female in the sample is two years younger than the typical male.

IV. RESULTS

Basic Results Excluding Spouse Variables

The first set of results explores the effect of health shocks on own retirement, ignoring any response to the spouse's health shocks. Table 2a presents linear probability model estimates of equation (1) using labor force exit as the dependent variable.[12] All specifications include dummies for age, education, occupation/industry, and year, as well as net worth and liquid assets. In the first specification, an acute health event is estimated to lead to a 16.1 percentage point increase in the probability of labor force exit; this effect is highly significant and quite large relative to the average probability of exit of 18.5 percent. The onset of a new chronic illness raises the probability of exit by 5.4 percentage points and an accident raises the probability of exit by 2.4 percentage points, but only the former effect is significant.

The average labor supply response to health shocks in the sample likely masks substantial heterogeneity. Not all heart attacks are created equal, and workers who suffer a greater loss in working capability should adjust their labor supply by a greater amount. The second

[12] In all regressions, standard errors are clustered at the person level to correct for arbitrary forms of serial correlation in the error term over time. Estimating the linear probability models as probits yields qualitatively similar results.

specification tests this hypothesis by adding a dummy variable indicating a large change in the ADL index (difficulty with 4 or more new ADLs) since the previous wave, the value of the ADL index at the previous wave, and interactions between the ADL change dummy and the health shock dummies.[13] The coefficients indicate that the effect of an acute health event is greatly magnified when it is accompanied by a large loss of functioning: the effect of an acute event without a large ADL change is an 8.8 percentage point increase in the probability of exit, but this effect is 25.8 percentage points greater when there is a large ADL change, so that the total effect of a "severe" health shock is a 34.6 percentage point increase.[14] The ADL change dummy has an independent effect of 10.6 percentage points; functioning difficulties may also have long-term effects on labor force exit, as the past ADL index has a positive and significant coefficient. The ADL interactions with the chronic illness and accident dummies are smaller and not significant.

A health shock not only affects an individual's working capacity but also may provide new information about life expectancy, which may affect the worker's labor supply decision. The third specification examines this by adding a dummy variable indicating a significant change in the self-reported survival probability to age 75 (a decrease greater than 20%) since the previous wave, the survival probability from the previous wave, and interactions of the survival change dummy with the health event dummies.[15] The effect is similar to that in the previous specification: an acute health event leads to a 10.4 percentage point increase in the probability of exit if it is not accompanied by a large change in mortality probability vs. a 22.2 percentage point increase if it is. The mortality change dummy and interactions of this with the chronic illness

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[13] Approximately 20% of respondents with a health shock meet the criteria for a large change in the ADL index.

[14] An alternative explanation for this finding is that there is measurement error in the definition of a health shock and that a "severe" health shock is measured with less error. This would be consistent with the finding of Baker et. al. (2004) that there is less measurement error in objective reports of health when the condition is more serious.

[15] Results are quite similar if the cutoff is a 10% decrease or a 25% decrease in survival probabilities.

and accident dummies are not significant, though the past mortality coefficient indicates that those who expect to live longer are less likely to retire.

Estimates of equation (1) using the change in annual hours worked as the dependent variable are also shown in Table 2a. This measure includes both labor force exits and marginal hours changes. Marginal hours changes are in fact quite common; for example, nearly one-third of those working at the previous wave reported higher annual hours two years later. A health shock is estimated to reduce average annual hours by 318 for an acute event, by 146 for a new chronic illness, and by 70 for an accident; the first two effects are statistically significant and fairly large relative to the baseline average decrease of 375 hours.[16] As before, the response to a health shock depends critically on the severity of the shock. An acute event is associated with a reduction in annual hours of 160 if not accompanied by a significant loss of functioning vs. 746 if it is; it also is associated with a reduction in hours of 217 if not accompanied by a significant reduction in life expectancy vs. 454 if it is.

The results for women are shown in Table 2b. Overall, the results for men and women are very similar. The coefficients for women are somewhat smaller in absolute terms than those estimated for men, though for the change in hours specifications the coefficients are very similar when compared relative to the average change in hours. To cite a few key results, an acute event increases the probability of women's labor force exit by 9.7 percentage points on average, or by

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[16] The effects of health shocks estimated here are smaller than those reported in McClellan (1998). Upon closer examination, I find that the effect of an acute event occurring between waves 1 and 2 is significantly larger than the effect of later health shocks, particularly for strokes and men's cancers. One possible explanation is that there have been advances in medical care during the sample period that allow affected individuals to continue working. As the HRS sample is aging over time, a second possibility is that people who experienced a health shock at a younger age may have a bigger response to it; however, this would not explain why the response fell between waves 2 and 3 but was flat thereafter or why this drop was seen only for certain types of health shocks.

22.9 percentage points if it is a "severe" event accompanied by a significant loss of functioning vs. by 4.0 percentage points if not.

Specification Checks and Extensions of Basic Results

While the preceding analysis suggests a large impact of health shocks on labor supply, the true impact could be even larger if shocks have long-term effects. I first address this by adding dummy variables for whether the respondent has ever had an acute health event or chronic illness diagnosis.[17] I find that these variables have a modest (3-5 percentage point) and significant effect on the probability of labor force exit for men and that past chronic illness has a similar effect for women; the effect of current shocks is unchanged by the inclusion of these dummies. To assess whether the effect of shocks diminishes over time, I estimate the model separately for each wave of the data using as many lags of the health shock dummies as are available; I find that while the coefficients on the lagged health shock dummies generally have the expected sign, indicating a persistent effect of shocks, sample sizes are too small for any consistent pattern to emerge as far as the rate of decay of the shock's effect.[18]

To consider the full impact of health shocks on labor supply, we must also examine their effect on re-entry decisions. Health shocks may have an even larger effect on labor supply if they deter re-entry; conversely, shocks may have a smaller effect if some of the reaction is temporary and workers later re-enter the labor force. To assess these possibilities, I re-estimate the specifications described in the preceding paragraph using labor force re-entry as the dependent variable. I find that having a health shock decreases the probability of re-entry by 3

[17] These and other results discussed in the text but not included in the tables are available from the author upon request.

to 4 percentage points and that the effect is similar for shocks experienced within the past two years and those experienced further in the past. The specification with lagged shock dummies shows no consistent pattern of decay in the effect of the shock, suggesting that the initial reduction in labor supply may be permanent.

As an additional check, I probe the large estimated effect of acute health events on labor supply by breaking this dummy into its component parts, dummies for heart attack, stroke, and new cancer diagnosis, and re-estimating the model with these dummies. Interestingly, I find that for men, the effect of a heart attack on the probability of labor force exit (22 percentage points) is larger than that of a stroke (16) or cancer (8), while for women, a stroke has a bigger effect (14 percentage points) than a heart attack (5) or cancer (8); these effects are statistically significant (except for women's heart attack) and are typically significantly different from each other.

Basic Results Including Spouse Health Shocks

To assess the spousal response to health shocks, the models are expanded by adding an equivalent set of health shock variables for the spouse and the spouse's demographic variables. The coefficients on the spousal health shock variables resulting from this exercise are shown in Tables 3a and 3b; although not reported on the tables, the effects of own health variables are virtually identical to the earlier results.[19]

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[18] Sample selection is a concern in this analysis with lagged health shock dummies, as many of the workers who experienced more severe health shocks are likely to have exited the labor force early on.

[19] The samples for this analysis are the same as described earlier; a small number of observations are lost due to missing data on spousal characteristics. The male (female) sample is conditional on men (women) being in the labor force at the previous wave, but there is no sample selection criteria regarding the spouse's participation. Restricting the sample to couples in which both were working at the past wave yields similar results; including couples in which neither worked yields similar results for the effect of spousal health shocks, though the effects of own health shocks are smaller because many retired people who experience shocks do not change their labor supply.

In the simplest specification for men (columns 1 and 5 on Table 3a), a wife's health shock is associated with a decrease in the probability of exiting the labor force or an increase in hours, as predicted by the AWE. The effects are small relative to the effects of own health shocks, on the order of a 1.5 percentage point decrease in the probability of retirement or an increase of 50 hours, and are not statistically significant, although replacing the individual health shock dummies with a single dummy variable for any type of health shock (columns 2 and 6) yields a significant coefficient in the hours regression. For women (Table 3b), a husband's health shock is not consistently associated with an increase in labor supply as predicted by the AWE and the coefficients are small and insignificant, whether several health shock dummies or a single dummy is used.

In the remaining columns of Tables 3a and 3b, the any health shock dummy is interacted with dummies for a significant loss in functioning or decrease in survival probability to explore whether the response to a spousal health shock depends on its severity. For men, the effect of a severe health shock is similar to that of any shock; if anything, the AWE may be slightly larger when the shock is severe, though the interaction coefficients are not significant. Women, on the other hand, decrease labor supply when the spouse's health shock is severe. The effect is about 6 percentage points, or one-third of baseline retirement, and the interaction coefficients are significant at the 10% level or better in both labor force exit models; the interaction coefficients in the hours models also indicate a decrease in labor supply but are insignificant.

Taken together with the large reductions in own labor supply shown in Tables 2a-2b, these results suggest that the family suffers a substantial loss in income when one spouse experiences a health shock. Husbands whose wives experience a health shock may increase labor supply slightly, but it is a small effect compared to the reduction in the wife's labor supply.[20] Wives have no labor supply response to an average spousal health shock and actually reduce labor supply substantially when the shock is severe.

These results raise two interesting questions – why is the estimated AWE small and often insignificant and why are there different responses by men and women, particularly to a severe shock? One possible answer to the first question is that different workers may in fact be responding to a spouse's health shock in predictable but offsetting ways – for example, with one worker working less to provide care for a spouse and another working more to provide health insurance coverage for the family – generating a net zero effect in aggregate. If certain of these motivations are more important for men or women, this might also help to explain some of the gender differences in the results. The remaining sections of the paper explore the how labor supply responses to health shocks depend on complementarity of leisure and care-giving motives and on the family's access to employer-provided and government benefits.

Complementarity of Leisure and Caregiving

One reason why the AWE may fail to materialize is that there may be complementarity in leisure for older couples – if older people enjoy their leisure time more when their spouse is with them, then the health-related retirement of one spouse may lead the other to retire as well. Most studies have found complementarity of leisure to be an important determinant of retirement decisions, and Coile (2004) suggests that this effect may be stronger for men than for women. If this were true here, though, it would work against finding a larger AWE for men. However, a hypothesis that could explain the observed gender differences in the results is that a severe health

[20] Indeed, an analysis of the effect of health shocks on total family hours shows that hours fall as a result of a shock (particularly for an acute event such as a heart attack), whether the shock is experienced by the husband or the wife. Smith (2003) finds that family income falls as a result of a health shock.

shock may differentially affect the complementarity of leisure for men and women. Specifically, if this event reduces the complementarity of leisure for men and increases it for women, for example because women are more willing to take on additional responsibilities around the house when their spouse falls ill, that would be consistent with men increasing labor supply and women decreasing labor supply as a result of a spouse's severe health shock.

To test this theory, I make use of the question in the HRS about whether the respondent finds time spent together with their spouse to be enjoyable (on a 4-point scale – extremely, very, somewhat, or not too enjoyable, where 1 is extremely enjoyable), and treat this as a proxy for complementarity of leisure. The test involves regressing the change in this index since the last wave on the value of the index at the last wave and the health shock variables for each spouse. The same model is estimated for each spouse via seemingly unrelated regression (SUR), and the coefficients on the spouse's health shock variables in each regression are tested for equality. As the question about enjoyment of time together was only asked of all respondents in waves 1 and 2, this analysis is based on the change between those waves only.

The results of this analysis are shown on Table 4. The average value of the index is 1.83 for men and 1.96 for women and the average change in the index is small, about 0.03 for both men and women. For women, there is essentially no effect of a severe health shock on the index, while for men, a decline in the wife's level of functioning is associated with a highly significant increase of 0.33 in the index (a decrease in complementarity of leisure). The hypothesis that these coefficients on the spouse's change in functioning dummy are equal is easily rejected at the 5% significance level. This exercise lends support to the hypothesis that differences in how men and women respond to a spouse's severe health shock could be driven in part by differences in its effect on their enjoyment of time spent with their spouse.

A second hypothesis to explain the gender differences in the results is that women may be more likely to decrease labor supply in order to provide care for a sick spouse. One way to explore the role of caregiving is to look at the effect of having adult children living within 10 miles prior to the shock, as these children can serve as alternate caregivers.[21] The key coefficients from this exercise are not statistically significant, so the results are discussed only briefly, but they suggest at least the possibility of a differential response by gender. For men, having kids nearby allows them to reduce the probability of exit by 2.1 percentage points more or increase hours by 75 more in response to a spouse's health shock than if kids were not nearby; these effects are comparable in size to the effects shown on Table 3a and the coefficients in the two models are of opposite sign as expected. For women, the coefficients are smaller, do not have the opposite sign, and are not significant. Thus it is possible that men make greater use of the presence of other potential caregivers to increase labor supply in response to a spouse's health shock, which could contribute to men's having a larger AWE.

Health Insurance

The family's response to health shocks may also be affected by its access to employer-provided and government benefits.[22] Table 5 explores the role of health insurance by augmenting the basic model with dummy variables for whether each spouse had employer-provided health insurance and retiree heath insurance at the last wave, as well as an interaction of

[21] An alternative method is simply compare whether husbands who have suffered a severe health shock are more likely to receive assistance with ADLs from their wives than comparable wives are from their husbands; in fact, husbands are slightly more likely to receive such assistance (21% to 18%). Yet it is difficult to conclude from this that the desire to provide care has a causal effect on labor supply decisions, as women may reduce labor supply in response to a spouse's health shock for other reasons and simply provide assistance because it is convenient to do so. The method discussed in the text is a cleaner, if less direct, way of assessing the role of caregiving in labor supply decisions.

the retiree insurance and any health shock dummies to test whether access to insurance is more important for families who have experienced health shocks. For simplicity, I focus on the results for labor force exit; results for changes in hours are similar.

The coefficient on own employer-provided health insurance may be negative if jobs with insurance have other attractive attributes that make people less likely to retire; indeed, having such insurance reduces the probability of exit by 4.2 percentage points for men and 8.5 percentage points for women and both effects are highly significant. Having retiree health insurance increases the probability of exit as expected, by 5.9 percentage points for men and 5.1 percentage points for women, and both effects are highly significant. However, this effect is not significantly larger for employees who have had a health shock.

Having one's spouse have retiree health insurance may increase the probability of exit by removing the need to work to provide insurance for the spouse and this effect may be stronger in families where the spouse has had a health shock. For men, this is the case – the wife's having retiree health insurance increases the probability of exit by 2.4 percentage points and the effect is 3.2 percentage points larger when she has had a health shock; the former effect is significant at the 10% level, though the latter is not significant and thus is suggestive only. For women, the husband's retiree health insurance has no effect on labor supply. In sum, access to retiree health insurance through one's employer facilitates retirement for both men and women, and this access is equally important for those who have and have not experienced a health shock. Further, the wife's access to retiree health insurance appears to facilitate retirement for men, but there is no similar effect for women.

[22] Several studies, including Blau and Gilleski (2001) and Gruber and Madrian (1995), have found access to health insurance to be an important determinant of own retirement decisions.

Retirement Benefits

Families may be able to weather a health shock without a spousal labor supply response if they have access to retirement benefits. To test this hypothesis, the models in Table 6 add dummy variables for whether each spouse is eligible for Social Security or a private pension and for whether each has applied for or received Disability Insurance benefits (DI) since the last wave; the Social Security and pension dummies are also interacted with the any shock dummy to test whether benefit access is more important for families who have had health shocks.[23]

If the respondent is eligible for Social Security or a pension, this is associated with a large and statistically significant decrease in labor supply; however, the effects are not larger for those who have had health shocks. The effects of the spouse being eligible for these benefits are generally insignificant, with one interesting exception: men whose wives have a health shock and are pension-eligible are 6.2 percentage points more likely to retire, suggesting that wives' pensions may crowd out the AWE. Surprisingly, though, women with comparable husbands are 3.4 percentage points less likely to retire. Both effects are significant at the 10% level or better.

Among the DI variables, applying for benefits should be associated with an increased probability of exiting the labor force, as applicants by law are not allowed to work; being a recipient will be associated with a further labor supply reduction if rejected applicants are more likely to be working than accepted applicants. The estimates in Table 7 reflect this – applicants are about 50 percentage points more likely to exit the labor force and recipients are a further 15-20 percentage points more likely to exit, and all effects are highly significant.

[23] Social Security eligibility is defined here as being age 62 or older. Exact age dummies remain in the model. The Social Security dummy may pick up a general effect of being age 62 or older as well as the effect of benefit eligibility.

It is expected that having a spouse apply for DI may be associated with an increase in labor supply due to the AWE, while having a spouse receive DI may be associated with a decrease in labor supply if the DI benefits crowd out the AWE. For women, the coefficients on the spouse's DI variables have the expected signs and there is a large and statistically significant decrease of 296 hours if the husband is awarded DI benefits, suggesting that there may be crowd out of the AWE. For men, there is an increased probability of labor force exit if the wife is awarded DI benefits, but it is not significant and the effect on hours is wrong-signed. Thus the evidence of crowd out of the AWE by retirement benefits is mixed.

V. CONCLUSIONS

Health events such as heart attacks or new diagnoses of chronic illnesses have a large effect on labor supply decisions for both men and women, particularly when accompanied by significant losses in functioning. Men who have experienced an acute event such as a heart attack or stroke that results in a large loss of functioning are 35 percentage points more likely to exit the labor force over a two-year period; comparable women are 23 percentage points more likely to exit.

The average response of workers to a spouse's health shocks is a small AWE for men and no significant increase in labor supply for women; women actually decrease labor supply when the husband's shock is accompanied by a loss of functioning or a reduction in life expectancy. The lack of a strong AWE and the gender differences in the results may be explained in part by families responding to shocks in predictable but offsetting ways based on characteristics such as complementarity of leisure, caregiving needs, and access to employer-provided and government benefits. For example, evidence suggests that husbands may not exit the labor force when the wife experiences a severe health shock because of a weakening of his traditionally stronger complementarity of leisure effect and that men may increase labor supply in response to a wife's health shock when substitute caregivers are available.

There is some evidence that the availability of employer-provided and government benefits affects workers' responses to their own and their spouses' health shocks in predictable ways, though these effects are often not consistent for men and women or across benefit types. Husbands reduce labor supply when their wives have access to retiree health insurance or private pension benefits, and wives reduce labor supply when their husbands have access to Disability Insurance benefits.

These findings have several notable implications. First, the study finds that health shocks represent real financial losses for the family, as any labor supply increase by the spouse is swamped by the large labor supply decrease by the affected individual. This suggests that health shocks are an important source of financial risk for near-retirement-age households and that there may be welfare gains from providing insurance against this risk. Second, the study supports the recent trend in the retirement literature to examine retirement in a household context, as it finds that the spouse's characteristics can have important effects on the worker's retirement decision for both men and women. Third, the results regarding employer-provided and government benefits may be of particular interest to policy makers, as they suggest that some families may be constrained in responding to health shocks by a lack of access to health insurance and that there may be some crowd out of spousal labor supply by DI benefits. Future research may help to explain why men's and women's responses to health shocks are not always symmetric.

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Table 1: Summary Statistics

Variable	Male Sample		Female Sample	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev**
Labor Force Variables				
Exited Labor Force	0.185		0.189	
Change in Hours	-375	1,026	-284	860
Health Variables				
Acute Health Event	0.067		0.050	
New Chronic Illness	0.107		0.098	
Accident	0.036		0.030	
Any Health Shock	0.191		0.167	
Past Acute Event	0.122		0.109	
Past Chronic Illness	0.475		0.546	
ADL Index	0.103	0.141	0.141	0.161
Change in ADL Index	0.015	0.122	0.011	0.130
Self-Reported Prob Live to 75	0.660	0.274	0.684	0.267
Change in Prob Live to 75	0.002	0.266	0.000	0.259
Demographics				
Age	60.4	4.1	58.3	4.5
Educ: <HS	0.234		0.188	
Educ: HS	0.320		0.407	
Educ: Some college	0.198		0.228	
Educ: College	0.111		0.080	
Net Worth (median)	138,000	1,190,334	135,000	1,125,822
Liquid Assets (median)	5,000	249,060	4,000	262,320
Number of Person-Wave Obs	11,006		9,592	

Table 2a: Effects of Own Health Shocks on Men's Labor Supply

Variable	Dep Var: Labor Force Exit			Dep Var: Change in Hours		
	(1)	(2)	(3)	(4)	(5)	(6)
Acute Event Dummy	0.161	0.088	0.104	-317.7	-159.7	-216.8
	(0.018)	(0.018)	(0.023)	(43.7)	(46.1)	(58.1)
Chronic Illness Dummy	0.054	0.031	0.042	-145.8	-91.8	-86.8
	(0.012)	(0.013)	(0.016)	(34.1)	(36.2)	(43.9)
Accident Dummy	0.024	0.003	0.069	-69.6	-20.0	-172.7
	(0.022)	(0.023)	(0.033)	(55.1)	(58.9)	(87.8)
Increase in ADL Dummy		0.106			-219.8	
(change>=4 activities)		(0.018)			(46.8)	
Past ADL (0-1 Index)		0.238			-337.8	
		(0.034)			(74.8)	
Acute * ADL Change		0.258			-586.0	
		(0.048)			(117.8)	
Chronic * ADL Change		0.024			-87.9	
		(0.038)			(99.0)	
Accid * ADL Change		-0.009			-31.6	
		(0.059)			(149.3)	
Decrease in Age75 Surv Prob			0.003			-9.7
(change<-.20)			(0.011)			(33.7)
Past Age75 Surv Pr (0-1 Index)			-0.054			57.5
			(0.016)			(39.2)
Acute * Survival Change			0.118			-237.2
			(0.050)			(126.9)
Chronic * Survival Change			0.030			-70.5
			(0.038)			(101.4)
Accid * Survival Change			-0.048			194.9
			(0.066)			(206.8)
R-Squared	0.111	0.130	0.101	0.061	0.072	0.064
Number of Obs	11,006	11,006	7,827	11,006	11,006	7,827

Note:
(1) Regressions include dummies for age, education, industry/occupation, and year, net worth and liquid assets.
(2) Standard errors are corrected for repeated observations on same individuals.
(3) Specifications 3 and 6 have fewer observations due to missing subjective mortality data.

Table 2b: Effects of Own Health Shocks on Women's Labor Supply

Variable	Dep Var: Labor Force Exit			Dep Var: Change in Hours		
	(1)	(2)	(3)	(4)	(5)	(6)
Acute Event Dummy	0.097	0.040	0.031	-249.9	-150.5	-170.8
	(0.021)	(0.021)	(0.024)	(46.8)	(50.3)	(59.1)
Chronic Illness Dummy	0.043	0.027	0.037	-86.4	-67.3	-96.1
	(0.014)	(0.015)	(0.016)	(32.9)	(36.6)	(37.5)
Accident Dummy	0.001	-0.031	-0.034	36.0	101.3	87.3
	(0.026)	(0.027)	(0.031)	(62.6)	(66.6)	(83.8)
Increase in ADL Dummy		0.080			-167.7	
(change>=4 activities)		(0.017)			(40.6)	
Past ADL (0-1 Index)		0.215			-293.9	
		(0.032)			(61.7)	
Acute * ADL Change		0.189			-339.2	
		(0.056)			(121.6)	
Chronic * ADL Change		0.039			-9.7	
		(0.041)			(91.2)	
Accid * ADL Change		0.068			-167.0	
		(0.068)			(158.2)	
Decrease in Age75 Surv Prob			0.001			25.0
(change<-.20)			(0.012)			(30.3)
Past Age75 Surv Pr (0-1 Index)			-0.008			-6.0
			(0.017)			(36.0)
Acute * Survival Change			0.132			-48.7
			(0.055)			(121.7)
Chronic * Survival Change			-0.010			102.9
			(0.038)			(95.1)
Accid * Survival Change			0.085			-294.2
			(0.083)			(212.9)
R-Squared	0.085	0.099	0.084	0.038	0.045	0.042
Number of Obs	9,592	9,592	8,188	9,592	9,592	8,188

Note:
(1) Regressions include dummies for age, education, industry/occupation, and year, net worth and liquid assets.
(2) Standard errors are corrected for repeated observations on same individuals.
(3) Specifications 3 and 6 have fewer observations due to missing subjective mortality data.

Table 3a: Effects of Spouse's Health Shocks on Men's Labor Supply

Variable	Exit Labor Force				Change in Hours			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Spouse Health Variables								
Acute Event	-0.022				61.7			
	(0.015)				(38.8)			
Chronic Illness	-0.006				29.8			
	(0.012)				(33.4)			
Accident	-0.013				74.5			
	(0.023)				(62.5)			
Any Health Shock		-0.014	-0.018	0.004		54.7	58.0	-34.7
		(0.010)	(0.010)	(0.013)		(26.0)	(28.9)	(36.9)
Increase in ADL Dummy			-0.002				-35.3	
(change>=4 activities)			(0.015)				(43.6)	
Past ADL (0-1 Index)			0.007				-7.3	
			(0.023)				(52.5)	
Any * ADL Change			0.001				29.1	
			(0.027)				(76.5)	
Decrease in Age75 Surv Prob				-0.012				11.7
(change<-.20)				(0.013)				(35.1)
Past Age 75 Surv Pr (0-1 Index)				0.024				-55.1
				(0.017)				(44.4)
Any * Survival Change				-0.024				108.3
				(0.029)				(80.5)
R-Squared	0.115	0.109	0.128	0.106	0.065	0.062	0.728	0.757
Number of Observations	10,690	10,690	10,646	6,722	10,690	10,690	10,646	6,722

Note:
(1) All regressions include the same own health shock variables; coefficients are very similar to those on Table 2a.
(2) Regressions include dummies for age, education, industry/occupation, and year, net worth and liquid assets.
(3) Standard errors are corrected for repeated observations on same individuals.

Table 3b: Effects of Spouse's Health Shocks on Women's Labor Supply

Variable	Exit Labor Force				Change in Hours			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Spouse Health Variables								
Acute Event	0.005				-17.1			
	(0.014)				(32.8)			
Chronic Illness	0.022				-40.6			
	(0.013)				(32.4)			
Accident	-0.008				87.2			
	(0.021)				(45.5)			
Any Health Shock		0.008	0.000	-0.009		-10.5	4.6	13.9
		(0.010)	(0.011)	(0.014)		(23.5)	(25.4)	(35.5)
Increase in ADL Dummy			-0.035				-27.3	
(change>=4 activities)			(0.016)				(43.1)	
Past ADL (0-1 Index)			-0.005				-21.2	
			(0.027)				(58.7)	
Any * ADL Change			0.060				-41.2	
			(0.029)				(70.4)	
Decrease in Age75 Surv Prob				-0.027				66.7
(change<-.20)				(0.015)				(40.1)
Past Age 75 Surv Pr (0-1 Index)				0.017				-64.7
				(0.019)				(42.0)
Any * ADL Change				0.058				-100.9
				(0.033)				(85.4)
R-Squared	0.099	0.096	0.112	0.100	0.047	0.044	0.052	0.053
Number of Observations	8,817	8,817	8,733	4,996	8,817	8,817	8,733	4,996

Note:
(1) All regressions include the same own health shock variables; coefficients are very similar to those on Table 2b.
(2) Regressions include dummies for age, education, industry/occupation, and year, net worth and liquid assets.
(3) Standard errors are corrected for repeated observations on same individuals.

Table 4: Change in Complementarity of Leisure Index

Variable	Wife's Change in CoL Index	Husband's Change in CoL Index
Spouse Variables		
Any Health Shock	0.095	-0.021
	(0.039)	(0.039)
ADL Change Dummy	-0.095	0.331
	(0.133)	(0.116)
Any Shock * ADL Change	0.026	0.052
	(0.091)	(0.092)
Own Variables		
Any Health Shock	0.088	-0.003
	(0.041)	(0.038)
ADL Change Dummy	0.016	-0.011
	(0.121)	(0.127)
Any Shock * ADL Change	0.052	0.097
	(0.096)	(0.087)
Past Comp of Leisure Index	-0.419	-0.536
	(0.020)	(0.021)
Test of Equality of Spouse ADL Change Dummy in 2 Models	chi2(1)=5.72	, p=0.017
Mean Value of Depend Variable	0.028	0.039
R-Squared	0.194	0.259
Number of Observations	1,787	1,787

Note:
(1) Comp of Leisure Index is 1 if respondent says that time spent together with spouse is extremely enjoyable, 2 if very, 3 if somewhat, 4 if not enjoyable.
(2) All variables refer to change in CoL Index, health, etc. between waves 1 & 2. Sample is couples where both spouses were working at wave 1.
(3) Model is estimated via seemingly unrelated regression (SUR).

Table 5: Effects of Health Shocks -- Health Insurance

Variable	Depend Var: Men's Labor Supply		Depend Var: Women's Labor Supply	
	Labor Force Exit	Change in Hours	Labor Force Exit	Change in Hours
	(1)	(2)	(3)	(4)
Spouse Variables				
Any Health Shock	-0.020	54.7	0.007	-2.0
	(0.010)	(28.0)	(0.012)	(27.4)
Employer HI	-0.017	-1.8	-0.010	2.4
	(0.010)	(28.5)	(0.011)	(24.3)
Retiree HI	0.024	-68.5	0.004	-40.4
	(0.013)	(37.3)	(0.012)	(28.1)
Retiree HI * Any	0.032	-11.5	0.008	-39.4
	(0.029)	(78.3)	(0.023)	(53.7)
Own Variables				
Any Health Shock	0.085	-168.3	0.049	-111.2
	(0.013)	(32.5)	(0.014)	(31.8)
Employer HI	-0.042	-127.0	-0.085	-38.5
	(0.009)	(25.3)	(0.010)	(23.3)
Retiree HI	0.059	-97.7	0.051	-95.2
	(0.009)	(25.6)	(0.011)	(27.1)
Retiree HI * Any	-0.008	-13.2	0.017	-45.3
	(0.022)	(56.0)	(0.028)	(68.3)
R-Squared	0.113	0.069	0.104	0.0477
Number of Obs	10,646	10,646	8,733	8,733

Note:
(1) Regressions include dummies for age, education, industry/occupation, and year, net worth and liquid assets.
(2) Standard errors are corrected for repeated observations on same individuals.

Table 6: Effects of Health Shocks -- Retirement Benefits

Variable	Dependent Variable: Men's Labor Supply Exit (1)	Dependent Variable: Men's Labor Supply Hours (2)	Dependent Variable: Women's Labor Supply Exit (3)	Dependent Variable: Women's Labor Supply Hours (4)
Spouse Variables				
Any Health Shock	-0.039	-84.5	0.024	-52.9
	(0.011)	(47.2)	(0.017)	(46.1)
SS-eligible (age 62+)	-0.006	-22.9	0.044	-187.4
	(0.040)	(93.3)	(0.037)	(90.9)
Pension eligible	0.010	-27.6	0.029	-34.1
	(0.009)	(20.9)	(0.010)	(20.0)
Any * SS-eligible	0.000	79.1	0.001	18.4
	(0.027)	(71.0)	(0.020)	(47.2)
Any * Pension-eligible	0.062	-66.1	-0.034	72.4
	(0.020)	(53.2)	(0.019)	(46.5)
DI Applicant	0.030	-83.7	-0.001	77.2
	(0.022)	(90.2)	(0.032)	(89.6)
DI Recipient	0.016	213.3	0.034	-296.3
	(0.050)	(134.8)	(0.047)	(139.3)
Own Variables				
Any Health Shock	0.050	65.5	0.015	-51.8
	(0.016)	(34.0)	(0.016)	(42.5)
SS-eligible (age 62+)	0.242	-514.5	0.250	-140.9
	(0.057)	(170.3)	(0.063)	(131.0)
Pension eligible	0.069	-96.0	0.007	-75.5
	(0.009)	(20.2)	(0.010)	(19.4)
Any * SS-eligible	0.028	-22.5	-0.004	-6.3
	(0.022)	(57.5)	(0.031)	(70.7)
Any * Pension-eligible	-0.013	-40.2	0.028	-49.3
	(0.019)	(53.6)	(0.022)	(54.2)
DI Applicant	0.542	-950.4	0.529	-1057.5
	(0.045)	(117.6)	(0.046)	(102.9)
DI Recipient	0.190	-420.0	0.151	-115.7
	(0.052)	(148.1)	(0.064)	(139.2)
R-Squared	0.089	0.174	0.075	0.144
Number of Obs	10,690	10,690	8,817	8,817

Note:

(1) Regressions include dummies for age, education, ind/occup, and year, net worth and liquid assets.

(2) Standard errors are corrected for repeated observations on same individuals.