ESSAYS ON THE EFFECT OF HEALTH ON HOUSEHOLD SPENDING, LABOR MARKET OUTCOMES, AND CHARITABLE CONTRIBUTIONS OF MONEY AND TIME

by

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(Under the direction of Angela Fertig and David Mustard)

ABSTRACT

These essays examine topics in health economics using the Panel Study of Income Dynamics. The first chapter analyzes the relationship between individuals' mental health status and their spending behavior. I find that the effect of mental illness on spending varies by the measure of mental illness, by the expenditure category, and by gender, age, income, and couple status. In general, the effect of severe forms of mental illness on spending is negative and appears to be strongest for older single women with low incomes. However, my results also indicate some specific evidence of 'retail therapy' involving women and food, and husbands and cars.

In the second chapter, I analyze the effects of mental illness on labor market outcomes for single men, single women, married men, and married women. Findings from the estimation of a reduced-form earnings equation indicate a negative relationship between weekly earnings and mental illnesses for all groups. However, when I condition on hours worked, there is no effect of mental illness on the hourly wage rate for men, suggesting that the negative effects of mental illness on weekly earnings result from reduced work hours. Mentally ill single women experience a 21.5 percent lower hourly wage rate (conditional on labor supply), the most severe adverse effect of mental illness on labor market outcomes among all groups.

The third chapter examines the association between individuals' health status and their philanthropic behavior. In particular, I examine whether changes in health affect monetary giving and volunteering, and in addition, whether changes in health direct philanthropy to charities promoting health. Empirical estimates from the fixed effects models show that health shocks (stroke, heart attack or cancer diagnosis) and mental health diagnoses are associated with a decline in total money and/or time donations. However, health shocks, mental health diagnoses, and declines in self-reported physical health status are associated with a rise in time and/or money donations to *health-related* charities. Thus my empirical results indicate that health may have an important effect on where donations are directed.

INDEX WORDS: Health, Mental Health, Consumption, Spending, Labor Market Outcomes, Earnings, Labor Supply, Charity, Donations, Volunteering

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DEDICATION

To my parents, Dilip and Kiran Dahal. Thank you for everything.

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CHAPTER 1

MENTAL ILLNESS AND HOUSEHOLD SPENDING BEHAVIOR

1.1 INTRODUCTION

Outside the field of economics, it is widely argued that the gradient—the well-established correlation between health and economic status—is driven by economic influences on health status: poor individuals receive low quality health care, have low access to any health care, and practice riskier health behaviors. Low-income households and workers in low status jobs are more likely to experience high psychosocial stress than those in high income households and high status jobs (Orpana et al. 2009; Marmot et al. 2001). Contrary to this point of view, economists argue that, while economic status likely affects health, most of the correlation is the result of health affecting economic status (Cutler et al. 2006). People with poor health earn less because their health has restricted their educational attainment and their ability to be productive in the workforce compared to healthy individuals (Case et al. 2005). Contributing to this debate, this study examines an alternate potential mechanism by which health may affect economic status. In particular, this chapter analyzes whether mental health problems affect households' spending behavior. We argue that if poor mental health causes individuals to spend more to achieve short-term gratification and forgo long-term savings goal, then mental health problems could have an additional and important causal effect on economic status.

Mental health problems are highly prevalent in the United States. Kessler et al. (1994) estimate that as much as 30 percent of the U.S. population has a mental or substance use disorder each year. There is also new evidence that mental health problems are on the rise among high school and college age individuals (Twenge et al. 2010). For purposes of this study, we define mental illness as psychological and emotional problems that include but are not limited to depression, bipolar disorder (mania), schizophrenia, anxiety, phobias, alcohol abuse, drug addiction, and obsessive compulsive disorder.

Very little is known about the relationship between mental health and spending. Evidence suggests an adverse effect of mental health on labor market outcomes (Bartel and Taubman 1986; Cseh 2008; Ettner et al. 1997), which reduces income available for spending. There is also some research that documents a correlation between mental health and savings and debt. While one in eleven individuals in the United Kingdom reports being in debt, one in four people with mental health problems and one in three people suffering from psychosis (i.e., schizophrenia or affective disorders) is in debt (UK Office of National Statistics 2002). Gresenz and Sturm (2000) find that compared to mentally healthy individuals, mentally ill individuals are seventy-five percent less likely to have any savings. However, it is unknown whether the connection between mental health and savings and debt results from spending on medical care, lower income-generating ability, reverse causality (debt causing depression and anxiety), or spending behaviors.

We hypothesize that individuals with mental health problems will have higher discount rates, and may derive greater utility from spending (commonly referred to as 'retail therapy') than people without mental health disorders. These characteristics will lead individuals with mental health problems to purchase goods and services that give immediate enjoyment,

sacrificing longer-term savings goals. On the other hand, some mental health disorders may result in a sense of worthlessness and lethargy such that less utility is derived from spending and less energy is available for spending.[1] Thus, the theoretical predictions are ambiguous indicating that empirical evidence is needed.

This chapter examines the spending pattern of mentally ill individuals using data from five recent waves of the Panel Study of Income Dynamics (PSID). These waves include mental health questions and information about specific expenditure categories. In particular, we examine whether, compared to healthy individuals, individuals with mental health issues spend more in general, and whether they spend more on durable, non-durable, or investment goods.[2] We also examine whether the severity of mental conditions differentially affects spending behavior, and whether there are differences in the effect of mental illnesses on spending by gender, couple status, age, and income group. We hold family income and spending on medical care constant, and use fixed effects estimation to address unobserved heterogeneity across individuals.

Our results, in general, suggest that mental illness affects the spending behavior of single women more so than single men or couple households. Women, regardless of marital status, increase spending on food when they have low values on a mental health screen, but decrease spending when they have high values on the screen, indicating a greater likelihood of serious mental illness. Other measures of mental health used in this analysis capture only the more severe end of the spectrum. For these measures, we find mental illness reduces overall spending

[1] Mental health disorders are diverse. Thus, these theories may apply more to certain conditions and less to others. In addition, we expect mild cases to have different effects from severe cases. We attempt to address these issues in the empirical analysis by conducting some specific sub-analyses on depression and by using mental health measures that vary by severity.

[2] Individuals who have high discount rates may prefer spending more on non-durable goods such as food and clothing, as opposed to spending on investment goods such as housing, education and childcare. Fersterer and Winter-Ebmer (2003) find that adolescents who stay in school longer tend to have lower discount rates, implying a link between discount rates and educational investments.

for single women. There are almost no significant effects for single men. For couple households, we find that depression is related to an increase in spending on cars for heads of couple households. These results suggest that, while 'retail therapy' may occur among individuals suffering from depression or mild non-specific psychological problems, other mental illnesses, and more severe cases of mental illness, appear to have effects consistent with a reduction in the marginal utility of consumption, particularly for single women.

1.2 THEORY AND BACKGROUND

We assume that individuals discount future consumption, derive utility from current consumption, and derive disutility from the costs of current and past consumption.[3] We argue below that mental health status can affect an individual's spending decisions by influencing each of these components and their income available for spending.

First, individuals with mental health problems may have a greater preference for current consumption, implying a high discount rate. Discounting is a rational preference for current consumption over future consumption (Ainslie 1975). Individuals vary in the degree to which they discount future consumption, and those with higher discount rates are more likely to spend a greater fraction of their income on current consumption. The costs of spending in a period are incorporated into the utility function in future periods, and these aggregated future costs are discounted. Thus, for an individual with a high discount rate, it is tempting to consume more in the present, as the costs of current spending is small.

[3] Examples of costs include debt accumulation and relationship problems.

There is a vast literature documenting the relationship between discount rates and various behaviors. Research attributes to differences in discount rates everything from health behaviors (Bradford et al. 2009; Kirby and Petry 2004; Petry and Casarella 1999; Madden et al. 1999; Madden et al. 1997; Chapman and Coups 1999) to education (Fersterer and Winter-Ebmer 2003). In contrast, there is relatively little research on the determinants of discount rates, with the exception of age (Yaari 1965; Borsch-Supan and Stahl 1991; Green et al. 1996; Trostel and Taylor 2001; Kirby et al. 2002; Read and Read 2004; Halevy 2005). Becker and Mulligan (1997) make a theoretical argument that health affects time preference because worse health shortens one's lifespan, which reduces one's planning horizons and future utility. Mental health, like physical health, may shorten one's expected or perceived lifespan. Moreover, if mental health problems reduce the perceived quality of one's future years, this may cause an individual to discount future utility more heavily. There is only one empirical test of this theory to our knowledge. Using a small sample (N = 175) from South Africa, Chao et al. (2009) find that individuals' physical health and survival expectations have a U-shaped relationship with respect to their subjective discount rates, implying individuals in very poor and very good health have high discount rates. They also examine the relationship between mental health and subjective discount rates, but find no empirical association between the two factors.

Despite this one finding, there is support for a connection between mental health and discount rates in both the economic literature and the psychology literature, which documents that substance abusers have high discount rates (See Kirby and Petry (2004); Bickel, Odum, and Madden (1999); and Bretteville-Jensen (1999)). Danielson, Overholser, and Butt (2003) demonstrate that mentally ill individuals report higher rates of binge drinking and involvement with substance abuse, suggesting a link between psychological problems and discount rates.

Additionally, Frederick (2005) also shows that individuals with more limited cognitive abilities have higher discount rates for short-term choices.

Second, mental health may affect the utility of current consumption directly. The marginal utility of current consumption may fall with poor health because people want to consume more when healthy than when sick. Viscusi and Evans (1990), Finkelstein et al. (2008), and Trostel and Taylor (2001) provide empirical evidence linking individuals' deteriorating health status to their decreasing marginal utility of consumption, consistent with this argument. However, Lillard and Weiss (1997) find the opposite, and Rust and Phelan (1997) find no significant relationship between the marginal utility of consumption and health. Specific to mental health, it may be that mentally ill individuals have diminished interest or pleasure in activities and consumption, experience fatigue or loss of energy, and exhibit feelings of worthlessness such that the marginal utility of consumption is lower. In particular, individuals who feel that their emotional problems limit their daily activities, or individuals who suffer from severe mental health problems, may experience reduced interest in activities and consumption.

On the other hand, individuals with milder conditions may experience an increase in the marginal utility of consumption, and may engage in a behavior popularly referred to as "retail therapy." Spending on goods that provide immediate gratification or participating in recreational activities may provide mentally ill individuals with temporary relief from depressive conditions (Lejoyeux et al. 1996). In the psychiatry literature, this behavior is referred to as an uncontrolled, impulsive, or compulsive buying disorder. These types of buying disorders have a high psychiatric co-morbidity rate, particularly with mood and anxiety disorders, substance use disorders, and eating disorders (Black 2007).

Third, there is the possibility that past spending behavior can affect mental health status. One of the main clinical features of uncontrolled buying disorder is the associated distress and interference with social or occupational functioning following the purchases (Lejoyeux et al. 1996). Uncontrolled buying may result in debt accumulation or marital conflict, which can be environmental triggers for some mental health conditions. As discussed in the empirical strategy section below, I attempt to isolate the direction of causality from mental health to spending behavior by controlling for individuals' histories of debt and divorce or separation status.

Finally, having any health problem can affect one's earnings and wealth. Mental health, in particular, has been shown to reduce the probability of employment and the level of earnings (Bartel and Taubman 1986; Ettner et al. 1997; Cseh 2008). Health problems are also associated with increased medical expenditures, which can erode one's wealth and increase debt accumulation. Individuals with mental health problems tend to have a higher rate of comorbidity and thus higher general medical and mental health expenditures. One study found that individuals with behavioral health insurance claims had almost double the claims of individuals with only general and/or pharmacy service claims (Kathol et al. 2004). Thus, individuals with mental health problems may spend less than healthy individuals because they have less money available for spending. In order to avoid capturing differences in spending by mental health status that are caused by differences in earnings and wealth, we examine these factors extensively.

Setting aside reverse causality and the confounding effect of mental health on earnings and medical expenses, the association of mental health problems with high discounting and 'retail therapy' suggest that mental health problems should increase spending, particularly for impulsive goods like food, clothing, and recreational activities. In contrast to this prediction,

there is the conjecture that mentally ill individuals, particularly the more severe cases, will have reduced utility from current spending and, thus, decreased spending among the mentally ill. If high discount rates are associated with mental illness, it is possible to observe a decrease in spending on investment goods with long-term returns. Given these conflicting predictions, we examine the effect of mental illness on spending empirically.

1.3 DATA AND SAMPLE

The data used in this study come from the PSID, a nationally representative longitudinal data set that includes over 8,000 families. The PSID contains data on the economic, health and social behaviors of these families as far back as 1968. It is the only nationally representative data source to our knowledge that includes questions on both expenditures and mental health. Household expenditure questions and questions about the mental health of the head and the wife are asked in all of the five most recent waves (1999-2007). The data were collected annually until 1997, and biennially henceforth. The latest wave of data that is publicly available is from 2007. For the empirical analysis, we use weights provided by the PSID to allow the sample to approximate a representative sample of the U.S. population.[4]

Subgroups

We separately study three groups of PSID households: households headed by single men, households headed by single women, and households comprised of couples (where we observe

[4] The attrition rate is higher for individuals with a mental health diagnosis than for respondents without a diagnosis such that the number of repeated observations on the mentally ill is slightly fewer than the number of repeated observations on the healthy, which may reduce the precision on our estimates of mental illness. In addition, if only the severest cases of mental illness are the ones most likely to be lost to attrition, then our estimated effect size is likely underestimated. We find that among those with mental illness in 2001, the average K-6 score is 6.18; among those reporting mental illness in 2001 and still in the sample in 2007, their average 2001 K-6 score was 5.32. Thus, it is likely that there may be some bias due to selective attrition that would underestimate the effect size of interest.

the mental health of both partners).[5] We separate the sample in this way because empirical evidence suggests that the financial decisions of couples differ from single individuals (Waite 1995; Lundberg et al. 2003; Kirchler et al. 2008), and that women spend and save differently than men (Jianakoplos and Bernasek 1998; Browning 2000; Barber and Odean 2001; Dittmar 2004). Couples spend less than singles with the same income level due to economies of scale and specialization within marriage (Waite 1995). There is mixed evidence about whether women spend or save more than men. On the one hand, Browning (2000) argues that, because wives have longer life expectancies and are often younger than their husbands, they save more than their husbands. In contrast, estimated average discount rates for women are generally higher than that estimated for men (Bradford et al. 2009), implying that women may spend more. In addition, Dittmar (2004) finds that women are much more likely to be compulsive shoppers than men.

We also separately analyze the sub-samples because we expect the effect of mental health to differ by couple status and gender. Couples may be different than single individuals because there may be some bargaining between partners or sharing of decision-making power with respect to expenditure decisions, whereas singles are lone decision-makers (Lundberg et al. 2003; Kirchler et al. 2008). For this reason, we expect to see greater spending effects of mental health, whatever the direction, among single-headed households. The expected gender difference in the effect of mental health on spending is less clear. There is evidence that, among couples, men have more influence over spending in certain categories like cars and insurance, whereas women have more influence over spending on goods like furniture and food (Belch and Willis 2002). Thus, men and women might exhibit spending effects of mental illness in different ways.

[5] The couples are not necessarily married, but are cohabiting and are restricted to opposite sex partners.

The sample consists of 10,789 households of single women, 5,101 households of single men, and 19,721 households of couples when all five waves of data are pooled (see Table 1.1). Only the heads of households who responded to questions about mental health, marital status, and limiting health status are included in the sample. In addition, men and women who report themselves as married, but do not report about their spouses are dropped. Similarly, men who live with a partner, but report themselves as singles are also not included in the sample. Thus, 657 observations of single women headed households, 278 observations of single men headed households, and 1,567 observations of couple households are dropped.

Mental Health Variables

The PSID ascertains mental health in two distinct ways. First, in three of the five waves we use in this analysis, the PSID asks the respondent a series of 6 questions about their current feelings. These questions make up the K-6 non-specific psychological distress score (Kessler et al. 2003). Specifically, in the 2001, 2003, and 2007 waves, whoever was responding to the survey, the head or the wife, is asked to respond, on a score from 0 (=none of the time) to 4 (=all of the time), whether he/she has felt sad, nervous, restless, hopeless, worthless, and that everything was an effort in the last 30 days. The exact questions are listed in Appendix Table A.1. The final score is a sum of the respondents' scores on all six questions; thus, the K-6 score ranges from 0 to 24. We use the raw score as a continuous variable. We also use the square of the score to capture any non-linearities derived from treatment or individuals' developing a coping mechanism to deal with psychological distress as they become more experienced with the illness.[6] Kessler et al. (2003) finds that a K-6 score of 13 or higher indicates that the respondent

[6] Cseh (2008) uses the CES-D score and its squared term to allow for non-linearity in his models.

suffers from serious mental illness. We create a dichotomous variable using this cutoff, and include this as an alternative variable in a separate regression.

The other type of mental health question asks the respondent whether the head and the wife have been diagnosed with any emotional, nervous, or psychiatric problems by a doctor. These questions are asked in all 5 years of the survey included in this analysis. We create a dummy variable for the response to this question. In 2005 and 2007, a follow-up question queries the specific type of mental illness from a list of 9 choices: depression, bipolar disorder (mania), schizophrenia, anxiety, phobias, alcohol abuse, drug addiction, obsessive compulsive disorder, and other disorders. The survey records up to three possible responses. In a sub-analysis, we focus on depression because it is one of the most common diagnoses in the health care industry (World Health Organization 2001). We create an indicator variable that takes a value of 1 if the respondent reported depression as any of the 3 possible responses. We then create an indicator variable for respondents who have mental illness, but none of the 3 possible responses were depression.

There are benefits and drawbacks to both mental health screens and diagnosis questions. The K-6 psychological distress screen is useful because it does not require a doctor diagnosis, which is less likely for individuals with low socioeconomic status. Because its values range between 0 and 24, it captures mild as well as severe conditions (Andrews and Slade 2001). However, it can only be measured for the respondent, which is problematic for couple households because the mental health of the spouse is known to be important for household decisions.[7] It is also only asked in three unevenly spaced interview waves of the PSID. Finally, it is a subjective measure of mental health and it is not clear what types of mental problems an

[7] Roughly half of respondents in couple households are the wife and half are the head.

individual has from their answers to these questions. There is some research that finds that the K-6 is a good predictor of depression and anxiety (Furukawa et al. 2003; Cairney et al. 2007), but the researcher cannot distinguish the exact condition.

The diagnosis question, while a simple dichotomous variable that confounds socioeconomic status and preferences along with mental health status, is asked in every wave from 1999 to 2007 for both the head and the wife. It is an objective measure of mental health status, capturing a state when the symptoms of the illness may be most pronounced, thereby inducing the individual to seek treatment. Thus, it captures more severe cases and there is fairly complete information over the observation period. For these reasons, we use both types of questions and all possible follow-up questions in this analysis.

Table 1.2 provides summary statistics for all of the mental health measures used in this analysis. The table indicates that between 3.7 and 12.7% of household heads or wives have a diagnosed psychological problem, with men in couple households having the lowest rate and single women having the highest. The dichotomous variable derived from the K-6 score indicates a similar pattern of overall psychological distress, but lower prevalence rates given that the cutoff of 13 indicates relatively severe distress. The rates of depression range between 2.2% for men in couple households to 9.2% for single women.[8]

Expenditure Variables

The PSID collects self-reported expenditures in eleven categories: food, clothing and apparel, trips and vacations, recreation and entertainment, home repairs and maintenance, household furnishings and equipment, health care, housing, transportation, education, and child

[8] Note that the percent with depression and the percent with non-depressive problems do not sum to the total percent with mental health problems because data on these specific conditions are available only for 2005 and 2007.

care.[9] Data on clothing, vacations, recreation, and household furnishings are available only for 2005 and 2007. The PSID also records contributions to IRA retirement accounts. Because we hypothesize that mental health may increase spending that provides instant gratification (likely non-durable goods) if "retail therapy" is a mechanism, and may decrease spending on investment goods with long-term returns if high discounting is a mechanism, we create three expenditure categories – non-durables, durables, and investments – and sum all expenditures in each category. Appendix Table A.2 details which expenditures is assigned to each of the three categories. Non-durable goods include food, clothing and apparel, trips and vacations, recreation and entertainment, gasoline expenses, utilities, and parking/transportation fees.[10] Durable goods include household furnishings and equipment, transportation (not including gasoline and car down payments), and monthly rent (for non-homeowners). Investment goods include educational expenses, childcare expenses, housing (for homeowners), home repairs and maintenance, and IRA contributions. In the analysis, we also use the sum of all expenditures as an outcome.

Respondents could provide expenditures over a day, week, month, or year. For consistency, all the expenditure variables have been converted into monthly averages. We also convert all nominal values into real dollars using the 2007 all-item seasonally-adjusted consumer price index. Because the outcomes are skewed, the outcome variables are log-transformed for the regression analysis.

[9] There is little evidence about the reliability of self-reported expenditure data, but we conjecture that respondents are more likely to report with error their expenditures than their annual earnings. However, measurement error on the dependent variable in a linear regression does not result in biased estimates, but only reduces statistical precision in estimation.

[10] Transportation costs are broken down into gasoline, down payments and other costs because gasoline is a non-durable good, whereas other transportation costs are durable, and down payments imply the purchase of a car (also a durable). However, down payments are not included in any category because they generally imply one-time payment, while other expenses are all converted into monthly expenses. we also separate out utilities from housing expenses, and parking/transportation fees from transportation expenses because these are non-durable types of expenses.

Summary statistics on these four outcomes are provided in Table 1.3; both the monthly average expenditures in 2007 dollars and the 2007 percent of family income devoted to expenditures are reported.[11] Average monthly expenditures are highest for couple households ($3,434.23) and lowest for single women ($1,697.14).[12] In contrast, the percent of income devoted to expenditures is highest for single women (100%) and lowest for couple households (64.4%). The largest expenditure category is non-durable expenditures for single men and single women headed households, and the smallest is durable expenditures for couples (who are more likely to be homeowners and have high investment expenses, i.e. a mortgage) and investments for singles (who are less likely to be homeowners and have high durable expenses, i.e. rent).

Control Variables

Finally, Table 1.4 gives summary statistics for the variables used to control for socio-economic status, demographic characteristics, physical health, and medical expenditures.[13] The variables that capture socio-economic status are education,[14] family income,[15] employment status, food stamp receipt status, and debt. The demographic variables include age, race, marital status, the number of children in the family, and whether individuals live in a rural area. The physical health variables include body mass index (BMI), whether the head drinks any alcohol,

[11] We do not use expenditures as a share of family income as a dependent variable because some households have positive expenditures but no family income and we do not want to lose these observations in our analysis.
[12] However, comparisons of per person expenditures indicate that single men spend the most and single women the least.
[13] By including medical expenditures as a control, expenditures will appear on both the right hand side and the left hand side of the equation. Because this may explain more variation in the dependent variable than intended, we run regressions with and without medical expenditures. This control has no effect on the results. In addition, we find no correlation between poor mental or physical health and medical spending in our sample of households.
[14] Education may be endogenous. In particular, mental illness can interfere with an individual's ability to obtain education, which in turn lowers one's marginal productivity of labor, and thus reduces the availability of disposable income available for spending. To examine this indirect effect of education on spending, we run regressions with and without education as a control. Whether education was included or not, the results remained the same.
[15] Family income includes taxable income, transfer income, and social security income of heads, wives and other members present in the family.

and a dichotomous variable indicating whether physical health problems limit normal daily activities. Physical health is included as a control because physical and mental health are highly correlated (Vaillant 1979) and we want to isolate the effects of mental health on spending.

1.4 EMPIRICAL STRATEGY

To examine the relationship between mental health and spending, this analysis utilizes the following baseline specification:

$$\ln E_{it} = H_{it}^{'}\alpha + X_{it}^{'}\beta + \varepsilon_{it} \qquad (1.1)$$

The dependent variable, $\ln E_{it}$, represents the logarithm of monthly expenditures of household *i* in interview year *t*. H_{it} represents one of our various measures of mental illness. For couple households, this variable is a vector of two variables, one for the head and one for the "wife". We do not run separate regressions for the two partners because expenditures are reported at the household level and because there is some evidence that mental health outcomes are correlated between spouses (Fletcher 2009). The coefficient of interest is α.

In this model, ε_{it} is assumed to be a normally distributed error term, and X_{it} is a vector of characteristics of the head and/or the household capturing socio-economic status, demographic characteristics, and physical health. We apply ordinary least squares (OLS) to equation (1.1) using weighted data. The standard errors in all regressions are adjusted for intra-cluster correlations at the household level.

Because there may be unobservable characteristics that are correlated with mental health and spending, we also apply the following fixed effects (FE) model to the weighted data,

$$\ln E_{it} = H_{it}^{'}\alpha + X_{it}^{'}\beta + c_i + \varepsilon_{it} \quad (1.2)$$

where c_i represents time-invariant individual and household characteristics, some of which may be unobserved.[16] If there are correlations between c_i and spending variables, and between c_i and mental health variables, then using the FE estimator eliminates the omitted variable bias (Wooldridge 2002) and is consistent in the presence of endogeneity (Cameron and Trivedi 2009). As a result, the FE models may be more likely to capture the causal relationship from mental illness to spending. However, a drawback of the FE model is that the FE might capture some of the effect of interest. In the FE model, identification hinges on changes in mental health status or the severity of mental health problems causing changes in spending. We will not see any effects of mental illness using a FE model if those whose mental health diagnosis occurred after 1999 had been suffering from mental illness prior to 1999. The FE will have absorbed all of the effects of the onset of mental illness because it occurred before our observation window. Because of this, the results from fixed effects will likely capture the effects of mental illnesses that are more acute and episodic like depression and anxiety. The estimation strategy will potentially absorb most of the effects of chronic disorders with onset in early life such as schizophrenia, bipolar disorder, and some personality disorders. For these reasons, we show both the OLS and the FE models and argue that the true effect likely lies between these two estimates.[17]

We also estimate some specifications that include interactions between mental health and age, family income, debt status, and divorce status. We include age interactions because some

[16] X_{it} in this specification does not include any time-invariant characteristics, like race. For the mental health variables derived from the mental health diagnosis question, the FE is estimated from at most 5 waves of data; for the K-6 variables, the FE is estimated from at most 3 waves of data; for the depression variables, the FE is estimated from 2 waves of data.

[17] We experimented with a Tobit model because the dependent variable has a lower bound of 0. However, the Tobit results are qualitatively similar to the OLS and FE results so we prefer the computationally simpler OLS model.

studies find that individuals spend more or become compulsive buyers in late adolescence or early adulthood (Christenson et al. 1994; Schlosser et al. 1994; McElroy et al. 1994). Thus, it is possible that there are stronger effects for certain age groups. We include income interactions because the marginal utility of consumption likely varies by income and thus the effects of mental illness on spending may vary by income group. As alluded to above, we estimate interactions between mental health and debt status and divorce status because of concerns about reverse causality. If spending patterns result in debt or marital problems, they may lead to mental health problems. If those with debt or divorce problems experience a larger effect of mental health on spending, there may be a cause for concern.

One additional concern that arises in our data is the possibility that current spending can partially depend on past spending. To capture this dynamic process, we employed the Arellano-Bond estimator which allows the inclusion of appropriate lags of regressors as the instruments to obtain more efficient and consistent estimates. In our analysis, we used an AR(1) model and the system general method of moments strategy, and found no significant relationship between current and past spending on any category of goods and services. Additionally, data on depression and the K-6 psychological distress scale are available for only two and three waves, respectively, making the Arellano-Bond estimate inappropriate for many of my models. Thus, we rely on the computationally simpler least-squares estimator for this analysis.

1.5 RESULTS

The OLS and FE results are reported in Tables 1.5, 1.6, and 1.7 for single women, single men, and heads of couple households, respectively. Table 1.8 also provides some specific

regression results on disaggregated expenditure categories. In Tables 1.5 and 1.6, there are four panels reporting the results using a different mental health variable. In Table 1.7, there is an extra panel with an interaction between partners' mental health status. Columns 1 and 2 show the coefficients on mental health variables from the OLS and FE regressions when the dependent variable is aggregated expenditures. The aggregated expenditures are broken down into non-durables, durables, and investments and are reported in the following columns. We argue that the estimated FE coefficients capture the effect for episodic mental illnesses where the estimated OLS coefficients may capture the effect for more chronic types of mental illness. Thus, we discuss both sets of results.

Single Women

In Table 1.5, the OLS and FE coefficients on the K-6 score and its square (Panel A) suggest that there is a positive but non-linear effect of the K-6 score on non-durable spending. In additional analyses on disaggregated expenditure categories shown in Table 1.8 (columns 1 and 2), we find that there is a strong concave relationship between the K-6 score and spending on food, which is significant in both the OLS and FE models. The FE coefficient indicates that single women spend more up until a K-6 score of about 7, after which spending on food declines for higher values of the K-6. This finding is consistent with the hypothesis that milder levels of psychological distress could induce single women to participate in 'retail therapy' where food consumption temporarily relieves depressive symptoms, but more severe forms of mental illness may reduce the marginal utility derived from food consumption.

The results in panels B, C and D focus on the effects of more severe mental health issues. Consistent with the findings described above, all of the significant coefficients indicate that

severe mental illness is related to lower spending levels. In panel B, the coefficient in columns 1 and 2 indicate that single women who are severely psychological distressed, as indicated by a K-6 score of 13 or higher, have lower aggregate spending. Mirroring the Panel B coefficients, in panel C, both the OLS and the FE coefficients on the self-reported diagnosis of a mental illness indicate significantly lower aggregate spending. The FE coefficients are significant for non-durable and durable goods, but the OLS coefficients are large and significant for investment goods. This suggests that single women with chronic mental health issues are less likely to spend on investment goods. Consistent with this, single women with a mental health diagnosis that is not depression (panel D) are significantly less likely to spend on investment goods.

Although we do not show the coefficients on regressions with age or income interactions due to space considerations, we find suggestive evidence that most of the negative effects of mental health on spending come from those single women over the age 50 and those women with annual incomes below $40,000. In particular, all of the FE coefficients on the interaction between mental health and being over age 50 are negative and significant, except with respect to investment expenditures. All of the FE coefficients on the main effect of mental health diagnosis are positive and not significant (except with respect to investment expenditures), implying that there is no significant effect of mental health on single women under age 50. We find few significant differences by age for the other household groups and argue that this is so because the sample of single women households is the most heterogeneous, including both young single mothers and older retired widows.

When income interactions are included, we find that the FE coefficients on the interaction between mental health and low income (<$40,000) are negative and significant for aggregated expenditures and non-durable and durable expenditures. We also find that low-income single

women have a concave relationship between the K-6 score and aggregated spending, and non-durables in particular. Low-income single women with K-6 scores higher than 13 are significantly less likely to spend on non-durable goods and their aggregated expenditures are lower.

To summarize, most of the measures of mental illness reduce spending among single women. We find some evidence that this negative effect on spending may be stronger among older single women and low-income single women. We also find suggestive evidence that single women with mental conditions that are more likely to be chronic have lower spending on investment goods. In addition, there is some evidence of 'retail therapy' with respect to food and mild cases of psychological distress among low-income single women.

Single Men

In Table 1.6, there are very few significant coefficients using the single men sample. There are no significant differences in effect by age, except with respect to durable goods where both OLS and FE coefficients on the interaction term between age and the K-6 score above 13 are positive and significant, indicating mentally ill older single men spend more on durable goods compared to their younger and mentally healthy counterparts. Additionally, there appears to be significant effects for high-income single men. Single men with incomes above $80,000 who have a K-6 score above 13 are significantly more likely to have higher expenditures in every category (results not shown). The disaggregated results (not shown) suggest that high-income single men with high K-6 scores spend more on recreation, vacations, clothing, transportation and housing. Thus, single men with mental illness do not spend differently than their healthy

counterparts, with a few exceptions (older and high-income men). When there is a significant effect of mental illness on expenditures, the effect is positive, unlike for single women.

Couples

In Table 1.7, Panels A and B indicate that there is no strong relationship between the K-6 psychological distress score and spending behavior of the heads of couple households.[18] However, analyses on disaggregated expenditures indicate (shown in columns 3 and 4 of Table 8) that spending on food is concave in the wife's K-6 score. Both OLS and FE coefficients indicate that wives spend more on food for lower values of the K-6, and the spending on food declines as the K-6 score increases. The disaggregated results also indicate a similar concave relationship between spending on clothing and apparel and wives' K-6 scores (not shown). In Panel C of Table 1.7, only a few OLS coefficients are significant; husbands with a mental health diagnosis spend more on nondurable and durable goods and wives with a diagnosis spend less on durable and investment goods, and thus overall.

The effect of mental health may be muted in couple households because there is bargaining involved in the decision-making process. For this reason, we also include a specification where the mental health status of the partners is interacted. If both partners have a mental illness, it is possible that there may be a stronger effect of mental illness on spending if the direction of the effect is the same for men and women. As shown in Panel D, if both the husband and wife have a diagnosis they spend significantly less on nondurable goods and thus

[18] Since the PSID reports the K-6 scores of only the respondents of households, it is possible to examine the effect of psychological status of only one spouse per household. My results show no relationship between the K-6 psychological distress score and spending behavior of the wives. For space consideration, I do not report the results for wives.

overall according to the FE coefficient. The interaction is not significant for durable or investment goods.

Finally, estimates from Panel E show that husbands with a depression diagnosis are significantly more likely to have higher spending on durable goods. A few other coefficients are significant; while they are all positive, there doesn't appear to be a strong pattern. Analysis using the disaggregated expenditure categories, shown in Table 1.8 (columns 3 and 4), reveals that spending on cars drives the durable good spending effect.

When income interactions are included, the estimates indicate that husbands in the middle-income category ($60,000-$120,000) were more likely to spend on non-durable goods if they had a mental health diagnosis or a K-6 score above 13. The disaggregated results (not shown) suggest that middle-income husbands with high K-6 scores spend more on food and those with a mental health diagnosis spend more on non-durables such as recreation and clothing.

In sum, as predicted, the effect of mental illness in couple households is smaller than in single-headed households, particularly single women households. Wives display a concave relationship between K-6 scores and spending on food and clothing, similar to that found for single women. Husbands with depression spend more on cars, consistent with the positive effect found for older, high-income single men.

Reverse Causality

While our results mainly suggest a decline in spending due to severe mental illness, particularly for single women, there is some specific evidence of increases in spending, particularly for milder cases. In these cases, we are concerned about reverse causality. In

particular, it may be the case that high past spending led to debt or marital conflict, which triggered mental health issues. To test whether reverse causality is playing a role, we examine whether those with debt or those divorced (in the case of single women and men) are driving the positive effect of mental illness on spending by interacting debt or divorced with mental health.

In the case of single women with low K-6 scores increasing their food spending, there is no significant difference in the effect by either debt status or divorce. Similarly, in the cases of depressed couple heads increasing their spending on cars and their wives increasing their food spending with low K-6 scores, there are no significant differences in the effect by debt status.[19] Overall, this evidence is not consistent with reverse causality.[20]

1.6 CONCLUSIONS

This study contributes to the literature on the relationship between mental health status and economic status by examining the impact of mental illness on spending behavior. The results show some evidence of reduced spending for the mentally ill. Single women with mental illness generally decrease their overall spending. This may be especially true of single women over age 50 and low income single women. The empirical estimates show suggestive evidence that women with chronic mental illness may decrease their spending on investments and savings, which could reduce lifetime utility. We also find some evidence of increased spending. Single

[19] We assume that past divorce is not relevant for mental health among couples since they must be remarried or cohabiting with a new partner to be in this household type.

[20] We also ran additional regressions using lagged debt as a regressor to deal with the potential endogeneity problem that current debt could be correlated with other regressors including mental illness. However, the results remained unchanged. Lagging debt requires losing one wave of observations so the tables present the results without this lagged variable to increase the precision of the estimates.

and married women with mild psychological distress spend more on food. Moreover, husbands who have been diagnosed with depression spend more on cars.

Our results indicate the strongest and the most number of effects for single women. Smaller effects are found for couple households, which is consistent with the hypothesis that bargaining between partners dampens the effect of the mental illness of one partner on household spending.

Thus, our results, in general, support the theory that the marginal utility of consumption falls as health deteriorates, consistent with Viscusi and Evans (1990), Finkelstein et al. (2008), and Trostel and Taylor (2001). Our findings are also consistent with the phenomenon of 'retail therapy' in that individuals with low values of the K-6 mental health screen increase spending. For this large segment of individuals, increasing levels of psychological distress may worsen their economic status, thereby contributing to the gradient between health and economic status.

Table 1.1 Sample Size of Weighted Data

Waves	Single Women	Single Men	Couples
1999	1949	851	3683
2001	2033	932	3848
2003	2173	1079	3950
2005	2256	1087	4091
2007	2378	1152	4149
Pooled # of Households (N)	10789	5101	19721
Unique # of Households (n)	3558	2059	5600
Average Obs Per Household	3	2.5	3.5

Table 1.2 Weighted Means on Mental Health Variables

	Waves	Singles				Couples	
		Women		Men			
N (number of repeated observations)		10789		5101		19721	
Head's Mental Health Variables		Mean	SE	Mean	SE	Mean	SE
Mental Health Diagnosis	All	0.127	(0.004)	0.084	(0.005)	0.037	(0.002)
Depression (if available)	'05,'07	0.092	(0.006)	0.048	(0.006)	0.022	(0.002)
Non-Depressive Problems (if available)	'05,'07	0.051	(0.004)	0.035	(0.005)	0.019	(0.002)
K-6 Non Specific Disorder (if available) [0-24]	'01,'03,'07	4.107	(0.074)	3.445	(0.088)	1.034	(0.025)
K-6 Dummy > 13 (if available)	'01,'03,'07	0.056	(0.004)	0.035	(0.004)	0.006	(0.001)
Spouse's Mental Health Variables							
Mental Health Diagnosis	All					0.062	(0.002)
Depression (if available)	'05,'07					0.040	(0.002)
Non-Depressive Problems (if available)	'05,'07					0.026	(0.002)
K-6 Non Specific Disorder (if available) [0-24]	'01,'03,'07					1.618	(0.034)
K-6 Dummy > 13 (if available)	'01,'03,'07					0.016	(0.001)

Table 1.3 Weighted Means of Expenditure Variables (available for all waves)

	Singles				Couples		
	Women		Men				
N (number of repeated obs)	10789		5101		19721		
	Mean	SE	Mean	SE	Mean	SE	Per Person
Average Monthly Expenditure Variables in 2007$							
Non Durable Expenditures	664.09	(6.99)	814.06	(23.24)	1282.98	(15.32)	641.49
Durable Expenditures	575.46	(11.00)	639.94	(14.04)	784.41	(18.56)	392.21
Investment Expenditures	457.55	(16.23)	573.78	(118.50)	1366.97	(20.21)	683.49
Total Expenditures	1697.14	(22.60)	2027.53	(126.25)	3434.23	(33.34)	1717.12
Percent of Total Family Income Devoted to Expenditures in 2007$							
Non Durable Expenditures	0.42	(0.02)	0.42	(0.02)	0.27	(0.02)	
Durable Expenditures	0.39	(0.03)	0.35	(0.02)	0.17	(0.01)	
Investment Expenditures	0.20	(0.02)	0.12	(0.01)	0.20	(0.01)	
Total Expenditures	1.01	(0.05)	0.91	(0.04)	0.64	(0.03)	

Table 1.4 Weighted Means of Control Variables

	Singles				Couples	
	Women		Men			
N (number of repeated obs)	10789		5101		19721	
Socio-Economic Status	Mean	SE	Mean	SE	Mean	SE
Some High School	0.201	(0.005)	0.154	(0.006)	0.152	(0.003)
High School	0.329	(0.006)	0.311	(0.008)	0.281	(0.004)
Some College	0.226	(0.006)	0.247	(0.008)	0.208	(0.003)
BA Degree	0.119	(0.004)	0.136	(0.006)	0.190	(0.003)
Some Post-Graduate or more	0.124	(0.004)	0.153	(0.007)	0.168	(0.003)
Family Income*	3103.705	(42.565)	4056.845	(130.123)	8214.921	(83.806)
Retired/Student	0.306	(0.006)	0.164	(0.007)	0.187	(0.004)
Sick/Disabled/Unemployed	0.107	(0.004)	0.130	(0.006)	0.049	(0.002)
Food Stamps Recipients	0.115	(0.004)	0.044	(0.004)	0.025	(0.001)
Debt	488.501	(18.849)	609.005	(39.091)	820.420	(67.156)
Demographic Characteristics						
Age	51.836	(0.250)	44.102	(0.309)	49.679	(0.133)
Black	0.129	(0.004)	0.088	(0.005)	0.039	(0.002)
Other Races	0.039	(0.003)	0.043	(0.004)	0.063	(0.002)
Divorced/Separated/Widowed	0.668	(0.006)	0.505	(0.009)	0.027	(0.001)
Married	0.000	(0.000)	0.000	(0.000)	0.973	(0.001)
Unmarried	0.332	(0.006)	0.495	(0.009)	0.000	(0.000)
Number of Children	0.454	(0.010)	0.108	(0.006)	0.877	(0.009)
Non-Urban	0.434	(0.007)	0.435	(0.009)	0.501	(0.004)
Physical Health/Substance Use Variables						
Health Limits Daily Activities	0.249	(0.006)	0.207	(0.007)	0.162	(0.003)
Body Mass Index	26.633	(0.106)	26.894	(0.095)	27.356	(0.044)
No Drinking Status	0.453	(0.007)	0.256	(0.008)	0.335	(0.004)

*converted to monthly averages in 2007 real dollars

Table 1.5 OLS and FE Results for Heads of Single Women Households

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Log Aggregate Expenditures		Log Nondurable Expenditures		Log Durable Expenditures		Log Investment Expenditures	
		OLS	FE	OLS	FE	OLS	FE	OLS	FE
A	K6 Raw Score	0.016	0.020	0.017*	0.036**	0.035*	0.022	-0.040	0.001
		(0.010)	(0.015)	(0.010)	(0.014)	(0.019)	(0.028)	(0.025)	(0.031)
	K6 Squared	-0.001*	-0.002*	-0.001*	-0.002**	-0.002	-0.002	-0.000	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
	N	6,586	6,586	6,586	6,586	6,586	6,586	6,586	6,586
	R-squared	0.356	0.085	0.273	0.188	0.195	0.021	0.204	0.027
B	K6 > 13	-0.157*	-0.251***	-0.132	-0.218**	0.019	-0.053	-0.432**	-0.100
		(0.089)	(0.097)	(0.087)	(0.092)	(0.146)	(0.195)	(0.196)	(0.218)
	N	6,586	6,586	6,586	6,586	6,586	6,586	6,586	6,586
	R-squared	0.355	0.083	0.272	0.185	0.194	0.019	0.201	0.027
C	MH Diagnosis	-0.062*	-0.103**	-0.022	-0.049	-0.025	-0.194*	-0.397***	0.046
		(0.035)	(0.050)	(0.037)	(0.047)	(0.077)	(0.103)	(0.111)	(0.142)
	N	10,789	10,789	10,789	10,789	10,789	10,789	10,789	10,789
	R-squared	0.339	0.082	0.265	0.150	0.193	0.012	0.198	0.016
D	Depression	-0.136**	-0.108	-0.104*	-0.118	-0.123	-0.169	-0.187	0.213
		(0.064)	(0.100)	(0.058)	(0.088)	(0.132)	(0.205)	(0.189)	(0.229)
	No depression	-0.072	0.005	0.012	-0.084	0.148	-0.070	-0.659**	0.370
		(0.084)	(0.102)	(0.078)	(0.066)	(0.129)	(0.182)	(0.263)	(0.285)
	N	4,627	4,627	4,627	4,627	4,627	4,627	4,627	4,627
	R-squared	0.367	0.035	0.320	0.046	0.219	0.017	0.245	0.025

$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Ordinary least squares and household fixed effects estimation on weighted data. Standard errors, adjusted for intra-cluster correlations at the family level, in parentheses. Controls include education, family income, food stamp receipt, debt, age, race, marital status, number of children, rural status, physical health limitations, alcohol abuse, BMI, and indicator variables for missing control variables.

Table 1.6 OLS and FE Results for Heads of Single Men Households

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Log Aggregate Expenditures		Log Nondurable Expenditures		Log Durable Expenditures		Log Investment Expenditures	
		OLS	FE	OLS	FE	OLS	FE	OLS	FE
A	K6 Raw Score	-0.022*	-0.020	-0.015	-0.008	-0.015	-0.051	-0.046	-0.032
		(0.012)	(0.017)	(0.012)	(0.016)	(0.023)	(0.036)	(0.038)	(0.051)
	K6 Squared	0.001	0.001	0.001	0.000	0.001	0.003	0.002	0.001
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)
	N	3,166	3,166	3,166	3,166	3,166	3,166	3,166	3,166
	R-squared	0.336	0.139	0.299	0.228	0.155	0.029	0.196	0.051
B	K6 > 13	-0.063	0.103	-0.096	0.050	-0.122	0.060	0.032	-0.277
		(0.176)	(0.253)	(0.161)	(0.205)	(0.285)	(0.353)	(0.330)	(0.263)
	N	3,166	3,166	3,166	3,166	3,166	3,166	3,166	3,166
	R-squared	0.334	0.138	0.298	0.228	0.155	0.027	0.195	0.051
C	MH Diagnosis	-0.053	0.037	-0.082	-0.065	-0.076	0.067	-0.277	-0.099
		(0.069)	(0.075)	(0.072)	(0.089)	(0.140)	(0.166)	(0.187)	(0.273)
	N	5,101	5,101	5,101	5,101	5,101	5,101	5,101	5,101
	R-squared	0.351	0.141	0.306	0.216	0.160	0.032	0.207	0.035
D	Depression	0.034	-0.017	0.070	0.013	0.372**	0.044	-0.571	0.279
		(0.108)	(0.153)	(0.115)	(0.133)	(0.166)	(0.313)	(0.368)	(0.373)
	No depression	-0.250	0.202**	-0.418*	-0.367	-0.371	0.539	0.288	0.460
		(0.177)	(0.099)	(0.215)	(0.316)	(0.320)	(0.401)	(0.328)	(0.381)
	N	2,233	2,233	2,233	2,233	2,233	2,233	2,233	2,233
	R-squared	0.459	0.177	0.428	0.163	0.176	0.064	0.231	0.039

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Ordinary least squares and household fixed effects estimation on weighted data. Standard errors, adjusted for intra-cluster correlations at the family level, in parentheses. Controls include education, family income, food stamp receipt, debt, age, race, marital status, number of children, rural status, physical health limitations, alcohol abuse, BMI, and indicator variables for missing control variables.

Table 1.7 OLS and FE Results for Heads of Couple Households

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Log Aggregate Expenditures		Log Nondurable Expenditures		Log Durable Expenditures		Log Investment Expenditures	
		OLS	FE	OLS	FE	OLS	FE	OLS	FE
A	HD: K6 Raw Score	0.007	0.003	0.001	0.004	-0.037**	0.002	0.051**	-0.025
		(0.006)	(0.006)	(0.006)	(0.006)	(0.015)	(0.022)	(0.025)	(0.023)
	HD: K6 Squared	-0.001	-0.000	-0.000	-0.000	0.002**	-0.001	-0.004	0.003
		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)	(0.002)
	N	5,163	5,163	5,163	5,163	5,163	5,163	5,163	5,163
	R-squared	0.374	0.180	0.222	0.419	0.126	0.029	0.285	0.039
B	HD: K6 > 13	-0.008	0.017	0.038	-0.025	-0.046	-0.208	0.042	0.863**
		(0.094)	(0.091)	(0.067)	(0.082)	(0.192)	(0.325)	(0.324)	(0.348)
	N	5,163	5,163	5,163	5,163	5,163	5,163	5,163	5,163
	R-squared	0.374	0.180	0.222	0.419	0.125	0.029	0.284	0.042
C	HD: MH Diagnosis	0.022	0.017	0.039*	-0.015	0.145**	0.066	-0.050	-0.015
		(0.026)	(0.027)	(0.023)	(0.025)	(0.067)	(0.097)	(0.095)	(0.120)
	WF: MH Diagnosis	-0.041**	0.032	-0.009	0.022	-0.115**	0.013	-0.264***	0.105
		(0.020)	(0.020)	(0.018)	(0.019)	(0.057)	(0.069)	(0.078)	(0.081)
	N	19,721	19,721	19,721	19,721	19,721	19,721	19,721	19,721
	R-squared	0.358	0.137	0.220	0.332	0.107	0.011	0.242	0.028
D	HD: MH Diagnosis	0.022	0.049	0.047*	0.023	0.133*	0.031	-0.123	0.027
		(0.030)	(0.030)	(0.027)	(0.026)	(0.075)	(0.104)	(0.105)	(0.135)
	WF: MH Diagnosis	-0.041*	0.048**	-0.005	0.040**	-0.122**	-0.004	-0.303***	0.126
		(0.021)	(0.020)	(0.019)	(0.020)	(0.062)	(0.068)	(0.084)	(0.083)
	Diagnosis: HD **X** WF	-0.001	-0.133**	-0.034	-0.159***	0.053	0.146	0.316	-0.175
		(0.050)	(0.054)	(0.048)	(0.047)	(0.157)	(0.214)	(0.232)	(0.201)
	N	19,721	19,721	19,721	19,721	19,721	19,721	19,721	19,721
	R-squared	0.358	0.137	0.220	0.332	0.107	0.011	0.242	0.028
E	HD: Depression	0.039	0.082	0.032	-0.020	0.288***	0.305**	-0.152	0.208
		(0.035)	(0.057)	(0.033)	(0.058)	(0.092)	(0.147)	(0.208)	(0.221)
	HD: No Depression	0.040	0.208***	-0.037	0.050	0.261**	0.298	-0.010	0.350
		(0.054)	(0.076)	(0.042)	(0.035)	(0.115)	(0.245)	(0.223)	(0.303)
	WF: Depression	-0.030	-0.008	-0.028	-0.008	-0.052	0.008	-0.207	0.265
		(0.037)	(0.039)	(0.028)	(0.035)	(0.080)	(0.121)	(0.169)	(0.198)
	WF: No Depression	-0.046	0.067	-0.007	0.108**	-0.144	0.022	-0.271	-0.007
		(0.033)	(0.046)	(0.031)	(0.048)	(0.096)	(0.143)	(0.185)	(0.198)
	N	8,222	8,222	8,222	8,222	8,222	8,222	8,222	8,222
	R-squared	0.390	0.031	0.317	0.031	0.117	0.019	0.239	0.018

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Ordinary least squares and household fixed effects estimation on weighted data. Standard errors, adjusted for intra-cluster correlations at the family level, in parentheses. Controls include education, family income, food stamp receipt, debt, age, race, marital status, number of children, rural status, physical health limitations, alcohol abuse, BMI, and indicator variables for missing control variables.

Table 1.8 OLS and FE Results for Specific Disaggregated Expenditures

		Single Women		Couples			
		Heads		Wives		Heads	
		(1)	(2)	(3)	(4)	(5)	(6)
		Log Food Expenditures		Log Food Expenditures		Log Transportation Expenditures	
		OLS	FE	OLS	FE	OLS	FE
A	HD: K6 Raw Score	0.037***	0.054**	0.018**	0.023*	-0.023	0.009
		(0.014)	(0.022)	(0.007)	(0.012)	(0.017)	(0.025)
	HD: K6 Squared	-0.003***	-0.004**	-0.001*	-0.002**	0.002	0.000
		(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
	N	6,586	6,586	6,795	6,795	5,163	5,163
	R-squared	0.257	0.120	0.243	0.140	0.125	0.013
B	HD: K6 > 13	-0.187	-0.303**	-0.037	-0.092	0.070	0.183
		(0.120)	(0.150)	(0.075)	(0.115)	(0.194)	(0.304)
	N	6,586	6,586	6,795	6,795	5,163	5,163
	R-squared	0.254	0.115	0.242	0.136	0.124	0.013
C	HD: MH Diagnosis	-0.013	-0.065			0.166**	0.179
		(0.048)	(0.062)			(0.072)	(0.112)
	WF: MH Diagnosis					-0.242***	-0.029
						(0.065)	(0.089)
	N	10,789	10,789			19,721	19,721
	R-squared	0.241	0.108			0.108	0.007
D	HD: Depression	-0.128	-0.123			0.315**	0.542*
		(0.093)	(0.135)			(0.126)	(0.279)
	HD: No Depression	0.069	-0.097			0.220	0.335
		(0.119)	(0.120)			(0.141)	(0.342)
	WF: Depression					-0.162	-0.037
						(0.116)	(0.212)
	WF: No Depression					-0.261**	0.022
						(0.112)	(0.204)
	N	4,627	4,627			8,222	8,222
	R-squared	0.241	0.073			0.111	0.018

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Ordinary least squares and household fixed effects estimation on weighted data. Standard errors, adjusted for intra-cluster correlations at the family level, in parentheses. Controls include education, family income, food stamp receipt, debt, age, race, marital status, number of children, rural status, physical health limitations, alcohol abuse, BMI, and indicator variables for missing control variables.

CHAPTER 2

MENTAL ILLNESS AND LABOR MARKET OUTCOMES

2.1 INTRODUCTION

In this chapter, I examine the effects of mental health problems on individuals' labor market employment and earnings. Mental illness is defined as the presence of psychological or emotional conditions such as depression, anxiety, alcohol or drug addictions, and phobias. Theory suggests that mental disorders diminish productivity and hinder normal work functioning. As a result, the presence of mental illness is expected to reduce the amount of time spent working and, among those who work, labor market earnings.

Previous empirical studies provide some evidence that mental health problems interfere with one's ability to supply labor and earn an income (Bartel and Taubman 1979; 1986; Benham and Benham 1981; Frank and Gertler 1991; Kessler and Frank 1997; Ettner et al. 1997; Cseh 2008). Bartel and Taubman (1986) and Benham and Benham (1981) find large earnings reductions involving the presence of psychoses. Moreover, mentally ill individuals find it difficult to look for, find, and retain adequately paying jobs (Ettner et al. 1997). In particular, mentally ill individuals may not know how to apply for jobs, may not interview well, and therefore may not compete successfully for good jobs (Liberman et al. 1987). Additionally, persons who are mentally ill may not have the social skills and cognitive abilities to adapt to work-related stress (Strauss and Carpenter 1981). This lack of cognitive skills implies that there

is a strong relationship between mental illness and educational attainment, at least among adolescents (Kessler et al. 1995). Finally, individuals with mental health problems are more likely to work in entry-level positions that have high turnover rates (Draine et al. 2002).

This chapter contributes to the literature on mental health and labor market outcomes in two ways. First, while past studies have examined differences in the effects of mental illness by gender (Cseh 2008; Ettner et al. 1997), I also examine differences by marital status. I argue that marital status is an important dimension to consider because of the well-documented relationships between marital status and health, and between marital status and labor market outcomes. Specifically, mental illness reduces one's chances of becoming and staying married (Bartel and Taubman 1986), and married men earn more than unmarried men (Scheoni 1995; Cornwell and Rupert 1997), and are more likely to be attached to the labor force (Bowen and Finegan 1969).

This study also contributes to the literature by incorporating selection into employment when estimating the effect of mental illness on earnings. In particular, I employ a Type III Tobit model (Amemiya 1985) to separate the effect of mental illness on labor supply from its effect on hourly wages. I follow a two-step approach in which I first estimate the effect of mental illness on labor supply, allowing for non-random selection into employment. Then, conditioning on hours worked, I estimate the effect of mental illness on the hourly wage rate. In the second step, I use a fixed effects estimator to control for unobserved person-specific heterogeneity that might have biased the results reported in prior studies. I also include an extensive set of observable controls, such as an individual's level of wealth, the labor income of other family members living in the same household, whether the respondent's job is salaried or paid hourly, and years of completed schooling to account for human capital accumulation.

One difficulty in estimating the causal effect of mental health on earnings and employment is the potential endogeneity of mental well-being. In particular, the presence of depressive symptoms may be endogenous with respect to earnings or the wage rate, however no such prediction can be made about the causal effect of earnings on non-depressive conditions. Sareen et al. (2011) find that individuals who experience a recent reduction in earnings are more likely to suffer from depression, anxiety, or substance abuse problems. While earning more could help alleviate mental strain, as well as mild depression or anxiety through a potential improvement in self-esteem, there is no direct evidence of higher income alleviating severe personality disorders and chronic condition such as schizophrenia that start early on life.[21]

A popular technique for dealing with endogeneity is the instrumental variable, however, it is always a challenge to find a good instrument. In the problem at hand, it is difficult to find an instrument for mental health that is uncorrelated with labor market outcomes but correlated with individuals' psychological dispositions.[22] Most major random and non-random life events, such as marriage, divorce, or the development of physical health problems, which affect an individual's mental health are also likely to be correlated with labor market outcomes. The inclusion of extensive controls for observable characteristics, as well as the use of the fixed-effects estimator to control for unobservables in the hourly wage equation, should reduce the bias resulting from this correlation. Nevertheless, the results from this analysis must be interpreted with caution.

Using data from the Panel Study of Income Dynamics (PSID), I find that there is a statistically significant, negative relationship for women and a weaker, negative effect for men.

[21] There is evidence that self-esteem is significantly affected by relative wages and the human capital accumulated previously by individuals (Goldsmith et al. 1997).
[22] See Ettner et al. (1997) for details.

Additionally, high scores on a mental health screen (the K-6 psychological distress score) are associated with reduced earnings and lower labor supply for all groups. Conditional on work hours, however, there is no effect of having a mental illness diagnosis on the hourly wage rate for married and single men, which suggests that the main effect of mental illness on earnings, among men, operates through a reduction in labor supply.

2.2 THE MODEL

Mental health problems can affect employment and earnings through several channels. First, physical or mental health can affect the acquisition of human capital by forcing a mentally ill individual to reduce time spent in schooling and, subsequently, in the labor force. Becker (1967) argues that individuals' earnings generating capability is determined both by innate ability and investments in human capital in the form of education, health, and training. An individual with mental health disorders will spend less time on human capital accumulation and at work than otherwise similar, mentally healthy persons, thereby reducing both education and work-related experience which ultimately translate into lower labor market earnings.

Second, mental health problems may cause concentration or other productivity problems at work. Stewart et al. (2003) find that mentally ill individuals have difficulty concentrating on their work, leading to reduced productivity. Additionally, mental illness may result in a large number of sick days, which translates into both a lower probability of keeping a job and lower earnings.[23]

[23] Mental health problems may alter the marginal rate of substitution between goods and leisure by reducing the effective time endowment.

Third, to avoid work-related stress, mentally ill individuals may choose less challenging work with lower pay. Draine et al. (2002) find that mentally ill individuals typically hold jobs that not only pay less but have high turnover rates, thereby reducing the job tenure and earnings of the affected individuals.

Fourth, Cseh (2008) mentions that individuals with psychological problems may work for employers who provide good health insurance and require tasks that can be performed even when the individuals are in a fragile mental state, thus trading certain advantageous job characteristics for lower monetary rewards.[24] Finally, poor mental health may increase the employer's medical expenses and productivity loss (Goetzel et al. 2003) which, once known to the employer, could reduce the probability of obtaining or retaining a job.[25]

Several researchers have found gender differences in the earnings effects of mental health problems. Marcotte et al. (2000) and Ettner et al. (1997) find stronger effects of mental illness on women's earnings than on men's, using an instrumental variables (IV) approach. By contrast, Cseh (2008) and Jofre-Bonet et al. (2005) report that mental illness affects men's earnings more than women's, using ordinary least squares (OLS).[26]

While there is some indirect evidence that mental health issues may have different consequences in couple households than in single-headed households, there is no direct evidence of a difference in the effects on earnings by couple status. For example, Fletcher (2009) finds

[24] This is consistent with the standard assumption that inputs are substitutable in the production process. In the absence of effective treatment or because of an inability to cope with the illness as it progresses, mentally ill individuals may choose to work at less demanding jobs that offer lower monetary rewards.

[25] Goetzel et al. (2003) find bipolar disorder, depression, personality and non-psychotic disorders, alcoholism, anxiety disorders, schizophrenia, and psychoses, among other mental health conditions to be most costly in terms of the medical expenses and productivity losses borne by employers.

[26] The fixed-effects estimates reported in Cseh (2008) do not indicate a significant relationship between depressive symptoms and earnings.

significant mental health spillovers between spouses. On the other hand, there is empirical evidence suggesting that family members or spouses of mentally ill individuals may develop coping mechanisms to lower their own probability of becoming mentally ill (Ettner et al. 1997).[27] Therefore, it is not clear whether spouses exacerbate or mediate the effects of mental health problems.

One difficulty with analyzing the relationship between mental health and labor market outcomes is that the great variety of mental health problems may have very different effects. It is difficult to categorize mental health conditions by the severity of the disability, as this depends on the individual case. Mental health problems tend to have high co-morbidity rates (i.e., a person with depression, for example, is more likely also to suffer from anxiety), thus making it difficult to isolate the effects of individual conditions. Moreover, two individuals with identical symptoms may be affected very differently by their illness. Therefore, the effect of specific mental illnesses on labor market outcomes is unclear. If there are opposing effects on these outcomes for different conditions, then aggregating across separate illnesses may result in estimating a small effect for a specific condition when it actually has a large effect.

There have only been a handful of studies that have attempted to estimate the labor market effects of specific types of mental illness. Bartel and Taubman (1986) divide mental illnesses into three groups: psychoses, neuroses, and other mental illnesses. Psychoses include schizophrenia, affective psychoses, and paranoia, and were found to reduce earnings by 32 to 47 percent. Neuroses are relatively less incapacitating, and lower earnings by 12 to 14 percent. Other mental illnesses, such as personality disorders, only reduce earnings if they were recently

[27] Ettner et al. (1997) find that children of alcoholics, on average, drink more. However, there are particular individuals who practice abstinence in the light of their parents' alcohol problems.

diagnosed. Miller and Kelman (1992) find that people with schizophrenia have 10 to 35 percent lower earnings, and people with anxiety have 3 to 10 percent lower earnings than their mentally healthy counterparts, while Marcotte et al. (2000) indicate that the initial earnings losses associated with depression are mitigated over time.

Based on the theory and the empirical evidence from prior studies, I hypothesize that mental illnesses (i) reduce work hours, (ii) lower hourly earnings; (iii) lower the probability of being employed, and (iv) increase the probability of being out of the labor force. I examine the effects of various types of mental illness, and depression in particular, on these labor market outcomes by gender and couple status.

2.3 THE DATA

The data used in this study come from the Panel Study of Income Dynamics (PSID), a nationally representative longitudinal survey that includes over 8,000 households and contains questions on mental health and labor market variables. Most families in the data have participated in the survey since 1968. For this study, I use the most recent five waves, 1999-2007. The PSID oversamples low-income families and minorities. Therefore, I use the sample weights provided by the PSID to obtain a representative sample. For this analysis, I drop observations for which data on employment and/or mental health status are missing. Also excluded from the sample are retired persons, students, criminals, and housewives. I further restrict the sample by including only those households in which the head is between the ages of 18 and 65.

I analyze for four groups: single women (n = 9122), single men (n = 4486), men in couple households (n = 17271) and their partners or wives (n = 18130)[28]. These samples include multiple observations over time on the same people and are broken down by year in Table 2.1. Couples are defined as opposite sex individuals who live in the same household but may or may not be married to each other. The head of household in a couple is always a male, while his partner is always a female.

Mental Health Variables

I use various measures of mental health in the analysis. First, individuals are asked in all five PSID waves whether they have been diagnosed with any kind of psychological or emotional problems by a doctor. I create a dummy variable using this information. Second, in the 2005 and 2007 waves there is a follow-up question that lists nine specific types of mental illnesses: depression, bipolar disorder (mania), schizophrenia, anxiety, phobias, alcohol abuse, drug addiction, obsessive compulsive disorder, and other disorders. Respondents can record up to three conditions. Using this information, mental health problems are grouped into depressive symptoms if the respondent indicated depression among the three allowable responses, and they are categorized as non-depressive if the respondent reports having a mental illness, but none of the three allowable responses was depression.

The final measure of mental health is based on six questions in which individuals are asked whether they had felt sad, nervous, hopeless, restless, worthless, or "everything was an effort" in last thirty days. These questions were asked only in the 2001, 2003, and 2007 waves. Respondents answered on a scale from 0 (= none of the time) to 4 (= all of the time). The exact

[28] There are more wives than husbands because of the selection criteria.

wording of the questions is provided in Appendix A1. The final score is the sum of the respondent's scores on all six questions; thus, the K-6 scale ranges from 0 to 24. Kessler et al. (2003) finds that a K-6 score of 13 or higher indicates that the respondent suffers from a serious mental illness. I create a binary variable using this cutoff score (= 1 if the K-6 score is greater than or equal to 13), and use this variable as an alternative measure of mental illness.

There is a distinct advantage to using these alternative measures of mental illness. The diagnosis variable is an objective measure of mental illness, and is available in all five waves of the PSID analyzed in this study. Information on the presence of depression and non-depressive conditions is available for only two waves, but this information allows me to explore the differences in the effects, if any, that these two broad types of mental illness have on labor market outcomes. Finally, the K-6 psychological distress scale is available for only three waves, 2001, 2003 and 2007, and is more subjective in nature. However, this mental health screen is useful because it does not require a physician's diagnosis, which individuals with low socioeconomic status are less likely to obtain.

Table 2.2 provides weighted averages of all of the mental health measures used in this study. The data show that between 3.4% and 13.9% of all respondents or their partners have been diagnosed with a psychological problem, with men in couple households having the lowest prevalence of mental illness and single women having the highest incidence. Rates of depression range from 2.4% for men in couple households to 10.6% for single women. The K-6 score indicates a similar pattern of psychological distress, with men in couple households having the lowest rate and single women having the highest. However, using the K-6 screen results in lower prevalence rates overall, since the cutoff score of 13 indicates relatively severe mental distress.

Dependent Variables

The PSID asks a series of questions related to employment, earnings, and other labor market outcomes. The dependent variables used in this analysis are employment status, number of weeks out of the labor force in the past year, the logarithm of the hourly wage rate, and the logarithm of weekly hours of work. Individuals report the hourly wage rate for themselves and their partners (if applicable) in one of three categories: first, they report the exact amount if they worked at an hourly wage rate between 1 cent and $998.99; second, they report whether they earned more than $999; and third, they report whether they had no labor market income that year. Similarly, the variable "weekly work hours" gives information about the number of hours worked in a given week on all jobs. Employment status is measured by a binary variable indicating whether the respondent is currently employed.

The summary statistics for the employment status variable are reported in Table 2.3. The employment rate is highest for married men (93.8%) and lowest for their wives (70%). The variables "weekly work hours" and "weeks out of the labor force" exhibit a similar pattern, indicating that married men have the highest labor market participation rate, while their wives have the lowest. Moreover, among those working the weighted means of the hourly wage rate indicate that married men earn the most ($27.50 per hour), while single women earn the least ($14.60 per hour). For consistency, all nominal values have been converted into constant (2007) dollars using the all-items, seasonally-adjusted consumer price index. Further, to minimize skewness, I log-transform the outcome variables for the Type III Tobit analysis.

Control Variables

Tables 2.4 and 2.5 provide summary statistics on the control variables I use in this study. These variables control for socio-economic status, demographic characteristics, and physical health. Individuals' socio-economic status is captured by education, wealth, the labor income of other family members residing in the same household, welfare recipient status, and whether the respondent or his partner has a salaried or a non-salaried job. The demographic variables are age, race, marital status, number of family members sharing the same household, and whether the family lives in a rural area. The physical health variable includes the self-rated health status and disability status of individuals in the household.

2.4 EMPIRICAL STRATEGY

Labor Force Participation

To examine the effect of mental health on employment status, I estimate a model using two different specifications of the dependent variable (both denoted L_{it}): a dichotomous indicator (equal to 1 if the respondent is currently employed, and a continuous variable indicating the number of weeks out of the labor force:

$$L_{it} = MH_{it}^{'}\alpha + X_{it}^{'}\beta + \varepsilon_{it} \qquad (2.1)$$

I use the second specification of the dependent variable because there is a possibility that the mentally ill are employed at the time of the interview, but enter and leave the labor force frequently and thus only work a few weeks per year. I use the Probit estimator to examine the effect of mental illness on the probability of employment. I use the Tobit estimator to examine

whether individuals with a mental illness spend more weeks out of the labor force than individuals without mental illness.

MH_{it} represents one of the several alternative measures of mental illness discussed above. For couples ("husbands and wives"), this variable is a vector of the mental health status of both the husband and the wife because the mental health statuses of spouses are related (Fletcher 2009). I assume that ε_{it} is a normally distributed error term and X_{it} is a vector of characteristics of the individuals and the household capturing socio-economic status, demographic characteristics, and physical health. The hypothesis that individuals with mental health problems experience adverse labor market outcomes implies that the coefficient on the mental health variable is negative, i.e., $\alpha < 0$.

Earnings

I initially estimate the following reduced-form relationship between mental health and weekly earnings:

$$\ln y_{it} = MH_{it}^{'}\alpha + X_{it}^{'}\beta + \varepsilon_{it} \qquad (2.2)$$

The dependent variable $y_{it} = w_{it}h_{it}$ is weekly earnings, where w_{it} is the hourly wage rate and h_{it} is the weekly work hours of household *i* in interview year *t*. The other variables are as described above.

The ordinary least squares (OLS) estimator of the coefficients of the model in equation (2.2) is inconsistent because of selection bias, as only individuals for whom there is an observable wage rate are included in the sample. To correct for selection bias, I employ the Type

III Tobit model, which allows for non-random selection into employment. Estimation of this model requires obtaining the residuals from the Tobit-estimated, first-stage labor supply model:

$$h_{it} = MH_{it}^{'}\alpha + Z_{it}^{'}\zeta + u_{it} \tag{2.3}$$

The dependent variable h_{it} is observed weekly work hours, MH_{it} represents one of the alternative measures of mental illness, and Z_{it} is a vector of exogenous variables that identify ζ. The hypothesis that individuals with mental health issues work fewer hours implies that $\alpha < 0$. The residuals obtained from estimating (2.3), along with the human capital variables, are then included in the following second-stage regression,

$$\ln w_{it} = MH_{it}^{'}\alpha + X_{it}^{'}\gamma + c_{it} + v_{it} \tag{2.4}$$

The dependent variable is the logarithm of the hourly wage rate w_{it}, and c_{it} represents a vector of time-invariant individual and household characteristics. I apply the fixed-effects estimator to equation (2.4) because there may be unobservable characteristics, such as self esteem, that are correlated with both mental health and the hourly wage rate. I assume that $E(v_{it} \mid MH_{it}, X_{it}, c_{it}, s_{it}) = 0$ where s_{it} = 1 if the observed wage w_{it} is greater than or equal to the reservation wage and s_{it} = 0 otherwise. Together, equations (2.3) and (2.4) comprise a censored-regression model with a Tobit selection rule, since we observe the explanatory variables for all values of the dependent variables.

2.5 EMPIRICAL RESULTS

Employment and Weeks-Not-Worked Equations

Empirical results for equation (2.1) determining employment status and number of weeks not employed were obtained using, respectively, the Probit and Tobit estimators and are reported in Tables 2.6 and 2.7. The results from estimating the reduced-form earnings equation and the two-stage model of labor supply and wages are reported in Tables 2.8, 2.9, and 2.10 for all groups. In each of these tables, there are three panels containing results obtained from using the alternative mental health variables.[29]

The Probit results (reported as marginal effects) are reported in Table 2.6, Panel A, and indicate that having received a diagnosis of any type of mental illness has no effect on the probability of employment for either single men or married men. However, the significantly negative coefficients in columns 2 and 4 indicate that a diagnosis of mental illness reduces the probability of employment for both single women and married women. Compared to their healthy counterparts, mentally ill single women and married women experience a 3.7 and 3.4 percents lower probability of employment, respectively. These results also show that married women who have mentally ill husbands have a 3.5 percent higher chance of being employed. This finding suggests that married women are more likely to seek and find employment when their spouses are mentally ill. The estimated coefficients reported in Panel B indicate that the negative relationship between mental illness and the probability of employment is mostly due to the presence of non-depressive symptoms.

[29] Compared to Panel A, the sample sizes in Panels B and C are smaller because the data on specific types of mental illness are available only for 2005 and 2007. Likewise, data on the K-6 psychological distress scale are available for only the 2001, 2003, and 2007 waves.

The coefficients displayed in Panel C indicate that single women and married men who are severely psychological distressed (as indicated by a K-6 score of 13 or higher) have, respectively, a 3.7 percent and 5 percent lower probability of being employed. However, there is no significant relationship between having a high K-6 score and the probability of employment for either single men or married women.

In Table 2.7, the Tobit results show that for single women, married men, and married women, there is generally a positive association between having received a mental illness diagnosis and the number of weeks out of the labor force. Among single men, however, this relationship is completely absent. For single women, married men, and married women, the positive relationship between mental illness and labor-force nonparticipation is mostly triggered by the presence of non-depressive symptoms. In the results shown in panel C, we find a significant but *negative* relationship between high values of the K-6 psychological distress scale and the number of weeks out of the labor force for married women. This finding is inconsistent with the hypothesis that increased severity of mental illness will more likely keep one out of the labor market longer.

Reduced-Form Earnings Equation

First, I estimate equation (2.2) using OLS separately for single men, single women, men in couple households, and their partners. These results are then compared with those obtained by estimating a Type III Tobit model, which allows estimation of the separate effects of mental health problems on weekly hours worked and on the hourly wage rate.

The results reported in Panel A of Table 2.8 show that a diagnosis of any type of mental illness adversely affects women's weekly earnings, but there is no significant effect of mental

illness diagnoses on men's weekly earnings. Married women are affected most severely by the presence of mental illness; compared to their healthy counterparts, having received a diagnosis of any type of mental illness reduces their labor market earnings by approximately 33 percent. Similarly, mentally ill single women experience a 28 percent reduction in weekly earnings. On the other hand, a married woman whose spouse is diagnosed with a mental illness earns 27 percent *more*, on average, than a woman whose husband is mentally healthy. This finding suggests that married women increase their contribution toward household labor-market earnings when their spouses are mentally ill. For single women, reductions in weekly earnings are associated with the presence of either depressive or non-depressive symptoms, as shown in Panel B. For married women, however, only non-depressive symptoms adversely affect their weekly earnings. Panel B also reveals that non-depressive mental disorders significantly decrease the weekly earnings of husbands.

In panel C, the estimated coefficients reported in columns 1, 2, and 3 indicate that single men, single women, and married men who are severely psychological distressed, as indicated by a K-6 score of 13 or higher, have lower weekly earnings. However, there is no significant relationship between the K-6 psychological distress score and married women's earnings. Having a high self-reported K-6 score has a much stronger negative association with men's earnings than with women's earnings. Specifically, compared to their mentally healthy counterparts, single and married men with a K-6 score of 13 or higher have, on average, 78 and 76 percent lower weekly earnings, whereas single women with severe psychological distress earn 29 percent less than mentally healthy single women.

Two-stage Model of Labor Supply and Wages

The empirical results reported in Panel A of Table 2.9 show that having received a diagnosis of any type of mental illness reduces the labor supply of all four groups. In addition, having a wife who was diagnosed with any type of mental illness is associated with a reduction in the weekly work hours of married men. Most of the negative effects of mental illness on labor supply are associated with diagnoses of non-depressive symptoms, as shown by the estimated coefficients in Panel B. Compared to their symptom-free counterparts, a diagnosis of non-depressive symptoms such as bipolar disorder or anxiety reduces labor supply for all four groups. In panel C, the estimated coefficients show that those who are severely psychological distressed, as indicated by a K-6 score of 13 or higher, have lower labor supply. The reduction in labor supply is smallest for married women and largest for single men.

Most of the estimated coefficients on the mental health variables in the second-stage, hourly-wage regression are statistically insignificant; that is, conditional on labor supply, there is either a weak or no relationship between mental health disorders and the hourly wage rate for most groups. The estimated coefficients in Panel A in Table 2.10 indicate that having received a diagnosis of mental illness adversely affects the hourly wage rates of both single and married women, but has no effect on the hourly wage rates of single and married men. Among women, there are no differences in the qualitative effects of mental illness on labor market outcomes by marital status. However, mentally ill single women have a 21.5 percent lower hourly wage compared to mentally ill married women, who themselves experience a 17.6 percent lower hourly wage. For married women, this negative relationship between mental illness and the hourly wage rate is mostly due to the presence of non-depressive symptoms. There is no relationship between depressive symptoms and the hourly wage rates of any of the four groups

(Panel B). Similarly, the estimated coefficients reported in Panel C indicate that there is no effect of having a K-6 score of 13 or higher on the hourly wage rates of any group.

2.6 CONCLUSIONS

This paper provides an empirical analysis of the relationship between mental illness and labor market outcomes for single and married men and women, using the PSID waves from 1999 to 2007. The results from estimating reduced-form earnings equations indicate that having a mental illness is associated with lower weekly earnings for all four groups. The empirical results also reveal a strong negative relationship between having a mental illness and labor supply for all groups. Conditional on hours worked, however, there is no relationship between any measure of mental illness and the hourly wage rates for either single or married men. Thus, among men, the effects of mental illness on weekly earnings result primarily from reduced work hours. By contrast, both single and married women experience a reduction in their hourly wage rate as a result of being mentally ill. Interestingly, single women experience twice as large a negative effect of mental illness on earnings as do married women. Also, the results from estimating hourly-wage regressions (conditioning on labor supply) show no relationship between having a K-6 score of 13 or higher and the hourly wage rate for any group.

The results also indicate that the effects of mental illness on labor market outcomes vary by the type of mental illness. Among men, whether married or single, higher values of the K-6 scores are associated with stronger negative effects on labor market outcomes. In contrast, among women, regardless of marital status, non-depressive conditions have stronger adverse effects on labor market outcomes.

Additionally, the results show that married women are more likely to seek and find employment, and earn more when their spouses are mentally ill. However, there are no effects of spousal mental health on labor market outcomes for married men. Thus, married men and married women might exhibit labor market effects of mental illnesses in different ways.

The empirical estimates of the reduced-form earnings equation and the two-step model of labor supply and the hourly wage show that compared to men, women experience stronger adverse effects of mental illness on labor market outcomes. Among women, although there are no differences in the qualitative effects of mental illness on labor market outcomes by marital status, having a mental illness reduces single women's hourly wage rate by 21.5 percent, compared to 17.6 percent for married women. The empirical estimates show fewer adverse associations between mental illness and labor market outcomes for single men, compared to married men. Overall, my results are similar to Marcotte et al. (2000) and Ettner et al. (1997), who report even stronger negative effects of mental illness on women's earnings.

Table 2.1 Sample Size of Weighted Data

	Singles		Couples	
Years	**Men**	**Women**	**Heads**	**Wives**
2007	1013	2062	3644	3866
2005	968	1934	3620	3738
2003	962	1834	3493	3649
2001	814	1675	3318	3518
1999	729	1617	3196	3359
Pooled # of Households (N)	4486	9122	17271	18130

Table 2.2 Weighted Means on Mental Health Variables

	Waves	**Singles**			
		Men		**Women**	
N (number of repeated observations)		4486		9122	
Head's Mental Health Variables		Mean	SE	Mean	SE
Mental Health Diagnosis	All	0.082	(0.005)	0.139	(0.005)
Depression (if available)	'05,'07	0.043	(0.006)	0.106	(0.007)
Non-Depressive Problems (if available)	'05,'07	0.038	(0.005)	0.053	(0.005)
K-6 Dummy > 13 (if available)	'01,'03,'07	0.037	(0.005)	0.062	(0.004)
	Waves	**Couples**			
		Heads		**Wives**	
N (number of repeated observations)		17271		18130	
Head's Mental Health Variables		Mean	SE	Mean	SE
Mental Health Diagnosis	All	0.034	(0.002)	0.062	(0.002)
Depression (if available)	'05,'07	0.024	(0.002)	0.040	(0.003)
Non-Depressive Problems (if available)	'05,'07	0.016	(0.002)	0.027	(0.002)
K-6 Dummy > 13 (if available)	'01,'03,'07	0.006	(0.001)	0.017	(0.001)

Table 2.3 Weighted Means on Labor Market Variables

	Singles			
	Men		**Women**	
N (number of repeated observations)	4486		9122	
	Mean	SE	Mean	SE
Employed (%)	0.846	(0.007)	0.770	(0.006)
Dependent Variables				
Hourly Wage Rate†	19.524	(0.507)	14.621	(0.237)
Weekly Work Hours	40.062	(0.342)	33.163	(0.267)
Weeks Out of Labor Force	4.290	(0.250)	7.948	(0.260)
	Couples			
	Heads		**Wives**	
N (number of repeated observations)	17271		18130	
	Mean	SE	Mean	SE
Employed (%)	0.938	(0.002)	0.700	(0.004)
Dependent Variables				
Hourly Wage Rate†	27.455	(0.384)	15.108	(0.198)
Weekly Work Hours	44.586	(0.132)	28.333	(0.170)
Weeks Out of Labor Force	1.787	(0.078)	11.462	(0.187)

†converted to hourly averages in 2007 real dollars

Table 2.4 Weighted Means of Control Variables for Singles

	Singles			
	Men		**Women**	
N (number of repeated observations)	4486		9122	
Socio-Economic Status	Mean	SE	Mean	SE
Some High School	0.139	(0.006)	0.180	(0.005)
High School	0.306	(0.009)	0.315	(0.007)
Some College	0.249	(0.008)	0.244	(0.006)
BA Degree	0.152	(0.007)	0.134	(0.005)
Some Post-Graduate or more	0.154	(0.007)	0.127	(0.005)
Wealth*	161943.400	(15567.170)	128245.700	(16661.890)
Welfare Status	0.025	(0.003)	0.067	(0.003)
Salaried Jobs (%)	0.285	(0.009)	0.285	(0.007)
Other Family Members: Labor Income*	3456.669	(249.955)	5156.466	(270.694)
Demographic Characteristics				
Age	39.533	(0.248)	45.257	(0.233)
Black	0.092	(0.005)	0.144	(0.005)
Number of Family Members	0.568	(0.020)	0.860	(0.017)
Non-Urban	0.428	(0.010)	0.422	(0.007)
Divorced/Separated/Widowed	0.443	(0.010)	0.597	(0.007)
Physical Health/Substance Use Variables				
Fair/Poor Physical Health	0.131	(0.007)	0.183	(0.006)
Disabled	0.061	(0.005)	0.058	(0.003)

*converted to annual averages in 2007 real dollars

Table 2.5 Weighted Means of Control Variables for Couples

	Couples			
	Heads		**Wives**	
N (number of repeated observations)	17271		18130	
Socio-Economic Status	Mean	SE	Mean	SE
Some High School	0.131	(0.003)	0.118	(0.003)
High School	0.276	(0.004)	0.316	(0.004)
Some College	0.220	(0.004)	0.236	(0.004)
BA Degree	0.202	(0.004)	0.163	(0.003)
Some Post-Graduate or more	0.170	(0.003)	0.167	(0.003)
Wealth*	362910.300	(13736.230)	370405.200	(12250.860)
Welfare Status	0.009	(0.001)	0.006	(0.001)
Salaried Jobs (%)	0.437	(0.004)	0.284	(0.004)
Other Family Members: Labor Income*	3062.172	(87.583)	3066.688	(87.738)
Demographic Characteristics				
Age	45.083	(0.110)	44.898	(0.121)
Black	0.040	(0.002)	0.037	(0.001)
Number of Family Members	1.112	(0.011)	1.037	(0.010)
Non-Urban	0.488	(0.004)	0.494	(0.004)
Divorced/Separated/Widowed	0.029	(0.001)	0.029	(0.001)
Physical Health/Substance Use Variables				
Fair/Poor Physical Health	0.097	(0.003)	0.117	(0.003)
Disabled	0.029	(0.002)	0.022	(0.001)

*converted to annual averages in 2007 real dollars

Table 2.6 Effects of Mental Illness on the Probability of Employment

		(1) Single Men P(Employed)	(2) Single Women P(Employed)	(3) Married Men P(Employed)	(4) Married Women P(Employed)
Any Mental Illness					
A	HD: MH Diagnosis	0.003	-0.037**	-0.006	0.035**
		(0.008)	(0.013)	(0.004)	(0.013)
	WF: MH Diagnosis			-0.003	-0.034*
				(0.003)	(0.013)
	Observations	4486	9122	17271	18130
	R-squared	0.36	0.44	0.28	0.30
Specific Mental Conditions					
B	HD: Depression	-0.004	-0.041	-0.013	0.050*
		(0.020)	(0.026)	(0.011)	(0.024)
	HD: Non-Depressive	0.015+	-0.078*	-0.015	0.014
		(0.008)	(0.038)	(0.015)	(0.033)
	WF: Depression			0.003	-0.009
				(0.003)	(0.024)
	WF: Non-Depressive			-0.000	-0.094*
				(0.006)	(0.037)
	Observations	1981	3996	7264	7604
	R-squared	0.46	0.46	0.32	0.32
K-6 Non Specific Psychological Distress Scale					
C	K6 (=1 if K6 > 13)	-0.049	-0.037+	-0.050+	0.020
		(0.038)	(0.023)	(0.027)	(0.018)
	Observations	2796	5588	4404	6431
	R-squared	0.37	0.45	0.26	0.29

+ significant at 10%; * significant at 5%; ** significant at 1%

Marginal Probit Estimates Reported. Standard errors, adjusted for intra-cluster correlations at the family level, in parentheses. Controls include education, wealth, the labor income of other family members, salaried or non-salaried job, age, race, marital status, number of total family members in the household, rural status, physical health status, and indicator variables for missing control variables.

Table 2.7 Effects of Mental Illness on Weeks out of the Labor Force

		(1) Single Men	(2) Single Women	(3) Married Men	(4) Married Women
		Ln(Wks Out of Labor Force)	Ln(Wks Out of Labor Force)	Ln(Wks Out of Labor Force)	Ln(Wks Out of Labor Force)
Any Mental Illness					
A	HD: MH Diagnosis	0.321	0.573*	1.055**	-0.407
		(0.371)	(0.230)	(0.375)	(0.288)
	WF: MH Diagnosis			0.183	0.434*
				(0.281)	(0.209)
	Observations	4486	9122	17271	18130
Specific Mental Conditions					
B	HD: Depression	0.893	0.532+	0.954+	-0.656
		(0.546)	(0.322)	(0.549)	(0.495)
	HD: Non-Depressive	-0.173	0.709+	1.081+	-0.287
		(0.533)	(0.411)	(0.630)	(0.494)
	WF: Depression			-0.123	0.157
				(0.437)	(0.305)
	WF: Non-Depressive			0.040	1.252**
				(0.643)	(0.356)
	Observations	1981	3996	7264	7604
K-6 Non Specific Psychological Distress Scale					
C	K6 (=1 if K6 > 13)	0.523	0.143	1.251	-0.878*
		(0.669)	(0.372)	(1.170)	(0.424)
	Observations	2796	5588	4404	6431

+ significant at 10%; * significant at 5%; ** significant at 1%

Tobit Estimates Reported. Standard errors, adjusted for intra-cluster correlations at the family level, in parentheses. Controls include education, wealth, the labor income of other family members, salaried or non-salaried job, age, race, marital status, number of total family members in the household, rural status, physical health status, disability status, and indicator for missing control variables.

Table 2.8 Effects of Mental Illness on Earnings

		(1) Single Men	(2) Single Women	(3) Married Men	(4) Married Women
		Ln(Labor Income)	Ln(Labor Income)	Ln(Labor Income)	Ln(Labor Income)
Any Mental Illness					
A	HD: MH Diagnosis	-0.080	-0.282**	-0.112	0.233*
		(0.143)	(0.083)	(0.089)	(0.111)
	WF: MH Diagnosis			0.008	-0.334**
				(0.064)	(0.092)
	Observations	4486	9122	17271	18130
	R-squared	0.36	0.44	0.28	0.30
Specific Mental Conditions					
B	HD: Depression	-0.282	-0.225+	-0.195	0.236
		(0.295)	(0.131)	(0.145)	(0.188)
	HD: Non-Depressive	0.047	-0.622**	-0.495*	-0.129
		(0.216)	(0.203)	(0.197)	(0.255)
	WF: Depression			0.067	-0.051
				(0.117)	(0.162)
	WF: Non-Depressive			-0.011	-0.672**
				(0.148)	(0.208)
	Observations	1981	3996	7264	7604
	R-squared	0.46	0.46	0.32	0.32
K-6 Non Specific Psychological Distress Scale					
C	K6 (=1 if K6 > 13)	-0.779*	-0.289+	-0.760+	0.191
		(0.347)	(0.160)	(0.411)	(0.182)
	Observations	2796	5588	4404	6431
	R-squared	0.37	0.45	0.26	0.29

+ significant at 10%; * significant at 5%; ** significant at 1%

OLS Reduced Form Earnings Estimates Reported. Standard errors, adjusted for intra-cluster correlations at the family level, in parentheses. Controls include education, wealth, the labor income of other family members, salaried or non-salaried job, age, race, marital status, number of total family members in the household, rural status, physical health status, disability status, and indicator variables for missing control variables.

Table 2.9 Effects of Mental Illness on Labor Supply

		(1) Single Men Ln(Weekly Work Hrs)	(2) Single Women Ln(Weekly Work Hrs)	(3) Married Men Ln(Weekly Work Hrs)	(4) Married Women Ln(Weekly Work Hrs)
Any Mental Illness					
A	HD: MH Diagnosis	-0.699**	-0.674**	-0.707**	0.134
		(0.170)	(0.110)	(0.102)	(0.113)
	WF: MH Diagnosis			-0.113*	-0.597**
				(0.047)	(0.103)
	Observations	4486	9122	17271	18130
Specific Mental Conditions					
B	HD: Depression	-0.456*	-0.628**	-0.679**	0.198
		(0.211)	(0.150)	(0.145)	(0.177)
	HD: Non-Depressive	-0.923**	-0.990**	-0.741**	-0.145
		(0.340)	(0.214)	(0.175)	(0.202)
	WF: Depression			-0.059	-0.457**
				(0.071)	(0.160)
	WF: Non-Depressive			-0.087	-0.826**
				(0.103)	(0.193)
	Observations	1981	3996	7264	7604
K-6 Non Specific Psychological Distress Scale					
C	K6 (=1 if K6 > 13)	-1.415**	-0.850**	-0.563*	-0.367+
		(0.281)	(0.180)	(0.229)	(0.219)
	Observations	2796	5588	4404	6431

+ significant at 10%; * significant at 5%; ** significant at 1%

Tobit Estimates Reported. Standard errors, adjusted for intra-cluster correlations at the family level, in parentheses. Controls include education, wealth, the labor income of other family members, salaried or non-salaried job, age, race, marital status, number of total family members in the household, rural status, physical health status, disability status, and indicator variables for missing control variables.

Table 2.10 Effects of Mental Illness on the Hourly Wage Rate

		(1) Single Men	(2) Single Women	(3) Married Men	(4) Married Women
		Ln(Hourly Wage Rate)	Ln(Hourly Wage Rate)	Ln(Hourly Wage Rate)	Ln(Hourly Wage Rate)
Any Mental Illness					
A	HD: MH Diagnosis	0.171	-0.215**	0.063	0.287
		(0.220)	(0.074)	(0.158)	(0.178)
	WF: MH Diagnosis			0.055	-0.176**
				(0.050)	(0.062)
	Residual	0.163	0.243+	0.217	0.170**
		(0.217)	(0.134)	(0.198)	(0.040)
	Observations	4486	9122	17271	18130
	R-squared	0.05	0.04	0.04	0.05
Specific Mental Conditions					
B	HD: Depression	-0.125	0.004	0.098	-0.084
		(0.358)	(0.147)	(0.260)	(0.091)
	HD: Non-Depressive	0.358	0.180	-0.096	-0.067
		(0.239)	(0.244)	(0.269)	(0.114)
	WF: Depression			0.243+	0.086
				(0.134)	(0.131)
	WF: Non-Depressive			0.093	-0.213**
				(0.112)	(0.079)
	Residual	0.312	0.287	0.006	0.172**
		(0.192)	(0.178)	(0.313)	(0.057)
	Observations	1981	3996	7264	7604
	R-squared	0.02	0.04	0.02	0.03
K-6 Non Specific Psychological Distress Scale					
C	K6 (=1 if K6 > 13)	0.144	-0.042	-0.368	0.044
		(0.481)	(0.251)	(0.271)	(0.137)
	Residual	0.141	0.010	-0.034	0.182*
		(0.227)	(0.242)	(0.324)	(0.074)
	Observations	2796	5588	4404	6431
	R-squared	0.07	0.05	0.03	0.03

+ significant at 10%; * significant at 5%; ** significant at 1%

Fixed Effects Estimates Reported. Standard errors, adjusted for intra-cluster correlations at the family level, in parentheses. Controls include education, salaried or non-salaried job, age, marital status, rural status, physical health status, disability status, and indicator variables for missing control variables.

CHAPTER 3

HEALTH AND CHARITABLE CONTRIBUTIONS OF MONEY AND TIME

3.1 INTRODUCTION

In 2009, Americans gave $304 billion to charity, equivalent to 2.1% of gross domestic product (GDP), up from 1.8% of GDP in the 1970s through the 1990s (Giving USA 2009). It is estimated that 66% of all US households gave to charity in 2006 (Center on Philanthropy 2010). Volunteering is also rising from an estimated 20% of adults in the U.S. in 1989 to 27% in 2009 (BLS 2010; Grimm et al. 2006). Because of these trends, there is a growing interest in understanding why people give their time and money and what predicts giving. We contribute to this growing literature by examining whether changes in health affect monetary giving and volunteering, and in addition, whether changes in health influence philanthropy to charities promoting health.

A change in health may affect philanthropy decisions in a variety of ways. First, health problems can limit physical strength that can deter individuals' ability to participate in volunteering activities. In addition, it can drain financial resources such that there are fewer disposable funds available for giving. Second, exposure to a crisis, like a health shock, can motivate people to give to a cause, because the exposure increases awareness of an illness, or because the shock causes people to want to help others. Fischer (1998) argues that in times of crisis and tragedies, individuals are more altruistic and demonstrate pro-social behavior. A great

example of this is the spontaneous emergence of volunteers and private organizations to help the people and city of New York in the wake of the September 11 attack (Tierney 2001). Finally, ill individuals may find investment in health-related charities to be personally beneficial for finding a cure.

Most research linking health and philanthropy focuses on volunteering. The research generally concludes that good health is positively correlated with volunteering (Piliavin and Siegl (2007), Li and Ferraro (2005), Musick and Wilson (2003), Thoits and Hewitt (2001), Wilson and Musick (1997), and Day and Devlin (1996)). However, the direction of causality is not clear. Thoits and Hewitt (2001) argue that good health is a determinant of volunteering. In contrast, Luoh and Herzog (2002) and Friedland et al. (2001) claim that volunteering improves health, and Musick and Wilson (2003) find that depressed individuals, in particular, benefit the most from volunteering. Finally, there is some evidence that mental and physical health problems can have different effects on individuals' philanthropic behavior. In particular, Li and Ferroro (2005) assert that functional health problems lower the probability of volunteering, but that depression increases the likelihood of volunteering. Thus our empirical strategy accounts for reverse causality and contributes to this literature by also examining the effect of physical and mental health on both time and money donations.

This chapter examines the philanthropic choices of households whose heads or spouses have health problems using data from four recent waves of the Panel Study of Income Dynamics (PSID). These waves include physical and mental health questions and information about charitable contributions and volunteering. In particular, we examine whether, compared to healthy individuals, individuals and spouses (for the married) with health issues are more or less

likely to give their money or time to any charitable organizations, and to health-related charities specifically, and how much more or less money or time do they give.

This chapter makes four contributions. First, we use a broader set of health measures—self-reported health, doctor diagnosed mental health, and health shocks like heart attacks and strokes. We also consider effects of both mental and physical health. Second, we explore the relationship between spousal health and giving. Third, the panel nature of the data allows us to control for person and couple fixed effects, which reduces omitted variable bias. Last, we address the simultaneity which may affect other studies because health can affect giving and giving may influence health. The panel data allow us to use lagged health status, which is correlated with current health, but is not influenced by contemporaneous giving.

Allowing for household fixed effects, we find that while health shocks (stroke, heart attack or cancer diagnosis) and mental health diagnoses are associated with a decline in total money and/or time donations; health shocks, mental health diagnoses, and declines in self-reported physical health status are associated with a rise in time and/or money donations to health-related charities. These results are most pronounced with respect to the health of single heads and wives. These results are consistent with prior studies on the effect of health on volunteering, but demonstrate that health may have an important effect on where donations are directed.

3.2 THEORETICAL MODEL

The model presented here modifies Freeman (1997), which assumes household utility is a function of private consumption, leisure hours, and charitable contributions. We assume that the

donor's utility function (U_{it}^{D}) depends on private consumption (X_{it}), leisure (L_{it}), charitable contributions (C_{it}), and his own general health stock (H_{it}^{D}). In the following equation, for simplicity, we suppress all other variables that affect a donor's level of utility, but are not directly relevant to this study:

$$U_{it} = U(X_{it}, L_{it}, C_{it}, H_{it}) \tag{3.1}$$

A donor's utility is increasing in private consumption, leisure, and charity such that $U'(X) > 0$, $U'(L) > 0$, $U'(C) > 0$, where C is a function of money and time donations. By including C_{it} in the donor's utility function, we assume that the donor is a "warm-glow altruist".[30] Further, he is happy when he is healthy, indicating that $U'(H) > 0$. Consistent with Freeman (1997), we assume that the amount of monetary donations (M_{it}) and time donations (T_{it}) do not enter the utility function directly. As such, the charitable production function is:

$$C_{it} = C(M_{it}, T_{it}) \tag{3.2}$$

Equation (3.2) shows that households can substitute between money and time donations. When wages increase, households may prefer to volunteer less and donate more money.[31]

[30] It is hypothesized in the literature that "warm-glow" altruists derive greater utility from the act of giving (Fehr and Gaechter 2000; Andreoni et al. 1996; Andreoni 1990; Cornes and Sandler 1984). That is, individuals are motivated to give because they are self-interested or seeking external rewards. In contrast, another hypothesis about why people give assumes pure altruism; that people give because they are truly concerned about the welfare of others. If we assume that the donor's motivations are purely altruistic, we could adjust the model by replacing C_{it} with the utility of an external group that receives the donor's charitable giving. A third hypothesis argues that individuals personally dislike giving, but give because of social pressure (DellaVigna et al 2009; Freeman 1997). In the social pressure model, giving is utility reducing as it is mostly driven by feelings of obligations (Akerlof and Kranton 2000).

[31] Duncan (1999) establishes that in a public goods model, cash and time donations are perfect substitutes in equilibrium. Additionally, Andreoni et al. (1993) make a theoretical prediction that people donate cash and time more when their non-labor income increases. Consistent with this, Freeman (1997) finds that volunteering declines as wages rise.

The donor's budget constraint and time constraint in any given period *t* are specified in equations (3.3) and (3.4) respectively:

$$X_{it} + \tau_1 M_{it} \leq \tau_2 Y_{it} + W_{it} \tag{3.3}$$

$$T_{it} + N_{it} + L_{it} = 1 \tag{3.4}$$

In equation (3.3), for simplicity, the price of the consumption good (X_{it}) is assumed to be one, otherwise it influences the optimal level of giving.[32] τ_1 is the price of the monetary contributions, which is equal to one minus the marginal tax rate for that particular year. Since money donations can be itemized, for every dollar donated, less than one dollar of the consumption good is forgone, meaning that $\tau_1 < 1$. Y_{it} is total income, equal to the wage rate before taxes multiplied by the total hours worked (N_{it}). τ_2 converts gross income to after-tax income. The hours of volunteering is valued at the after tax wage rate. In equilibrium, the marginal utility obtained from the last hour of volunteering equals the marginal benefit from work or leisure. As τ_2 falls, the opportunity cost of an hour of labor supply declines, making volunteering more attractive. We assume that taxes are proportional, and thus ignore any complications that are likely to arise where taxes are progressive. W_{it} is the non-wage earnings or the level of wealth. In equation (3.4), the sum of all activities, leisure, labor and volunteering is fixed at one.

[32] However, these directions of effects are ambiguous, as income and substitution effects have opposite effects.

We also assume that the donor's health status in period *t* is determined by health variables from the previous year:[33]

$$H_{it} = H\left(H_{it-1}\right) \tag{3.5}$$

In equation (3.5), for simplicity, we suppress all life-style characteristics and other exogenous factors that could determine individuals' health status in period *t*. We derive the following donor's utility maximization problem from equations (3.1) to (3.5):

$$\max_{M_{it},T_{it}} \sum_{t=0}^{\infty} \beta_t U(X_{it}, L_{it}, C_{it}, H_{it}) \tag{3.6}$$

$$\text{subject to } C_{it} = C(M_{it}, T_{it});\ X_{it} + \tau_1 M_{it} \le \tau_2 Y_{it} + W_{it};$$

$$T_{it} + N_{it} + L_{it} = 1;\ H_{it} = H\left(H_{it-1}\right)$$

Maximizing the household utility function with respect to the four constraints gives the following set of optimal values for monetary and time contributions:

$$M_{it}^{*} = M_{it}(\tau_1, \tau_2, Y_{it}, W_{it}, H_{it-1}) \tag{3.7}$$

$$T_{it}^{*} = M_{it}(\tau_1, \tau_2, Y_{it}, W_{it}, H_{it-1}) \tag{3.8}$$

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[33] While a true model can be: $H_{it} = H\left(\sum_{1}^{t-1} H_{it}\right)$, which includes past health variables from many years, for simplicity and empirical relevance, we choose only one lag. We also assume that the health accumulation process is determined by the following standard equation: $\frac{\partial H_{it}}{\partial t} = I_{it} - \delta_{it} H_{it}$, where I_{it} is the investment toward building health stock, and δ_{it} is the depreciation rate.

This model indicates that important determinants of charitable giving will include the marginal tax rate, the wage rate, hours worked, wealth, and health. As discussed in the introduction, the effect of health on M_{it} and T_{it} is ambiguous. Thus, we now examine the effect of health empirically.

3.3 EMPIRICAL MODEL

Data

The data used in this study come from the PSID. The PSID is a nationally representative data set that includes data on economic, health, and social behaviors of over 8,000 families since 1968.[34] Many studies on charitable donations rely on data obtained from the IRS (Auten and Joulfaian 1996; Auten et al. 2002; Abrams et al. 1978), but using such data restricts the sample to those who itemize their tax deductions, thus removing a large segment of the population, the poor in particular.

We use data from the four most recent publicly available waves of the PSID (2001, 2003, 2005, and 2007) because data on charitable contributions are available starting in 2001. Nearly 85 percent of all households interviewed are in the sample in all four years. We limit our sample by including only the heads of households who responded to questions about mental health, physical health, charitable contributions, and marital status.[35] We separate the PSID households into two groups: households headed by singles, and households of couples, because the marginal tax rate varies by marital status and couples may behave differently than singles if couples

[34] We use weights provided by the PSID to allow the sample to reflect a representative sample of the US population.
[35] Men and women who report being married, but do not report about their spouses are dropped. Similarly, men who live with a partner, but report themselves as single are also not included in the sample. Thus, 771 observations of single households and 1,346 observations of couple households are dropped from the analysis.

bargain over charitable giving. Andreoni et al. (2003) find a reduction in donations by at least 6 percent when spouses bargain over money contributions. Our pooled sample consists of 13,092 household-year observations from singles and 16,035 couple household-year observations.

The PSID collects self-reported annual dollar values of contributions made to eleven types of charitable organizations categorized by purpose: religious purposes or spiritual development; combined purposes (e.g., United Way); helping people in need of basic necessities; health care or medical research; educational purposes; youth or family services; supporting or promoting arts, culture, or ethnic awareness; improving neighborhoods and communities; preserving the environment; providing international aid or promoting world peace; and to organizations serving purposes other than the ones listed above.[36] Data on dollar values of contributions made toward cultural, community, environment, world peace, and other donations are available only between 2003 and 2007. In 2005, individuals were also asked whether they contributed to help the victims of the Tsunami.[37]

Table 3.1 provides summary statistics on the annual dollar value of donations in 2007 dollars. Overall, 56.7% of single household-year observations and 78.3% of couple household-year observations donated at least $25. Sixty two percent of all households donated in all 4 years, 30% donated 1, 2 or 3 of the 4 years, and 8% never donated. Annual dollar contributions, which include the contributions made to all eleven types of organizations, are highest for couple households ($2,118, or 2.1% of average annual family income) and lowest for singles ($744, or 1.8% of average annual family income). The category that receives the highest fraction of total

[36] It is not always clear how respondents categorize their donations if an organization can fall in more than one category. In particular, donations to schools, hospitals, and other charities that are run by religious organizations may be categorized as religious, or as educational, health, or basic necessities.
[37] Tsunami contribution is not included in the total dollar donation.

money donations is religious organizations. On average, single households contribute 5.9% and couple households donate 3.8% of their total dollar contributions to health-related organizations.

Data on annual volunteer hours are not available in the 2007 PSID wave, and data on volunteer hours for specific organizations are only available in 2003 and 2005. Respondents report volunteering for seven different types of organizations: religious; child and youth welfare; senior citizens; health improvement (raising funds to fight a disease); needy and poor people; social change; and finally, causes other than the above. Overall, 25.4% of single household-year observations report volunteering at least one time. 50.2% of couple household-year observations had at least one member volunteer. Most couples volunteered together (45% of volunteering couple household-years), followed by the wife only (37% of volunteering couple household-years), and the husband only (18% of volunteering couple household-years). Average annual volunteering hours are roughly the same across household types at about 50 hours among those who volunteer. Volunteering for a religious organization is the most common type of activity. Compared to couples, singles have stronger preferences for volunteering for organizations that are devoted to improving health awareness and research.

Health Variables

We use three different measures of health: whether one has a mental health diagnosis, four categories of self-reported physical health status, and whether one experienced a health shock. In the PSID, mental health is ascertained by asking whether a doctor diagnosed the head and the wife with any emotional, nervous, or psychiatric problems.[38] The summary statistics

[38] Emotional, nervous, or psychiatric problems may include but are not limited to depression, bipolar disorder (mania), schizophrenia, anxiety, phobias, alcohol abuse, drug addiction, and obsessive-compulsive disorder.

reported in Table 3.2 indicate that the highest incidence of mental illness is for singles (11.7 percent) and the lowest is for heads of couple households (3.8 percent).

Self-reported health status is assessed by asking the respondent to rate their general health on the scale from 1 to 5 where 1 is excellent and 5 is poor. We create four indicator variables indicating whether the respondent rates their health as fair or poor or very good or excellent (the middle category 'good' is omitted). Self-reported health status has been shown to predict mortality, and to be correlated with the presence of chronic conditions, disabilities, and hospitalizations (Idler and Kasl 1995; Benyamini et al. 2000). In our sample, 20.2% of singles, 13.5% of husbands, and 13.9% of wives report being in poor or fair health.

Finally, we use health shocks (stroke, heart attack or cancer diagnosis) as an alternative health measure because of its potential to change philanthropic behavior compared to a chronic health condition that develops slowly over a long period.[39] Wilson and Musick (1997) did something similar by using the number of life-threatening conditions the respondent experienced during the previous year. Awareness of these particular health problems occurs suddenly and, as a result, may stimulate a change in behavior. In our sample, the rates of stroke and cancer are similar across household types; between 2.7% and 3.7% of individuals have had a stroke and between 5.9% and 6.5% have had a cancer diagnosis. The incidence of heart attack is, however, much lower for wives than the other groups; 6.3% of husbands and 5.0% of singles have had a heart attack while only 1.6% of wives had experienced one.

[39] Because identification in the fixed effects model depends on changes across time, the fixed effects results will capture the effect of health shocks that occur in the four interview waves we observe. In the models that do not account for fixed effects, the health shocks may have occurred prior to 2001.

Estimation Strategy

To examine the relationship between the households' health status and their philanthropic behavior we use the following specifications:

$$y_{it} = \alpha_2^* MHealth_{it-1} + Health_{it-1}^{'}\alpha_1^* + X_{it}^{'}\beta^* + \varepsilon_{it} \quad (3.9)$$

$$y_{it} = \alpha_3^* Shock_{it} + X_{it}^{'}\beta^* + \varepsilon_{it} \quad (3.10)$$

In equations (3.9) and (3.10), y_{it} represents the giving of person i in time period t and can be one of eight dependent variables: the probability of any donation of money or time; the logged amount of all donations of money or time; the probability of a health-related donation of money or time; and the logged amount of all donations of money or time directed toward health-related organizations.

$MHealth_{it-1}$ is a binary variable indicating a mental health diagnosis. $Health_{it-1}$ represents a vector of four categories of self-reported health status (the middle category is omitted). We include both mental and physical health in the same regressions because they are highly correlated (Vaillant 1979). $Shock_{it}$ is a binary variable that indicates whether any of the three health shocks described above has occurred. For couple households, we include both the husband's and the wife's health variables, because health is correlated between spouses (Fletcher 2009; Siegel et al. 2004) and because the charitable contributions are provided at the household level.

To reduce concerns about simultaneity, we lag the self-reported health status and the diagnosed mental health problem to the previous interview wave.[40] Lagged health status is correlated with current health, but is not influenced by contemporaneous giving. Since health shocks are typically exogenous in any given period, we do not lag the health shocks measure.

X_{it} is described below. The disturbance term, ε_{it}, follows a standard normal distribution. We apply the Logit model when the dependent variable is binary and a Tobit model when the dependent variable is continuous, but truncated at zero, and adjust the standard errors for intra-cluster correlations at the household level.

We also estimate equations (9) and (10) using a conditional fixed effects Logit model and the censored fixed effects specification developed by Honore (1992) to difference out time-invariant sources of individual heterogeneity. In these models, identification hinges on changes in health status causing changes in philanthropic behavior.[41] We argue that the coefficients estimated using these models are more likely to capture the causal relationship from health to philanthropic decisions because unobservable time-invariant characteristics are held constant.

Control Variables

Table 3.3 reports the summary statistics for important determinants of charitable giving, based on the theoretical model and the literature, which are divided into four groups—prices, socio-economic status, demographic characteristics, and religiosity. The price associated with money donations is one minus the marginal tax rate for the given year. To assign the probable

[40] Because mental and physical health status is available in the 1999 interview wave, we do not lose observations by lagging these variables.
[41] Note that in the conditional fixed effects model, those observations that do not change their donation status over the four interview waves are dropped because they do not contribute any information.

tax filing status to households and to obtain the appropriate tax bracket for each household, we use data on the total number of household members, gross income, and whether the household itemized their tax deductions for the relevant year. The price associated with time donations is the hourly wage rate of the head.

The variables that capture socio-economic status are family income, wealth, debt, public program participation,[42] employment status, and education level. Income has a negative effect on volunteering and a positive effect on money donations (Freeman 1997; Clotfelter 2002).[43] Wealth, debt and public program participation provide information about financial security and the money available for charitable contributions. Employment status affects the time available for volunteering. Finally, education and charitable giving and volunteering have been shown to be correlated (Feldstein and Clotfelter 1976; Smith 1994).[44]

The demographic variables incorporated in the study are age, race, marital status, gender (relevant only for households headed by single individuals), the number of children in the household, disability status, and whether the respondent lives in a rural area. Older adults are the most likely to give money and middle-aged groups are the most likely to volunteer time (Center on Philanthropy 2010; Grimm et al. 2006). There is also evidence that whites and women have higher rates and amounts of charitable giving than other groups (Rooney et al. 2005; Fong and Luttmer 2009). Hayghe (1991) finds that compared to single individuals, married individuals volunteer more, as volunteering can be a utility-enhancing family activity. Smith (1994) argues that compared to non-parents, parents are likely to have more social contacts and higher

[42] Public program participation is a binary variable that takes a value of one if the respondent reports receiving any among the following: food stamps, the supplemental security income, TANF, or other welfare programs such as the general assistance programs, emergency assistance, Cuban/Haitian Refugee, or Indian assistance.
[43] However, Smith (1994) finds a positive relationship between income and volunteering.
[44] In their empirical analysis, Feldstein and Clotfelter (1976) find positive but insignificant coefficient on education.

participation rates in volunteering activities, indicating that children are an important source of social interactions. Duncan (1999) also finds that number of children increases the households' participation in volunteering activities. Disability status is included because we want to reduce the bias caused by limiting physical health conditions. Finally, there is evidence that there are urban/rural differences in charitable giving (Andreoni and Scholz 1998).

We also incorporate a measure for the respondent's degree of religiosity in our analysis. Brooks (2004) documents that although religious affiliation does not affect the giving of time and money, the intensity of one's religious commitment is one of the most important determinants of giving. Therefore, we use religiosity instead of religious affiliation. Our measure of religiosity is a binary variable indicating whether the respondent goes to church every week.

3.4 RESULTS

Tables 3.4 and 3.5 present the results of regressions based on equation (9) without fixed effects where the health variables are a mental health diagnosis and four categories of self-reported general health at the previous interview. The first four columns include all types of volunteering and donations and the last four columns focus on health-related donations. Columns (1), (2), (5), and (6) include single households only and columns (3), (4), (7) and (8) include couple households only and include the health measures for both the head and the wife. The dependent variables in Table 3.4 focus on volunteering where the dependent variables in Table 3.5 focus on dollar donations.

Consistent with the previous literature, these results indicate that individuals who were in fair or poor health are less likely to volunteer and their volunteer hours are lower compared to

those who rated themselves in the middle health category (good). Likewise, those who were in excellent or very good health are more likely to volunteer and their volunteer hours are higher (particularly single heads and husbands). In line with Li and Ferroro (2005), single heads and wives who had a mental health diagnosis are more likely to volunteer and volunteer more hours.

Similar to the effect on all types of volunteering, single heads and husbands who were in fair or poor health volunteer less to health-related charities and wives in excellent or very good health volunteer more to health-related charities. However, in contrast to the findings for all types of charities, wives who were in fair or poor health volunteer more to health-related charities and husbands with a mental health diagnosis volunteer less to health-related charities.

The effects of health on dollar donations appear to be similar to the effect on volunteering. Single heads and husbands who were in fair or poor health are less likely to donate and donate less while individuals who were in excellent or very good health are more likely to donate and donate more. Also, wives who had a mental health diagnosis are more likely to give dollar donations and to give more.

The effects of health on dollar donations to health-related charities are primarily focused on wives. Wives who were in poor health donate less to health-related charities and wives who were in excellent or very good health donate more to these charities. Wives (and single heads) who had a mental diagnosis donate more to health-related charities.

The regression results presented in Tables 3.6 and 3.7 account for unobservable time-invariant fixed effects and as expected, show fewer statistically significant effects of health on philanthropic behavior. The dependent variables in Table 3.6 are volunteering related whereas the dependent variables in Table 3.7 include dollar donations. Similar to the findings in Tables

3.4 and 3.5, wives who were in poor health reduce their volunteering and single heads that were in excellent or very good health increase their money donations. In contrast to the previous tables, wives who were in excellent health and single heads who had a mental diagnosis also volunteer less.

Most of the significant effects in Tables 3.6 and 3.7 are with respect to the health-related volunteering and giving. Among singles and wives, having a health problem increases donations and volunteering to health-related charities. The effect of having been in excellent or very good health also increase volunteering and donations for singles and wives; excellent or very good health among husbands reduces volunteering for health-related charities however.

Table 3.8 shows that health shocks are positively correlated with donating money to health-related charities. In contrast, health shocks of wives are correlated with a decline in overall volunteering. When fixed effects are included, shown in Table 3.9, health shocks decrease total money donations and total volunteering, but increase health-related volunteering among singles and have no effect on health-related money donations. Specifically, a health shock to the husband reduces the probability of any dollar donations and reduces the amount of dollar donations while a health shock to the wife reduces the probability of any volunteering and reduces the amount of volunteering. However, singles that experience a health shock increase the probability of volunteering for a health-related charity and the number of volunteer hours devoted to health-related causes. These findings suggest that health shocks bring awareness to single households about the needs for health research or outreach to patients, which may cause donors to switch from other types of donations to health-related donations.

3.5 CONCLUSIONS

While considerable work has been done on the relationship between charitable contributions and socio-economic status, demographic characteristics, religiosity, and price incentives, there is relatively little research relating donors' health status and their philanthropic behavior. This chapter aims to contribute in this area. Consistent with the previous literature, we find that heads of households with excellent or very good health volunteer more, heads with fair or poor health volunteer less, and singles and wives with a mental health diagnosis volunteer more. We find that this pattern also generally holds for money donations. However, when we apply household fixed effects, we find that poor health, health shocks and mental health diagnoses are associated with a decline in total money and/or time donations. On the other hand, health shocks, mental health diagnoses, and deteriorating self-reported health status appear to increase time and/or money donations to health-related charities. These results suggest that health may have an important effect on where donations are directed.

Table 3.1 Weighted Means of Dependent Variables

	Waves	Singles		Couples	
N household-years		13092		16035	
Money Donations		Mean	SE	Mean	SE
Whether Household Donated At All	All	0.567	(0.006)	0.783	(0.004)
Total Annual Donation Amount in 2007$	All	744.352	(30.975)	2117.509	(46.629)
Annual Health Donation Amount in 2007	All	44.287	(4.426)	80.270	(5.382)
Time Donations					
Only Head Volunteered	'01,'03,'05	0.254	(0.006)	0.091	(0.003)
Only Wife Volunteered	'01,'03,'05			0.185	(0.004)
Both Head & Wife Volunteered	'01,'03,'05			0.226	(0.005)
Total Annual Volunteer Hours (if any)	'01,'03,'05	48.090	(3.085)	50.021	(2.746)
Annual Health Volunteering Hours	'03,'05	4.054	(0.724)	1.718	(0.301)

Table 3.2 Weighted Means on Health Variables

	Singles		Couples			
	Heads		Heads		Wives	
N household-years	13092		16035			
	Mean	SE	Mean	SE	Mean	SE
Mental Health Diagnosis	0.117	(0.004)	0.038	(0.002)	0.064	(0.002)
Excellent Self-Reported Health	0.167	(0.004)	0.245	(0.004)	0.218	(0.004)
Very Good Self-Reported Health	0.317	(0.006)	0.355	(0.004)	0.347	(0.004)
Fair Self-Reported Health	0.144	(0.004)	0.100	(0.003)	0.106	(0.003)
Poor Self-Reported Health	0.058	(0.003)	0.035	(0.002)	0.033	(0.002)
Had Health Shock	0.127	(0.004)	0.128	(0.003)	0.088	(0.003)
Had Stroke	0.037	(0.002)	0.031	(0.002)	0.027	(0.002)
Had Heart Attack	0.050	(0.003)	0.063	(0.003)	0.016	(0.001)
Diagnosed with Cancer	0.065	(0.003)	0.063	(0.003)	0.059	(0.002)

Table 3.3 Weighted Means of Control Variables

	Singles		Couples	
N household-years	13092		16035	
Prices	Mean	SE	Mean	SE
1 - Marginal Tax Rate	0.936	(0.001)	0.860	(0.001)
Hourly Wage	12.393	(0.250)	21.854	(0.491)
Socio-Economic Status				
Family Income*	41267.490	(748.885)	99223.440	(1139.736)
Public Program Participation	0.117	(0.003)	0.034	(0.002)
Wealth*	176241.600	(12032.860)	429855.200	(13902.590)
Debt*	6629.260	(254.498)	10268.680	(956.431)
Retired	0.195	(0.005)	0.178	(0.004)
No High School	0.180	(0.004)	0.146	(0.003)
Some College or College	0.495	(0.006)	0.573	(0.005)
Demographic Characteristics				
Age	49.161	(0.221)	49.915	(0.148)
Black	0.096	(0.003)	0.033	(0.001)
Other Races	0.032	(0.002)	0.053	(0.002)
Divorced/Separated/Widowed	0.604	(0.006)	0.027	(0.001)
Number of Children	0.320	(0.008)	0.863	(0.010)
Disability Status	0.048	(0.002)	0.023	(0.001)
Non-Urban	0.434	(0.006)	0.502	(0.005)
Male	0.363	(0.006)		
Religiosity				
Head: Attend services weekly	0.638	(0.006)	0.391	(0.005)
Wife: Attend services weekly			0.413	(0.005)

*converted to annual averages in 2007 real dollars

Table 3.4 Effects of Health on Time Donations (Excluding Fixed Effects)

	Singles		Couples		Singles		Couples	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Pr(Total Donations)	Donations Amount	Pr(Total Donations)	Donations Amount	Pr(Health Donations)	Health Donations	Pr(Health Donations)	Health Donations
	Logit	Tobit	Logit	Tobit	Logit	Tobit	Logit	Tobit
HD: Mental Diagnosis	0.276**	0.791*	-0.204	-0.644	0.263	0.903	-1.398*	-4.055**
	(0.127)	(0.447)	(0.168)	(0.585)	(0.322)	(1.189)	(0.743)	(1.943)
HD: Excellent Health	0.070	0.242	0.257***	0.819***	0.197	0.718	0.197	0.623
	(0.114)	(0.438)	(0.077)	(0.262)	(0.322)	(1.151)	(0.271)	(0.837)
HD: Very Good Health	0.210**	0.678**	0.126*	0.434*	0.112	0.503	-0.156	-0.564
	(0.093)	(0.324)	(0.071)	(0.238)	(0.278)	(0.963)	(0.252)	(0.784)
HD: Fair Health	-0.111	-0.503	-0.523***	-1.526***	-0.663	-2.470**	-0.995*	-2.874**
	(0.132)	(0.454)	(0.133)	(0.426)	(0.445)	(1.249)	(0.510)	(1.333)
HD: Poor Health	-0.737***	-2.354***	-0.490*	-1.538*	-0.182	-0.848	-1.401	-3.601
	(0.262)	(0.840)	(0.267)	(0.786)	(0.635)	(2.015)	(1.024)	(2.676)
WF: Mental Diagnosis			0.220*	0.733*			0.312	0.573
			(0.118)	(0.431)			(0.396)	(1.638)
WF: Excellent Health			0.044	0.051			0.474	1.430
			(0.077)	(0.270)			(0.306)	(0.884)
WF: Very Good Health			0.038	0.113			0.806***	2.444***
			(0.068)	(0.227)			(0.259)	(0.765)
WF: Fair Health			0.033	0.098			0.862**	2.651**
			(0.110)	(0.371)			(0.359)	(1.097)
WF: Poor Health			-0.512**	-1.378			1.030*	1.824
			(0.225)	(0.869)			(0.585)	(2.048)
Observations	7,756	7,756	10,542	10,542	5,438	5,438	7,321	7,321

All specifications include the controls listed in Table 3.
Standard errors are adjusted for intra-cluster correlations at the household level.
* significant at the 5% level; ** significant at the 1% level; *** significant at the 0.1%.

Table 3.5 Effects of Health on Dollar Donations (Excluding Fixed Effects)

	Singles		Couples		Singles		Couples	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Pr(Total Donations)	Donations Amount	Pr(Total Donations)	Donations Amount	Pr(Health Donations)	Health Donations	Pr(Health Donations)	Health Donations
	Logit	Tobit	Logit	Tobit	Logit	Tobit	Logit	Tobit
HD: Mental Diagnosis	0.144	0.315	0.112	0.205	0.233*	0.619	-0.021	-0.123
	(0.105)	(0.255)	(0.144)	(0.230)	(0.130)	(0.479)	(0.141)	(0.509)
HD: Excellent Health	0.318***	0.559**	0.205**	0.232**	0.118	0.461	0.028	0.127
	(0.095)	(0.217)	(0.080)	(0.111)	(0.115)	(0.434)	(0.069)	(0.248)
HD: Very Good Health	0.218***	0.462***	0.170**	0.228**	-0.003	0.045	-0.018	-0.063
	(0.077)	(0.169)	(0.069)	(0.096)	(0.094)	(0.338)	(0.062)	(0.218)
HD: Fair Health	-0.096	-0.424*	-0.205**	-0.361**	-0.091	-0.228	-0.102	-0.297
	(0.098)	(0.242)	(0.101)	(0.171)	(0.128)	(0.445)	(0.103)	(0.339)
HD: Poor Health	-0.041	-0.428	-0.335**	-0.697**	-0.092	-0.461	-0.198	-0.600
	(0.155)	(0.400)	(0.169)	(0.329)	(0.210)	(0.711)	(0.201)	(0.701)
WF: Mental Diagnosis			0.229**	0.234			0.228**	0.761**
			(0.115)	(0.174)			(0.100)	(0.361)
WF: Excellent Health			0.138	0.229**			0.160**	0.544**
			(0.085)	(0.115)			(0.069)	(0.255)
WF: Very Good Health			0.206***	0.335***			0.102*	0.382*
			(0.068)	(0.097)			(0.060)	(0.214)
WF: Fair Health			0.074	0.177			-0.039	-0.138
			(0.092)	(0.149)			(0.095)	(0.351)
WF: Poor Health			-0.083	0.033			-0.305*	-0.923*
			(0.154)	(0.305)			(0.165)	(0.559)
Observations	10,691	10,691	14,526	14,529	10,634	10,634	14,421	14,421

All specifications include the controls listed in Table 3.
Standard errors are adjusted for intra-cluster correlations at the household level.
* significant at the 5% level; ** significant at the 1% level; *** significant at the 0.1%.

Table 3.6 Effects of Health on Time Donations (Including Fixed Effects)

	Singles		Couples		Singles		Couples	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Pr(Total Donations)	Donations Amount	Pr(Total Donations)	Donations Amount	Pr(Health Donations)	Health Donations	Pr(Health Donations)	Health Donations
	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit
HD: Mental Diagnosis	-0.285	-0.842**	0.202	0.444	-1.215	-0.564	-16.726	-2.291
	(0.262)	(0.424)	(0.435)	(0.610)	(1.241)	(0.784)	(10,627.775)	(1.717)
HD: Excellent Health	-0.049	-0.465	-0.091	-0.067	1.664	1.367	-1.890**	-2.037
	(0.206)	(0.357)	(0.158)	(0.232)	(1.218)	(1.215)	(0.897)	(1.660)
HD: Very Good Health	0.222	0.064	-0.153	-0.160	1.172	0.922	-0.643	-0.931
	(0.159)	(0.274)	(0.123)	(0.191)	(0.738)	(0.904)	(0.660)	(1.184)
HD: Fair Health	0.108	0.141	-0.254	-0.432	-1.233	-0.638	-0.421	-2.371
	(0.201)	(0.397)	(0.215)	(0.392)	(1.245)	(0.660)	(1.179)	(1.924)
HD: Poor Health	0.654	1.598	0.229	0.310	2.389	2.523***	40.087	10.401
	(0.408)	(1.010)	(0.459)	(0.790)	(2.365)	(0.897)	(15,029.943)	(0.000)
WF: Mental Diagnosis			-0.008	-0.356			0.817	2.537
			(0.256)	(0.372)			(1.912)	(2.533)
WF: Excellent Health			-0.323*	-0.386			0.023	1.784
			(0.169)	(0.254)			(0.988)	(1.539)
WF: Very Good Health			-0.030	-0.030			1.709**	2.362***
			(0.122)	(0.200)			(0.755)	(0.850)
WF: Fair Health			-0.046	-0.272			1.805	0.017
			(0.188)	(0.330)			(1.129)	(1.652)
WF: Poor Health			-0.794*	-0.375			-1.258	-2.661
			(0.460)	(1.002)			(2.817)	(2.195)
Observations	1,818	7,864	2,996	10,631	152	5,496	232	7,367

All specifications include the time-invariant controls listed in Table 3.

* significant at the 5% level; ** significant at the 1% level; *** significant at the 0.1%.

Table 3.7 Effects of Health on Dollar Donations (Including Fixed Effects)

	Singles		Couples		Singles		Couples	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Pr(Total Donations)	Donations Amount	Pr(Total Donations)	Donations Amount	Pr(Health Donations)	Health Donations	Pr(Health Donations)	Health Donations
	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit
HD: Mental Diagnosis	-0.028	-0.105	-0.229	-0.197	0.101	0.093	-0.312	-0.675
	(0.187)	(0.266)	(0.245)	(0.219)	(0.244)	(0.494)	(0.239)	(0.534)
HD: Excellent Health	0.256*	0.346	0.054	-0.018	0.521***	0.954**	-0.185	-0.390
	(0.152)	(0.213)	(0.130)	(0.111)	(0.202)	(0.404)	(0.120)	(0.247)
HD: Very Good Health	0.222**	0.297*	-0.073	-0.062	0.206	0.412	-0.112	-0.182
	(0.109)	(0.152)	(0.100)	(0.086)	(0.136)	(0.291)	(0.094)	(0.189)
HD: Fair Health	0.206	0.124	0.045	-0.020	0.174	0.744*	0.084	0.293
	(0.139)	(0.214)	(0.153)	(0.149)	(0.190)	(0.396)	(0.159)	(0.296)
HD: Poor Health	0.140	0.163	-0.285	-0.363	0.486	0.983	-0.044	0.327
	(0.226)	(0.384)	(0.282)	(0.310)	(0.351)	(0.701)	(0.334)	(0.697)
WF: Mental Diagnosis			0.084	0.228			0.341**	0.730**
			(0.186)	(0.155)			(0.173)	(0.352)
WF: Excellent Health			-0.142	-0.099			-0.101	-0.185
			(0.140)	(0.115)			(0.126)	(0.272)
WF: Very Good Health			-0.041	0.013			-0.137	-0.286
			(0.102)	(0.084)			(0.094)	(0.210)
WF: Fair Health			0.000	0.073			-0.022	-0.120
			(0.142)	(0.138)			(0.147)	(0.313)
WF: Poor Health			0.238	0.286			-0.231	-0.316
			(0.266)	(0.273)			(0.294)	(0.576)
Observations	3,713	10,805	4,086	14,622	2,262	10,748	5,339	14,514

All specifications include the time-invariant controls listed in Table 3.

Table 3.8 Effects of Any Health Shocks on Time/Dollar Donations (Excluding Fixed Effects)

	Singles		Couples		Singles		Couples	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Pr(Total Donations)	Donations Amount	Pr(Total Donations)	Donations Amount	Pr(Health Donations)	Health Donations	Pr(Health Donations)	Health Donations
Volunteering								
	Logit	Tobit	Logit	Tobit	Logit	Tobit	Logit	Tobit
HD: Hlth Shock	-0.049	-0.078	-0.048	-0.013	0.160	0.494	0.339	0.679
	(0.116)	(0.442)	(0.098)	(0.439)	(0.325)	(1.288)	(0.286)	(1.027)
WF: Hlth Shock			-0.247**	-0.794**			0.337	1.247
			(0.104)	(0.397)			(0.287)	(1.010)
Observations	9,529	9,529	11,731	11,731	6,615	6,615	8,060	8,060
Dollar Donations								
	Logit	Tobit	Logit	Tobit	Logit	Tobit	Logit	Tobit
HD: Hlth Shock	0.188*	0.347	0.045	0.082	0.281***	0.928**	0.181**	0.570*
	(0.096)	(0.228)	(0.096)	(0.147)	(0.102)	(0.399)	(0.078)	(0.308)
WF: Hlth Shock			-0.024	-0.065			0.179**	0.556*
			(0.100)	(0.164)			(0.082)	(0.307)
Observations	13,107	13,107	16,058	16,058	13,052	13,052	15,946	15,946

All specifications include the time-invariant controls listed in Table 3.

* significant at the 5% level; ** significant at the 1% level; *** significant at the 0.1%.

Table 3.9 Effects of Any Health Shocks on Time/Dollar Donations (Including Fixed Effects)

	Singles		Couples		Singles		Couples	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Pr(Total Donations)	Donations Amount	Pr(Total Donations)	Donations Amount	Pr(Health Donations)	Health Donations	Pr(Health Donations)	Health Donations
Volunteering								
	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit
HD: Hlth Shock	0.047	-0.071	0.001	-0.198	2.867*	3.208**	15.525	3.146
	(0.276)	(0.535)	(0.259)	(0.419)	(1.620)	(1.454)	(2,298.008)	(0.000)
WF: Hlth Shock			-0.509**	-0.928**			0.133	-3.072**
			(0.228)	(0.365)			(1.056)	(1.421)
Observations	2,221	9,682	3,318	11,842	178	6,696	248	8,112
Dollar Donations								
	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit	Panel Logit	Panel Tobit
HD: Hlth Shock	-0.152	-0.451*	-0.499**	-0.443***	0.004	0.259	-0.029	-0.031
	(0.179)	(0.257)	(0.218)	(0.160)	(0.230)	(0.486)	(0.168)	(0.324)
WF: Hlth Shock			-0.183	-0.058			0.126	0.134
			(0.207)	(0.147)			(0.182)	(0.309)
Observations	4,605	13,278	4,787	16,180	2,663	13,212	5,781	16,063

All specifications include the time-invariant controls listed in Table 3.

* significant at the 5% level; ** significant at the 1% level; *** significant at the 0.1%.

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APPENDIX A1 K-6 NON-SPECIFIC PSYCHOLOGICAL DISTRESS SCALE

1	In the past 30 days, how often did you feel so sad that nothing could cheer you up?
2	In the past 30 days, how often did you feel nervous?
3	In the past 30 days, how often did you feel restless or fidgety?
4	In the past 30 days, how often did you feel hopeless?
5	In the past 30 days, how often did you feel that everything was an effort?
6	In the past 30 days, how often did you feel worthless?

APPENDIX A2 CATEGORIZATION AND DESCRIPTION OF EXPENDITURE DATA AVAILABLE IN THE PSID

Expenditure Variables	Waves	Descriptions
Non-Durable Goods		
Food	1999-2007	Food used at home with and without food stamps
		Food delivered to home with and without food stamps
		Eating out with and without food stamps
Clothing & Apparel	2005-2007	Clothes, footwear, outerwear, watches, jewelry, etc
Trips & Vacations	2005-2007	Trips and vacations, including transportation, accomdoations, and recreational expenses on trips
Recreation & Entertainment	2005-2007	Recreation and entertainment, including tickets to movies, sporting events, expenses incurred pursuing hobbies such as arts, camping, photography, etc
Gasoline	1999-2007	Monthly gasoline expenses
Housing	1999-2007	Heating, electricity, water, sewer, telecommunication, and other utilities
Transportation	1999-2007	Parking, carpool, bus fares, train fares, taxicabs and other transportation expenses
Durable Goods		
Household Furnishings & Equipment	2005-2007	Textiles, furniture, floor coverings, major and small appliances, and miscellaneous housewares
Transportation	1999-2007	Vehicle loan payments
		Vehicle down payments
		Vehicle lease payments
		Vehicle insurance
		Vehicle repairs and maintenance
		Other vehicle expenditures
Housing	1999-2007	Monthly rent

APPENDIX A2 CATEGORIZATION AND DESCRIPTION OF EXPENDITURE DATA AVAILABLE IN THE PSID (CONTINUED)

Investment Goods	Waves	Descriptions
Education	1999-2007	Expenses on books, supplies, computer and softwares, tuition, fees, room and board, etc
Child Care	1999-2007	Child care expenses
Housing	1999-2007	Insurance premiums Property tax payments Homeowner's insurance premium
Home Repairs & Maintenance	2003-2007	Home repairs and maintenance, including materials and hiring a professional
Retirement Savings	1999-2007	Amount invested in IRA savings