YOUR MONEY OR YOUR LIFE: MANAGING HEALTH, MANAGING MONEY

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Abstract: Using the Panel Study of Income Dynamics, this paper examines the relationship between non-collateralized debt (NCD) and health behaviors. The results reveal that households whose members tend to lead less healthy lifestyles are more likely to hold NCD. Obesity of either spouse is associated with about 7 percentage point increase in the probability of holding NCD. Similarly, wife's smoking is associated with a 4 percentage point increase in the probability of holding NCD. There are three possible underlying hypotheses that may explain these relationships: common factors, such as preferences, shaping both debt and poorer health behaviors; poorer health and health behaviors causing debt; and debt causing poorer health behaviors. Our findings are not consistent with a causal relationship between health behaviors and NCD. It is likely that other factors, such as time preferences, risk aversion and self-control may underlie the observed correlation.

Keywords: credit card debt, non-collateralized debt, health behaviors, smoking, obesity

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Introduction

A large body of economic literature shows that there is a positive link between income, education, wealth and various health and health behavior indicators. (i.e., Hersch (2000), Attanasio and Emmerson (2003), Brunner et al. (1999), Stewart (2001), and Deaton (2003)). Recent research shows that the relationship between socioeconomic status (SES) and health may be more complicated since financial status indicators, such as delinquency, indebtedness, and degree of the financial strain, are also related to health status (Drentea (2000), Lyons and Yilmazer (2005)).

The mechanism behind the SES-health link appears to be very complex. On the one hand, there is evidence that health status affects economic resources accumulation (Ettner (1996), Adams et al. (2003), Lyons and Yilmazer (2005)). On the other hand, there is evidence that lower socioeconomic status may result in poor health (Smith (1999), Drentea and Lavrakas (2000)) either because of limited access to health care or because of psychological stress. Additionally, there is evidence that third factors (for example time preference, self-control, etc) may determine both health and socioeconomic status, thereby yielding the correlation (Meer et al. (2003), Barsky et al. (1997)).

In fact, wealth, financial status and health can all be thought of as capital stocks arising from investment. Both financial status and health status result from an accumulation process involving various types of allocation decisions and exogenous shocks. There are only very few papers that relate financial decisions and health status (Rosen and Wu (2004), Finkelstein and Poterba (2002), Drentea (2000), Lyons and Yilmazer (2005)) and only one paper (Ippolito (2003)) that relates financial decisions and health decisions.

None of these papers relate one of the most common financial decisions that families face: whether or not to hold Non-Collateralized Debt[1] to health behavior decisions. Yet, NCD in general, and credit card debt as a particular example of it, is a widespread phenomenon. About 80 percent of all US households have at least one credit card. Over 60 percent of US households with credit cards are currently carrying a balance[2] which means they are borrowing on those cards and paying interest.

This paper examines whether, how, and why NCD is related to health behavior, such as smoking and excess weight. The results show that women who smoke or are obese and men who are overweight or obese are more likely to reside in families that hold NCD. For example, families where either wife or husband is obese are, on average, about 7 percentage points more likely to hold NCD. Similarly, families where women smoke are, on average, 4 percentage points more likely to hold NCD. These associations remain almost unchanged after controlling for income, education, net family wealth, family medical expenditures and basic demographic characteristics, such as age, race, ethnicity and household composition. Fixed effects estimates show that unobservable factors confound estimates of the relationship between health behaviors and NCD. Accounting for a family-specific effect dramatically reduced estimates of the association between obesity and NCD. Additional estimation showed no association between having NCD and the level of psychological distress of the respondents. Finally, we verified that the effect of health behaviors on the decision to hold NCD is not particular only to the families with high amounts of NCD. The results show that poor health behaviors are associated with a higher probability to hold NCD across the entire distribution of NCD. Overall, these results are consistent with the hypothesis that the correlation between health behaviors and NCD is driven

[1] Non-collateralized debt (NCD) includes credit card debt, student loans, medical or legal bills, loans from relatives, and other such debts
[2] Source: 1995 Survey of Consumer Finance cross-section.

by third factors. These third factors are correlated with health behaviors as well as debt, causing the observed correlation. The theoretical review in this paper suggests several plausible candidates for the role of these third factors: time preferences, risk aversion, self-control, etc.

The remainder of the paper is set out as follows: the following section discusses various factors shaping the decision to hold NCD. Next, various possible mechanisms behind the relationship between health behaviors and NCD are outlined. The data and empirical approach are then discussed and the estimation results are presented. The final section concludes with a discussion of results.

Risk Aversion, Time Preferences, Self-Control and Non-Collateralized Debt

Liquidity Constraint

Non-collateralized debt (NCD), as defined in this paper, includes credit card debt, student loans, medical or legal bills, loans from relatives, and other such debts. NCD is often related to the household's liquidity constraint, and to its socio-economic status, such as its wealth, income, and education. Households with more wealth, income and education are less likely to experience a liquidity constraint and, therefore, are less likely to hold NCD. However, controlling for household characteristics, such as income, wealth, education, age[3], and other indicators of socio-economic status fails to explain much of the variation in household debt.

One of the traditional explanations for such variation is that two households with the same income, education and wealth may still have different likelihoods of experiencing liquidity constraints. When a member of a household has a health problem, the household is much more likely to have high out-of-pocket medical expenses and is much more likely to face a liquidity constraint. Indeed, households struggling with high out-of-pocket medical expenses are much

[3] Life-cycle plays an important role in explaining consumer debt (Baek and Hong (2004)). However, life-cycle and permanent income models do not necessarily explain them entirely (Deaton (1992)).

more likely than other families to report difficulties in paying their bills (Merlis et al. (2006)). Moreover, medical bankruptcy became a widespread phenomenon that affects not only poor but also middle class families (Himmelstein et al (2005), Himmelstein et al (2006)). Therefore, poorer health could lead to higher medical expenditures and higher probability of unpaid medical bills and accumulated NCD.

Alternatively, households with identical wealth may have different attitudes toward risk. Households with lower risk aversion would invest more in riskier, more illiquid assets (Rosen and Wu (2004)). Liquid assets are more likely to be used to finance consumption than illiquid assets. Thus, other things being equal, households with fewer liquid assets are more likely to be liquidity constrained and more likely to borrow. Accordingly, NCD, conditional on socio-economic status, may reflect lower risk aversion.

Empirical evidence supports the latter viewpoint. For example, Castronova and Hagstrom (2004) report that, conditional on income, wealth, and education, risk averse individuals demand lower limits on their credit cards. Min and Kim (2003) report that, conditional on income, wealth, and education, risk averse individuals are likely to borrow smaller amounts on credit cards and are less likely to experience a credit constraint. Godwin (1998) finds, conditional on income, home equity and education, higher risk aversion is associated with a greater likelihood of being in a lower consumer debt quintile[4].

Time Preference and Self-Control

Other factors besides liquidity constraints may also help to explain variation in NCD. The economic literature provides evidence that credit card borrowers are not necessarily those who do not have enough liquid or other assets to finance their consumption. Gross and Souleles

[4] Consumer debt was the total balances owed on all credit cards, installment loans, and other debts. Installment debt included home improvement, auto, durable goods and such.

(2002) show that a third of credit card borrowers have more than one month of gross total household income in liquid assets. These assets could instead have been used to reduce their credit card debt. In addition, Laibson et al. (2003) find that the median householder borrows aggressively on credit cards but still carries a substantial amount of illiquid wealth. Thus, NCD, and credit card debt as a particular example of it, co-exists with substantial holdings of both liquid and illiquid assets (this phenomenon is sometimes referred to as the "borrow to save puzzle").

Hyperbolic time preferences may provide an insight into why such debt co-exists with substantial holdings of illiquid assets (Liabson et al. (2003) and Angeletos et al. (2001)). Individuals with hyperbolic time preferences discount over short horizons at a higher rate than over long horizons[5]. Such individuals demonstrate short term impatience that may drive credit card debt and NCD accumulation as well as long term patience that may drive pre-retirement wealth accumulation.

However, the hyperbolic time preference framework does not necessarily explain the entire puzzle. For instance, it fails to explain the co-existence of credit card debt with substantial holdings of short term liquid assets. Bertaut and Haliassos (2003, 2005) and Haliassos and Reiter (2003) suggested that accounting for the lack of self-control resolves this inconsistency. The hypothesis is that those who or whose spouses exhibit compulsive shopping behavior and experience self-control problems may control their household financial behavior by restraining the amount of unused credit line available to them. This may help to explain why accumulated

[5] Suppose that when confronted with the choice between $10 today and $11 tomorrow an individual prefers immediate payment of $1. However, the same individual chooses $11 in 101 days over $10 in 100 days, even though the distance between both payments is still one day. Such preferences would be an example of hyperbolic time preferences.

credit card debt and other similar types of NCD coexist with substantial liquid asset accumulation.

Human Capital Investment

Previous research has shown that level of education is positively related to the probability of holding a credit card and negatively related to the probability of having revolving card debt for those who have a credit card (Min and Kim (2003), Baek and Hong (2004), Kim and DeVaney (2001)). Overall, level of education is positively related to the amount of credit card debt (Chain and DeVaney (2001)). However, credit card debt is not the only type of NCD that is associated with education. While education leads to human capital accumulation, such accumulation comes at a cost. Those who ever went to college are also likely to have student loans. It has been long argued that those who are more future-oriented (who have a high degree of time preference for the future or discount it at a modest rate) attain higher levels of education (Fuchs (1982)). This introduces an interesting paradox: different types of NCD may be related to time preferences in a different way. While credit card debt may reflect a lower valuation of the future, student loans, another type of NCD, may reflect a higher valuation of the future.

In summary, theoretical and empirical evidence suggest the nature of NCD may be quite complex. First, it may reflect liquidity constraints faced by a household. Households with lower income, lower wealth, lower education level, poor health and lower risk aversion are more likely to experience a liquidity constraint and are more likely to accumulate NCD. Second, NCD could reflect personality and preference factors, such as hyperbolic discounting and lack of self-control. It has been suggested that higher short term impatience and lack of self-control may lead to a higher probability of having credit card debt, while smaller short term impatience and presence of self-control may lead to a lower probability of having credit card debt. Finally, NCD,

and student loans in particular, may signal human capital accumulation and higher valuation of the future.

Health Behaviors and Non-Collateralized Debt (NCD)

This section is devoted to a discussion of how and why NCD, conditional on socio-economic status, could be related to health behavior. The first hypothesis suggests that poorer health behaviors may directly shape NCD. Wu (2003) shows that conditional on education, income, initial wealth, and initial health, serious health shocks have strong negative effects on household wealth. As discussed in the previous section, a family experiencing such a health shock is more likely to experience a liquidity constraint and therefore more likely to finance it by NCD. Since individuals with poorer health behaviors are more likely to experience health shocks, poorer health behaviors of household members may increase the likelihood of having NCD.

The second hypothesis suggests that there are common factors, such as preferences or behaviors that shape both health behaviors and NCD. As reviewed in the previous section, time preference, risk aversion, and self-control could shape NCD. Additionally, a higher valuation of the future, higher risk aversion, and better self-control have been shown to relate to better health behaviors (i.e., Barsky et al. (1997), Fuchs (1982), Lahiri and Song (2000), Sato and Ohkusa (2003), Smith et al. (2005), Feng (2005), Gruber and Koszegi (2004)). Therefore, the correlation between poorer health behaviors and NCD may not necessarily be caused by poorer health behaviors. Such correlation may result from statistical endogeneity and reflect individual preferences.

Finally, NCD may directly cause poorer health behaviors by placing additional stress and frustration on household members (Drentea and Lavrakas (2000)). For example, using a survey

from Ohio, Drentea (2000) finds that anxiety is positively associated with having credit card debt and with missing a minimum payment requirement on a credit card. While such correlation does not necessarily imply causation, credit card debt might be especially conducive to anxiety. For example, such credit card debt may be assumed to be the result of prodigal habits and, therefore, be more embarrassing than being behind on the mortgage or car payment. Thus, the third hypothesis is that debt may cause additional stress, frustration, or anxiety that may result in poorer health habits.

Data and Empirical Approach

The data used in this study are from the Panel Study of Income Dynamics (PSID), a longitudinal data collection based on a nationally representative sample of U.S. individuals (men, women, and children) and the family units in which they reside. The PSID began in 1968 and has been conducted annually until 1997 and biannually since then. The PSID concentrates on dynamic aspects of economic, health, and demographic behavior. The sample grew from the original 4,800 family units in 1986 to over 8,400 family units in 1996, and 7,822 family units in 2003.

Since the detailed health behavior modules were added to the PSID in the 1999, 2001, and 2003 waves, the sample used in this study was restricted to individuals present in at least one of these three waves. Next, because financial and health decisions made by individuals may vary by marital status and gender, separate analysis by marital status and gender are warranted[6]. Due to sample size constraints, the analysis in the paper is limited to married couples only[7]. Also, the

[6] For example, while married individuals are more likely to have credit cards and more likely to have revolving credit card debt (Min and Kim (2003)) than single individuals, women are less likely than men to smoke and are more likely than men to have healthy weight (National Center for Health Statistics (2005)).

[7] In the appendix, the analysis of results for single men and single women is presented. The subsample of single men is so small that the regression coefficients are not precisely estimated and it is difficult to draw any conclusions from these results. The subsample of single women is larger and probit regression gives more precise estimates. However,

sample is restricted to households in which the household head and his spouse were within the prime working age range of 25-60 years old at the time of the survey. The age restriction implies that the household head and his spouse are old enough to have likely completed their education and have at least a few years of working experience. The age restriction also implies that the household head and his wife are still in their active working years and are not likely to have retired[8].

Table 1 shows how the sample size evolves once the sample restrictions are implemented. After all of these restrictions are applied, the sample consists of an unbalanced panel of 2,499 households in the 1999 wave, 2,442 households in the 2001 wave, and 2,651 households in the 2003 wave. The resulting sample consists of 7,592 household-year observations.

Wealth and NCD Measures

The 1999-2003 waves have a comprehensive wealth supplement that provides a measure of household wealth as the total amount of money in real estate (including main home), checking or saving accounts, and other financial instruments net of mortgage debt and net of NCD[9]. Median total net wealth (in 2003 dollars) is $84,490. The NCD measure, used in the 1999-2003 waves, includes credit card debt[10], student loans, medical or legal bills, loans from relatives, and other such debts[11]. According to Table 2, about 58 percent of households in the sample have

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the fixed effects results for single women are very imprecise. Since these results provide similar evidence with married couple subsample, they are not included into the main part of the paper.

[8] Retirees are excluded from the sample since their decision making is likely to differ compared to prime age workers. For example, households appear to reduce their consumption expenditures substantially around the age of retirement ((Hamermesh (1984)), Lundberg et al. (2003)). This puzzling behavior is often referred to as the "retirement-consumption puzzle" and relates to increased use of non-market time.

[9] Other financial instruments include money market funds, certificates of deposits, government saving bonds or treasury bills, vehicles, farms, businesses, stocks, bonds, mutual funds, IRAs, bond funds, cash value of life insurance policies, valuable collections for investment purposes. Note also that the wealth measure does not include the present value of Social Security or the present value of defined benefit pension plans or the asset value of defined contribution pension accounts.

[10] Credit card debt is supposed to include the unpaid credit card balance rather than the monthly statement bill.

[11] Debt measures used in this paper do not include vehicle loans or loans on farms and businesses. Instead, respondents provide the value of their vehicles' net of debt owed on these vehicles and the value of their farm and

NCD. Measured in 2003 dollars, the mean and the median NCD are $13,523 and $6,000, respectively, which suggests that the distribution of NCD is positively skewed.

Unfortunately, the PSID does not report separately on the subcategories that form NCD. However, we can get an insight on the structure of NCD from another data set: the Survey of Consumer Finances (SCF). According to the Survey of Consumer Finances (Bucks, Kennickell, and Moore (2006a, 2006b)) 46.2 percent of families were holding credit card debt in 2004, 13.5 percent were holding education loans, and 8.5 percent were holding other types of installment debt[12]. Other types of installment debt include loans for furniture, appliances, recreational equipment and other durable goods, loans for medical bills, and other such loans. This suggests that credit card debt is by far the most prevalent type of NCD. While much less frequent than credit card debt, education loan debt or other installment debt tends to be larger in size than credit card debt. For example, in 2004, the mean credit card debt was $5,100 while the mean education loan (for those families that hold an education loan) was $16,700 and the mean of other installment debt (for those families that hold such debt) was $18,700 (Bucks, Kennickell, and Moore (2006a, 2006b)). Summing up, the evidence suggests that those who have NCD are more likely to hold credit card debt than any other NCD. At the same time, those who hold particularly large amounts of NCD are more likely to hold education loans, loans for furniture, appliances, recreational equipment and other durable goods, loans for medical bills, and other such loans.

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business net of the debt owed on the farm or business. The respondent householder answers the question: "Aside from the debts that we have already talked about, like any mortgage on your main home or vehicle loans, do you or anyone in your family currently have any other debts, such as credit card charges, student loans, medical or legal bills, or loans from relatives?"

[12] The SCF has two serious limitations that preclude its use instead of the PSID in this paper. First limitation is that the SCF does not provide the information on height and weight of the respondent family member and his/her partner. Thus, the strong relationship between weight status and NCD that was found in the PSID cannot be considered in the SCF. The second limitation is that, unlike the PSID, the SCF is a cross-sectional study which does not allow for the use of the fixed effects estimators.

Health Behavior Measures

The 1999-2003 waves include measures of health and health habits, such as information on whether individual smoke, their height and weight and responses to questions on psychological distress. Height and weight data are used to construct an individual Body Mass Index (BMI) which is used to classify individuals as overweight or obese[13]. About 25% of men and 19% of women in the sample are obese while 49% of men and 26% of women are overweight. Additionally, Table 2 shows that 21% of men and 16% of women in the sample smoke.

NCD and Health Behaviors: Mean Comparison and Empirical Approach

The PSID data measures wealth and debt at the household or family level. Health and health behaviors are measured at the individual level for both husband and wife. While the saving, debt accumulation, and debt payment decisions are made at the household level, the relative influence of spouses in these decisions is not measured. Yet, there is evidence that financial decision making within a household is consistent with the bargaining model and that spouses bargaining power is related to their education and wages (Elder and Rudolph (2003). Not only do men and women play different roles in financial decision making, they also play different roles in household production. Women still do 70 percent of the cooking, cleaning, grocery shopping, laundry, washing dishes, performing repairs, paying bills, and caring for children (Bird (1996)). If a wife is a primary manager of household consumption, then her illness would be more likely to increase daily living expenses than the illness of her husband. For example, Wu (2003) shows that serious health conditions of women have a larger and more

[13] A person is considered to be obese if he or she has a Body Mass Index (BMI) of 30 or above. A person is considered to be overweight if he or she has a BMI between 25 and 3. BMI equals individual weight in kilograms divided by individual height in meters squared. For example, an individual of height 6'3'' weighing 220 lbs would have a BMI of 27.5.

significant effect on household wealth than serious health conditions of men. Therefore, this paper relates the family's decision to hold NCD to health behaviors decisions of husband and wife, controlling separately for health behaviors of each spouse.

Table 3 shows that men and women with poorer health behaviors are associated with a higher likelihood of NCD. In particular, obese or overweight men and women are, on average, 4-5% more likely to reside in families that hold NCD, while women smokers are about 2% more likely to reside in families with NCD.

In the empirical work that follows, we estimate models of the form:

$$NCD_{it} = \alpha + \beta_1 HealthBehaviorsHd_{it} + \beta_2 HealthBehaviorsWf_{it} + \delta X_{it} + \varepsilon_{it} \qquad (1)$$

where NCD_{it} is a dummy variable that equals one if household i holds outstanding non-collateralized debt at the year $t=1999,2001,2003$. $HealthBehaviorsHd_{it}$ and $HealthBehaviorsWf_{it}$ correspond to measures for the health behaviors of husband and wife in household i at year t. These measures include indicators as to whether a person is a smoker, whether a person is obese, and whether a person is overweight. Thus, these three health behavior variables are entered separately into the regression analysis for each of two spouses. Vector X_{it} includes other regressors reflecting socioeconomic differences and ε is the disturbance term. Equation (1) is estimated as pooled probit with robust standard errors.

Those who engage in poorer health behaviors may differ from those who do not on the basis of both observable and unobservable characteristics. As a result of the latter, the decision to engage into these health behaviors could be endogenous. Thus, estimates from equation (1) of the impact of health behaviors on the likelihood of having NCD cannot, in general, be interpreted as *causal.* Possible endogeneity could come from two sources. First, according to the common factor hypothesis discussed in the previous section, unmeasured components of ε are likely to be

correlated with both health behaviors and the decision to hold NCD (statistical endogeneity). Second, as discussed in the previous section, poorer health behaviors could be caused by NCD (structural endogeneity, or reverse causality). For example, NCD can cause poor health behaviors through increased psychological stress or limited access to health care. Consequently, two different approaches were used to address these statistical problems.

The first method relies on the estimation of a series of specifications, with each specification including additional variables. While it is not possible to control for all sources of heterogeneity, the pattern of the coefficients and its change as other covariates are added should be informative. For example, if estimates are relatively unaffected by the addition of several variables that are strongly correlated with NCD behavior, it is reasonable to conclude that there is relatively little selection on either observed variables. This is often referred to in the literature as estimating the "long form" and the "short form" models. Given the richness of the PSID, it is possible to include a wide range of controls for the individual and family characteristics.

The second method takes advantage of the panel structure of the data. The identifying assumption of the fixed effects procedure is that the correlation between health behaviors and the unmeasured determinants of NCD in equation (1) is due to an unmeasured, time-invariant, family-specific effect. Complimenting short/long form approach with an alternative way(s) to address the endogeneity, such as instrumental variables (Williams (2005)) or fixed effects (Aughinbaugh and Gittleman (2004), Cook and Moore (2001)) is quite common in the health economics literature.

We acknowledge that neither of these two approaches address structural endogeneity. Given the data limitations, there does not seem to be an ideal way to address this problem.[14]

[14] The multivariate probit model has the potential to control for both statistical and structural endogeneity. To be effective, the multivariate probit model requires valid exclusion restrictions —variables that determine health

However, the 2001 and 2003 waves of the PSID capture the psychological well-being of the respondents by a 6-item 30-day distress measure called the K-6[15] (Kessler et al. (2002)). We examine whether respondents in the families holding NCD are more likely to be in psychological distress. While this exercise does not really answer the question of whether NCD can cause poorer health behaviors by putting additional stress and anxiety on the family member, it can still be informative. For example, if psychological distress measures are relatively unaffected by NCD, it may be reasonable to suppose that structural endogeneity may be relatively less important.

Another issue that arises is whether the decision to hold debt matters more than the amount of NCD. Theory does not seem to provide a clear answer to this question. In the final set of models, we compare the effect of health behaviors on the decision to hold NCD with the effect of health behaviors on the decision to hold large amounts of NCD.

Results

Table 4 summarizes the results from our first approach to estimating the impact of health behaviors on NCD. Three different specifications are used. In the first, only health behavior variables are included as regressors. These include two sets of measures, one for each of the two spouses that indicates whether a spouse is obese, overweight or a smoker. The other three specifications include various socioeconomic and demographic characteristics. Some of these

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behaviors, but do not affect NCD behavior. Average state cigarette prices and fast food prices could be used for such purposes. However, for this identification strategy to be effective, it is necessary to have data for a long period of time, so that there is sufficient within and across state variation in these variables and relatively large samples to insure precise estimates. Unfortunately, there is not enough variation in these price measures in our sample.

[15] This measure asks respondents how frequently in the past 30 days they have felt sad, nervous, restless, hopeless, and worthless on a scale from none of the time (0) to all of the time (4). The scale is constructed by simply summing the values obtained (from 1-4) on each of the six symptoms, yielding a score ranging from 0-24. A score of 13 or higher indicates sensitivity around the threshold for the clinically significant range of the distribution of nonspecific distress. The measure is available for the 2001 and 2003 waves but not for the 1999 wave. This measure is reported directly by the respondent with the reporting being about equally split between husbands and wives in married couples.

characteristics can be assumed to be independent of the unobserved heterogeneity that determines current NCD use while others are choice variables and may be endogenous to the NCD decision.

In the second specification, we include a basic set of exogenous covariates: age, race, ethnicity, interaction terms between age and race/ethnicity variables, year dummies and region dummies. The third specification includes additional covariates that potentially could be endogenous: the income to needs[16] ratio (linear, squared and cubed), total net wealth (spline at median), highest level of education attained for husband and wife (college, some college, high school), white collar job dummies for husband and wife, number of children in the household, a health insurance dummy[17], a home ownership dummy, and number of weeks unemployed in the past year. Additionally, the fourth specification includes a measure of total out-of-pocket medical expenditures during the two years, prior to the interview. If the impact of poorer health behaviors is a consequence of additional unpaid medical bills, the inclusion of the out-of-pocket medical expenditure variable should account for these effects.

Table 4 summarizes results, reporting coefficients, standard errors and the marginal effects of poor health behaviors on the probability of having NCD. Estimates from the first specification show that obese men are about 8 percentage points more likely to live in families with NCD and obese women are about 6 percentage points more likely to do so. Overweight status in men is associated, on average, with a 5 percentage point higher likelihood of living in a family with NCD and smoking for women is associated with a 4 percentage point higher

[16] The income to needs ratio equals total family income over an annual needs standard. The annual needs standard reflects the poverty threshold and was taken from U.S. Census' Current Population Reports, Series P-30, Poverty in the United States. The threshold values are based on family size, the number of persons in the family under age 18, and the age of the household head.

[17] Health insurance dummy equals one if one or more persons in the household were covered by health insurance during past two years.

likelihood of living in a family with NCD. The estimates from the other three specifications are very close to the unadjusted differences reported in column one. Neither the inclusion of basic demographic covariates, nor additional covariates that control for socioeconomic status, nor out-of-pocket medical expenditures change the magnitude of the effect of poorer health behaviors on NCD. Obesity in men and women is associated, on average, with about 7 percentage point increase in the probability that a family will hold NCD, while female smoking is associated, on average, with about 4 percentage point increase in this probability. Comparisons of the estimation results across various specifications indicate that there is very little selection on the observed characteristics.

Next, Table 5 summarizes the results from our second approach to estimating the impact of health behaviors on NCD. The first two columns present probit and OLS pooled cross-sectional estimates to show that the method of estimation makes little difference. Column three lists the fixed effects estimates[18]. These estimates are dramatically smaller than the cross-sectional estimates. For example, the probability that obese men and women reside in families with NCD is reduced from 6.5 percentage points in the cross-sectional OLS estimation to roughly 1.3-1.9 percentage point in the fixed effects OLS estimation. Similarly, the effect of female smoking on the probability of holding NCD goes down from 4.7 percentage points to 1.1 percentage points in the fixed effects model. This indicates that there is a substantial selection on time-invariant family-specific unobservable characteristics. At the same time, the effect of overweight status in men, while insignificant in the fixed effects model, remains somewhat

[18] Fixed effects logit/probit is likely to produce biased coefficient when only three time periods are used. For example, Hsiao (1993, 1996) demonstrates an example showing that in a logit fixed effects model with two time periods the sample bias was 100%. Similarly, Heckman (1981) found that fixed effects probit produced a bias of 8% in the Monte Carlo simulation study of a panel consisting of eight time periods. So, instead, OLS fixed effects model that produces consistent estimate that is easy to interpret and implement was used in the paper.

substantial: 3 percentage points. This leaves open the question of the importance of unmeasured, time-varying effects.

The fixed effects model neither addresses the question of unmeasured, time-varying effects nor does it address potential structural endogeneity. As discussed earlier, the size of the effect of NCD on the psychological distress of the respondents could be informative. Table 6 shows that whether a family has NCD has very small and insignificant effects on the probability of psychological distress in both men and women. This may indicate that structural endogeneity is not an important factor. However, it is not possible to rule out entirely the possibility that NCD could cause poorer health behaviors through anxiety and frustration.

So far the analysis has concentrated on the decision to hold NCD disregarding its magnitude. In this final section of the analysis we examine whether the relationship between NCD and health behaviors is driven by families with large amounts of debt. If the analysis shows that poor health behaviors are related to having large amount of NCD rather than to having any amount of NCD it may have several important implications. For example, it may mean that it is financial distress, and not merely holding debt, that is related to health behaviors. Alternatively, it may mean that loans for education and unpaid medical bills are driving the observed correlations rather than credit card debt. As discussed above, according to the Survey of Consumer Finances, those who have NCD are more likely to hold credit card debt than any other NCD. However, those who hold particularly large amounts of NCD are more likely to hold education loans, loans for furniture, appliances, recreational equipment and other durable goods, loans for medical bills, and other such loans than credit card debt. Thus, even though the data used in this project does not allow disaggregating NCD by its components, testing whether the relationship between NCD and health behaviors is driven by families with high amounts of NCD

provides an indirect test of what type of NCD is more likely to be behind the observed correlations.

To test for this hypothesis, we compare the estimated effect of health behaviors on the decision to hold NCD in the full sample and in the sample that excludes the families that are in the top 5% of NCD holders. Additionally, we estimate multinomial probit regression model to compare the effect of health behaviors on the decision to hold NCD across the four quartiles of the NCD distribution. The results are displayed in Table 7 and indicate the relationship between health behaviors and NCD is not unique to the families with high amounts of NCD. For example, the coefficients reflecting the effect of health behaviors on the decision to hold NCD in the full sample and in the sample that excludes the families that are in the top 5% of NCD holders are almost identical. Additionally, Table 7 shows that the effect of obesity and overweight status on the probability of having NCD in each of the four quartiles (1^{st} (lowest), 2^{nd}, 3^{rd}, 4rth (highest)) is very similar across all quartiles. These numbers are also very similar to the effect of obesity and overweight status on the probability of having any NCD. The effect of female smoking on NCD is slightly different. It seems that the previous results are driven by the families in the lowest two quartiles of debt. Summing up, the evidence presented in Table 7 suggests that the effect of health behaviors on NCD does not seem to be driven by the families with very high NCD[19]. This suggests that financial distress, unpaid medical bills[20], or education loans do not cause health

[19] We also compared the effect of health behaviors on the decision to hold NCD with their effect on the decision to hold large amounts of NCD. The latter was measured by the probability of holding the amount of NCD above the median value and by the probability of holding NCD above the total family annual needs amount. Results showed that the effects of health behaviors are stronger for the probability of holding NCD of any amount. For example, obesity in women is associated with 6.5 percentage point increase in the probability of holding NCD of any size and is associated with only a 1.4 percentage point increase in the probability of holding high amounts of NCD.

[20] We also examined whether having serious health conditions in 1999 predicted the onset of NCD between 2001 and 1999, and between 2003 and 1999. Additionally, we examined whether having serious health conditions in 2001 predicted the onset of NCD between 2003 and 2001. The list of serious conditions included stroke, hypertension,

behaviors and NCD to be correlated. Also, that this result is consistent with the earlier finding that the relationship between NCD and health behaviors is largely explained by unoservables that are correlated with both health behaviors and NCD.

Conclusions

Previous research has shown that attitude toward risk and time preferences may determine both health status and socioeconomic status, thereby causing the correlation between the latter variables (Meer et al. (2003), Barsky et al. (1997)). Additionally, previous research has also found that preferences play an important role in formation of health (see e.g. Fuchs (1982), Barsky et. al (1997)) as well as in formation of socio-economic status (see e.g. Gustman and Steinmeier (2005)). This paper connects these three streams of literature by examining the relationship between two types of behaviors that contribute to the formation of health and socio-economic status: health behaviors and a decision to hold NCD.

In this study, we have examined how and why spouses' health behaviors, such as smoking, and excess weight are related to the family decision to hold NCD. Results show that poorer health behaviors are related to a higher probability of having NCD. For example, obesity in men and women is associated with about a 7 percentage point increase in the probability of living in a family with NCD. Also, overweight status in men is associated, on average, with a 5 percentage point higher likelihood of living in a family with NCD and smoking for women is associated with a 4 percentage point higher likelihood of living in a family with NCD. However, due to possible statistical and structural endogeneity, these estimates cannot be interpreted as causal. Two statistical approaches were used to evaluate whether the positive relationship between poorer health behaviors and NCD remained when the analysis controlled for both

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diabetes, cancer, lung disease, heart attack, heart disease, arthritis, and asthma. The results show that health conditions do not predict the onset of NCD. The estimates are available from the author upon request.

measured and unmeasured heterogeneity. The first approach relies on the estimation of a series of specifications, with each specification including additional variables describing demographic characteristics and socioeconomic status. The second approach utilizes a family-specific fixed effects model, taking advantage of the panel structure of the data.

Overall, estimates applying these approaches (Tables 4 and 5) suggest that while there is very little selection on the observed characteristics, there is a large amount of selection on unobserved characteristics. On the one hand, neither basic demographic covariates, nor additional covariates that control for socioeconomic status, nor out-of-pocket medical expenditures change the magnitude of the effect of poorer health behaviors on NCD. On the other hand, family-specific fixed effects estimates are dramatically smaller than cross-sectional estimates and become insignificant. For example, the effect of obesity on the probability of residing in families holding NCD is reduced from 6 percentage points in the cross-sectional OLS to roughly 1.5 percentage points in the fixed effects OLS. Similarly, the effect of female smoking on the probability of holding NCD goes down from 4 percentage points to 1 percentage point in the fixed effects model. The small amount of selection on observed characteristics and the large amount of selection on unobserved family-specific characteristics suggest that the association between health behaviors and NCD is not causal. Additionally, we find that the relationship between health behaviors and NCD is not unique to the families holding large amounts of debt and is observed throughout the NCD distribution. All these pieces of evidence are consistent with the hypothesis that other factors, such as time preferences, risk aversion and self-control maybe causing the correlation between health behaviors and NCD.

Nevertheless, it is not possible to completely rule out that the correlation represents a true causal effect. For example, according to cross-sectional models, overweight men are about 5

percentage points more likely to live in families with NCD. The effect of overweight status in men on the probability of holding NCD, while insignificant in the fixed effects model, remains quite substantial: 3 percentage points.

The present study has other limitations. For example, the fixed effects model does not account for unmeasured time-varying factors. For example, it is likely that time preferences could change with age (Bishai (2004)). Thus, the fixed effects methodology may not be adequate. Also, the possibility of structural endogeneity, i.e. reverse causality, should be examined in greater detail. While the present study shows that NCD is not associated with non-specific psychological distress, it does not rule out entirely the possibility that NCD could cause poorer health behaviors through anxiety and frustration. Finally, while the paper argues that family-specific unobservable characteristics play an important role in the association between poorer health behaviors and NCD, the nature of such characteristics remains unclear.

The findings of this paper have potentially very important implications with regard to public policy. If the correlation between health behaviors and NCD is a spurious correlation due to such factors as time preferences, risk aversion, and self-control then public policy affecting health behaviors would not be an effective tool in reducing consumer debt. Similarly, policies targeted at reducing consumer debt may not be likely to affect health behaviors.

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TABLE 1
Data Restrictions and Sample Size

	Survey Year		
	1999	2001	2003
Total Number of Households	6,995	7,404	7,822
Married/Cohabiting Couple Households	3,950	4,204	4,298
Add Age Restriction	3,072	3,255	3,343
Number of Households with Missing Data	573	813	692
Number of Households with Missing BMI Among Households with Missing Data	554	790	657
Add No Missing Data Restriction	2,499	2,442	2,651
Results in 7,592 Household-Year Observations			

TABLE 2
Unweighted Descriptive Statistics of the Sample

Sample Characteristic	
NCD measures	
Whether Family Has NCD, %	58.47
Mean NCD, If Any in 2003 Dollars	13,523
Median NCD, If Any in 2003 Dollars	6,000
Whether NCD Above Median, %	31.44
Whether NCD Above Annual Needs, %	13.45
Income	
Mean Total Annual Family Income to Annual Census Needs Ratio	5.51
Median Total Annual Family Income to Annual Census Needs Ratio	4.35
Wealth	
Mean Net Wealth, in 2003 Dollars	261,728
Median Net Wealth, in 2003 Dollars	84,490
% Obese Among	
…Husbands	24.57
…Wives	19.02
% Overweight Among	
…Husbands	48.54
…Wives	25.71
% of Smokers Among…	
…Husbands	21.60
…Wives	16.12
Highest Level of Education Attained by Husband	
College Degree, %	32.97
Some College, %	19.28
High School or GED, %	31.93
Highest Level of Education Attained by Wife	
College Degree, %	29.07
Some College, %	25.63
High School or GED, %	32.56
Whether Black Race, Husband; %	20.63
Whether Hispanic or Other Race, Husband; %	8.50
Total 7,592 Family-Year Observations	

TABLE 3
NCD and Health Behaviors: Mean Comparison

	Male			Female		
	No NCD	NCD	Difference	No NCD	NCD	Difference
Obese, %	21.92	26.45	-4.53**	16.43	20.86	-4.43**
Obese or Overweight, %	69.90	75.38	-5.48**	42.47	46.34	-3.87**
Smoker, %	21.60	21.60	-.01	14.94	16.96	-2.03**

There are 3,153 and 4,439 Family-Year Observations without and with NCD
Asterisks (**) next to a number indicate that the difference between individuals residing in households with and without NCD is statistically significant at 5% level.

TABLE 4
Probit Models: Estimates of the Effect of Obesity and Smoking on the Probability of Having NCD

	Probit Models for the Probability of Having Any NCD			
	Health Behavior Covariates Only	Add Basic Covariates	Add Additional Covariates	Add Medical Expenditures
Obese, Husband	.2121***	.2168***	.1954***	.1861***
	(.0512)	(.0517)	(.0519)	(.0518)
	[.0815]	[.0831]	[.0747]	[.0712]
Obese, Wife	.1608***	.1962***	.1878***	.1712***
	(.0500)	(.0517)	(.0529)	(.0528)
	[.0619]	[.0751]	[.0716]	[.0654]
Overweight, Husband	.1302***	.1432***	.1379***	.1365***
(Normal or Underweight Husband is	(.0421)	(.0424)	(.0428)	(.0429)
Excluded Variable)	[.0507]	[.0557]	[.0534]	[.0528]
Overweight, Wife	.0135	.0607	.05	.0392
(Normal or Underweight Wife is	(.0404)	(.0410)	(.0420)	(.0422)
Excluded Variable)	[.0053]	[.0235]	[.0193]	[.0152]
Smoker, Husband	-.0304	-.0229	-.0147	-.0171
(Non-Smoker Husband is Excluded	(.0468)	(.0473)	(.0481)	(.0479)
Variable)	[-.0119]	[-.0089]	[-.0057]	[-.0066]
Smoker, Wife	.1123**	.0809	.1188**	.1083**
(Non-Smoker Wife is Excluded	(.0512)	(.0515)	(.0526)	(.0524)
Variable)	[.0433]	[.0313]	[.0456]	[.0416]
Basic Covariates	No	Yes	Yes	Yes
Additional Covariates	No	No	Yes	Yes
Medical Expenditure	No	No	No	Yes
Pseudo R^2	.0058	.0264	.0708	.0793
Number of Observations	7,592	7,592	7,592	7,592

Notes:
1. Standard errors in parentheses.
2. Marginal effects in brackets. Marginal effects were approximated using the discrete change from zero to one for discrete variables.
3. Basic set of covariates are: race and ethnicity dummy variables (Black; Hispanic and other), age, age interacted with race and ethnicity dummy variables, year dummies, region dummies. Omitted categories include white non-Hispanic, year 1999 and north central region dummies.
4. Additional covariates are: income to needs ratio (linear, squared and cubed), total net wealth (spline at median), highest level of education attained for husband and wife (college, some college, high school), white collar job dummies for husband and wife, number of children in the household, health insurance dummy, home ownership dummy, number of weeks unemployed in the past year. Omitted categories include high school or less dummy.
5. * Significant at 10% level; ** Significant at 5% level; *** Significant at 1% level.

TABLE 5
Fixed Effects Estimates of the Effect of Obesity and Smoking on the Probability of Having NCD

	Probability of Having Any NCD		
	Probit Model	OLS Model	OLS Fixed Effects Model
Obese, Husband	.1954*** (.0519) [.0747]	.0658*** (.0189)	.0132 (.0329)
Obese, Wife	.1878*** (.0529) [.0716]	.0636*** (.0187)	.0198 (.0336)
Overweight, Husband (Normal or Underweight Husband is Excluded Variable)	.1379*** (.0428) [.0534]	.0454*** (.0158)	.0314 (.0225)
Overweight, Wife (Normal or Underweight Wife is Excluded Variable)	.05 (.0420) [.0193]	.0109 (.0154)	-.0213 (.0216)
Smoker, Husband (Non-Smoker Husband is Excluded Variable)	-.0147 (.0481) [-.0057]	-.0078 (.0176)	.0094 (.0308)
Smoker, Wife (Non-Smoker Wife is Excluded Variable)	.1188** (.0526) [.0456]	.0472** (.0190)	.0114 (.0344)
Basic Covariates	Yes	Yes	Yes
Additional Covariates	Yes	Yes	Yes
Medical Expenditure	No	No	No
Fixed Effects	No	No	Yes
Number of Observations	7,592	7,592	7,592

Notes: See notes to Table 4

TABLE 6
Probit Models: Estimates of the Effect of Having NCD of Psychological Distress measure (K-6)

	Probit Model for Probability of Being in Psychological Distress	
	Male	Female
NCD	.1952 (.1378) [.0069]	-.12737 (.0958) [-.0098]
Number of Observations	2,121	2,972

Notes:
1. Standard errors in parentheses.
2. Marginal effects in brackets. Marginal effects were approximated using the discrete change from zero to one.

TABLE 7
Comparing the Effect of Health Behaviors on Having NCD across NCD Size

	Probit Models for Probability of Having…		Mutinomial Probit Model for the Probability of Having NCD in …			
	Any NCD	Any NCD (Top 5% Debt Excluded)	1st Quartile (Lowest Debt)	2nd Quartile	3rd Quartile	4th Quartile (Highest Debt)
Obese, Husband	.1956***	.1919***	.2649***	.2069**	.2119**	.2841***
	(.0519)	(.0526)	(.0804)	(.0825)	(.0833)	(.0887)
Obese, Wife	.1877***	.1804***	.2339***	.2836***	.1809**	.2316***
	(.0529)	(.0536)	(.0803)	(.0814)	(.0830)	(.0904)
Overweight, Husband	.1381***	.1294***	.1754***	.1553**	.1771***	.1796**
(Normal or Underweight Husband is Excluded Variable)	(.0428)	(.0435)	(.0680)	(.0684)	(.0682)	(.0738)
Overweight, Wife	.0498	.0422	.01374	.0622	.0965	.0563
(Normal or Underweight Wife is Excluded Variable)	(.0420)	(.0428)	(.0665)	(.0689)	(.0672)	(.0739)
Smoker, Husband	-.0148	-.0071	.0178	-.0126	-.0605	-.0003
(Non-Smoker Husband is Excluded Variable)	(.0481)	(.0486)	(.0754)	(.0741)	(.0765)	(.0866)
Smoker, Wife	.1186**	.1359**	.1988**	.2519***	.0683	.0616
(Non-Smoker Wife is Excluded Variable)	(.0526)	(.0533)	(.0802)	(.0817)	(.0853)	(.0942)
Basic Covariates	Yes	Yes	Yes			
Additional Covariates	Yes	Yes	Yes			
Medical Expenditure	No	No	No			
Number of Observations	7,592	7,113	7,592			

Notes: See notes to Table 4

TABLE A1
Data Restrictions and Sample Size for Single Person Households

	Survey Year					
	1999		2001		2003	
	Male	Female	Male	Female	Male	Female
Total Number of Single Person Households by Gender	958	2,087	1,039	2,161	1,195	2,329
Add Age Restriction	702	1,361	763	1,447	884	1,569
Add No Missing Data Restriction	684	1,290	737	1,374	792	1,439
Results in 1,421 Male and 4,103 Female Household-Year Observations						

TABLE A2
Probit Models: Estimates of the Effect of Obesity and Smoking on the Probability of Having NCD for Single Males and Females

	Probit Model for Probability of Having Any NCD	
	Male	Female
Obese	-.0278	.1191*
	(.1110)	(.0625)
	[-.0109]	[.0473]
Overweight	.0399	.1095*
(Normal or Underweight are Excluded	(.0894)	(.0600)
Variables)	[.0157]	[.0435]
Smoker (Non-Smoker is Excluded	.0371	-.0668
Variable)	(.0904)	(.0549)
	[.0146]	[-.0266]
Basic Covariates	Yes	Yes
Additional Covariates	Yes	Yes
Medical Expenditure	No	No
Pseudo R^2	.1546	.1045
Number of Observations	1,421	4,103

Notes: See notes to Table 4