

An Empirical Investigation of the Relationship Between Wealth and Health Using the Survey of Consumer Finances

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We explore the relationship between health and wealth and between health and income using the Survey of Consumer Finances. We focus on the working-age population, describing the shape of the health-income and health-wealth gradients for individuals between ages 25 and 54. We find that the health-wealth relationship is weaker than the health-income relationship, and whereas health differences persist throughout the wealth distribution, there appears to be a threshold effect such that wealth increments are particularly important for health at the low end of the wealth distribution.

1. INTRODUCTION

The nature of the relationship between income and health has fascinated researchers for decades. Somewhat surprisingly, this has not been the case for the relationship between wealth and health. We suggest that this is surprising because wealth may be a better measure of a person's economic resources than current earnings. The analysis of the link between income and health suggests a positive but declining marginal relationship between the two. Does the same relationship exist between health and wealth?¹ And does the suggested relationship between income and health, as first illustrated by Samuel Preston (1975), hold up once wealth has been taken into account? The few studies of health and wealth have in general been limited to older populations, particularly those sampled in the longitudinal Health and Retirement Study (HRS) and Assets and Health Dynamics among the Oldest Old (AHEAD) surveys. The findings from

these studies have suggested that among those nearing or past retirement age, greater wealth and better health are dynamically related, and that this link is stronger than the link between income and health. In this paper we describe the cross-sectional relationship between health and wealth and health and income for individuals between the ages of 25 and 54 in the United States.

Wealth may influence health through a variety of channels. Savings may provide crucial resources when an individual is struck by an unexpected health shock. For individuals with little disposable income, lack of wealth may limit the ability to receive the care they need or place them in situations with additional health risks. Identifying such a health-wealth link would provide individuals a strong incentive to save. This would be particularly relevant for the working-aged population that is still accumulating wealth. The study of the health-wealth relationship is also relevant to many questions asked by researchers of income and health. While income inequality may cause stress and thus poor health, wealth inequality may do so as well. And if affects employment outcomes, then it is likely to affect an individual's long-term savings or wealth.

Although study of the causal mechanisms of the health-wealth dynamics is necessary to answer these questions, characterizing the cross-sectional relationship between health, income, and wealth can provide information that supports or rejects certain hypotheses, or that raises other interesting research questions. Victor Fuchs (1982), for example, has suggested that "third variables" such as time preference may explain the links between socioeconomic status and health. Time preferences may influence the attainment of both health and wealth, resulting in the spurious positive correlation between the two. The Survey of Consumer Finances, the data

source used in this analysis, includes questions regarding individual time preferences for saving, allowing us to explore this hypothesis.

In the next section, we summarize the current literature on the relationship between health, income, and wealth. We then describe the Survey of Consumer Finances and the variables used in this study. A description of our methodological approach follows. The results section contains a detailed description of the cross-sectional relationship between health and wealth among individuals aged 25 to 54. This includes an analysis of health-wealth differences by age and by race group, and a characterization of the health gradient. In the final sections of this paper, we describe various sensitivity analyses and discuss the implications and limitations of our findings.

2. THE EVIDENCE TO DATE

The literature relating health to socioeconomic status (SES) has a long history (see recent reviews in Nancy Adler and Katherine Newman, 2002; Angus Deaton, 2001; Noreen Goldman, 2001; Stephanie Robert and James House, 2000a, 2000b). For the most part, however, the study of SES has been limited to measures of income, education, and occupation. In each of these cases, a strong positive relationship between health and SES has been established. More recent studies have explored the relationship between health, income, and income inequality (see recent reviews by Deaton, 2001; John Mullahy, Stephanie Robert, and Barbara Wolfe, 2001; Robert and House, 2000b; and Adam Wagstaff and Eddy van Doorslaer, 2000). There is a consensus among these authors that given the research to date, there is (1) a well-documented concave

relationship between individual income and health, but (2) little evidence that income inequality affects health.

The literature relating health to wealth is more limited. This is partly due to the difficulty in collecting wealth data and the limited availability of surveys that collect both wealth and health information in the United States. There is some evidence, however, that wealth and health are positively correlated. In a recent effort to identify optimal indicators of SES for health research, Greg Duncan et al. (2002) used the Panel Study of Income Dynamics (PSID) to compare measures of income, education, occupation, and wealth in predicting mortality. Although they found that wealth and family income were each associated with mortality net of education, occupation, age, sex, and race/ethnicity, they did not report the associations of assets and family income net of each other.

Studies that have attempted to evaluate the association between wealth and health net of other SES measures have suggested a positive relationship between the two. Using the Americans' Changing Lives Study, a cross-sectional national sample of adults in in 1986, Robert and House (1996) found that assets are associated with self-rated health, functional health, and a number of chronic conditions, over and above income, education, home ownership, and age, sex, and race. However, they were able to use only a crude dichotomous measure of assets, indicating whether people reported having less vs. more than \$10,000 in assets (minus home ownership, which was measured separately).

Additional evidence of a health-wealth link net of other SES measures comes from the Whitehall studies of British civil servants. These have found a negative correlation between mortality and such assets as cars and home ownership, net of occupation (Micahel Marmot et al.,

1987) and net of occupation and income (Said Shahtahmasebi et al., 1992). Finally, using data from a random-digit-dialing study in the state of Ohio, Patricia Drentea and Paul Lavrakas (2000) found that credit card debt was significantly related to both having physical impairments and living in poor self-reported health.

A number of recent studies have addressed the dynamic nature of the health-wealth relationship. The mechanisms through which wealth may be related to health have been described most recently by Goldman (2001).² Explanations for the health-wealth link can be categorized into three general types of mechanisms: ways in which health affects wealth; ways in which wealth influences health; and links between health and wealth that are due to other common correlates such as age or differences in individual time preferences (discount rates). The small set of studies that specifically analyze the relationship between health and wealth have in general attempted to address one or more of these possible mechanisms. They have also been limited to samples of older Americans.

Peter Adams et al. (2003) analyzed panel data from the AHEAD sample of individuals from households with at least one person over 70 in 1994. Their study of the causal relationship between wealth and health rejected the hypothesis that there are causal effects of SES on health when health is measured by acute illnesses. However, they could not reject the hypothesis that SES causes health conditions with gradual onset, such as mental illnesses, or that health shocks affect wealth.

James P. Smith (1999) used data from the HRS, limited to individuals over 50, to consider the effects of health shocks on individual wealth. Smith found a strong effect of new illness on both income and wealth. The onset of a minor illness among HRS respondents

resulted in a decrease of wealth accumulation averaging \$3,620 over a four-year period. The effects of a major illness were much larger. Smith found a \$17,000 reduction in wealth accumulation among these individuals. This reduction in wealth was compared to the increase in out-of-pocket health expenditures of \$635 and \$2,266 due to minor and major health shocks, respectively. It is unclear whether the remaining differences in wealth accumulation were due to effects of health on income and employment, or were a result of direct effects of health on wealth via other mechanisms.

In a related paper analyzing the AHEAD sample, Smith and Raynard Kington (1997) found (1) a strong nonlinearity in the relationship between health and both wealth and income—they solved the nonlinearity problem by estimating separate spline linear effects for income and wealth terciles; (2) both income and wealth were related to health in this elderly population; (3) different types of income were differentially related to health; (4) race and ethnic differences in health were explained by income and wealth for functional limitations, but not other health outcomes. The authors also argued that there are important feedback loops between SES and health and between past health and future health of respondents.

Dennis She et al. (1996) also examined racial differences in the relationship between wealth and health among older adults. They analyzed a cross-section of HRS respondents, documenting both wealth stratification and health stratification by race. Although they estimated models of both wealth and health, with log-income as an independent variable, they did not consider the health-income-wealth relationship together. In terms of racial differences, they found that although income was related to health among whites, this was not the case among blacks, suggesting that estimating this relationship separately for the two groups is important.

Some additional insight on our topic can also be gained from the wealth accumulation research that has indirectly addressed health effects and which has not been limited to older populations. These research studies have attempted to explain the large black and white differences in wealth and savings. The evidence suggests that income does not explain the entire wealth gap. Inheritance (Smith, 1995; Maury Gittleman and Edward Wolff, 2000; and Joseph Altonji and Ulrich Doraszelski, 2001), public assistance disincentives (Jonathan Gruber and Aaron Yelowitz, 1999; Erik Hurst and James Ziliak, 2001), family composition, and health (Smith, 1995; Shea et al., 1996) may all play a role in explaining black and white wealth differences. While only a few studies focus directly on the relationship between wealth and health, many authors of wealth accumulation studies include health measures as independent variables in their models. The parameter estimates for health among whites consistently suggest a positive relationship between wealth and health. The relationship among blacks has been more tenuous.³

In summary, most of the evidence regarding the relationship between wealth and health suggests that they are positively but nonlinearly related, at least among whites. Among the working-age population, there is some evidence that assets and debt are associated with health over and above income and other measures of SES. Among older populations, this evidence is well established. The research described above also suggests that the relationship between wealth and health may be bidirectional. Meanwhile, little is known about the characteristics of the health-wealth relationship among younger populations, and whether it resembles the gradient relationship between health and income, particularly once income is held constant. The most detailed analyses on the topic have been limited to older individuals in the HRS. Our goal is to

generalize the descriptive findings to a working-age U.S. adult population using rich wealth data, particularly distinguishing between income and wealth as they relate to health.

3. DATA

The data analyzed in this study are from the Survey of Consumer Finances (SCF), a nationally representative survey of families obtaining information on income and assets. Compared to other national surveys, the SCF stands out for its measurement of wealth—wealthy individuals are over-sampled so that accurate estimates can be made at the highest income and wealth levels. The SCF is considered to be the gold standard in terms of capturing the distribution of wealth in the United States.⁴

The SCF is a triennial repeated cross-section of approximately 4,000 to 5,000 families. Along with detailed information regarding household assets, the SCF collects demographic, health, and income data from all survey participants. In this study we use data aggregated from the 1989, 1992, 1995, and 1998 SCF surveys. Each interview was conducted with the individual most familiar with the family's finances. We define this individual as being the household head. Among couples, this implies that only the health of the household head is considered in analyses. Health and demographic information is also collected for the spouse or partner in married or cohabiting households. However, this information is in general collected by proxy report. Our examination of the spousal data, described in Section 6 of this paper, suggests that household heads and spouses do not differ in a significant way that is relevant to this study. We also limit our analysis to individuals between the ages of 25 and 54 to target the working-age population.

3.1 Health Measure

The SCF collects basic information regarding family health. Each survey year, the following question is asked of the respondent: “Would you say your health is excellent, good, fair, or poor?” The same information is obtained for the respondent’s spouse or partner, if applicable. Although the four-category scale has been shown to be culturally sensitive, a dichotomous measure reflecting a response of “poor” or “fair” health has been shown to be both reliable and highly correlated with other measures of morbidity and mortality (Michael Baker et al., 2001). We use this dichotomous self-report of poor/fair health in our study. Approximately 16.5 percent of our weighted sample of household heads reported poor or fair health.

A change in the survey questionnaire between 1992 and 1995 had a possible impact on the four-category measure of self-reported health. In 1995, an additional question was added to the survey asking whether the respondent or spouse currently smokes. This new smoking question immediately precedes the self-reported general health question, possibly resulting in the notable decline in reports of excellent health in 1995. It appears that this change had a much smaller effect on the collapsed dichotomous measure of poor/fair health. Nevertheless, year dummies included in the models of poor/fair health should be interpreted as including any effect of the survey change.

3.2 Measures of Wealth and Income

We use net worth of the family to measure wealth. A family includes all individuals that make up the primary economic unit (PEU) in the household. The PEU is defined in the SCF to consist of “an economically dominant single individual or couple (married or living as partners)

in a household and all other individuals in the household who are financially dependent on that individual or couple” (Board of Governors of the Federal Reserve System, 2000). Net worth is defined as the sum of all financial assets (e.g. stocks, savings) and nonfinancial assets (e.g. homes, cars) minus total debt. Specifically, net worth includes housing assets less liabilities, business assets less liabilities, checking and saving accounts, stocks, bonds, mutual funds, retirement accounts, certificates of deposits, whole life insurance and other assets less credit card debt, and other liabilities. It does not include defined benefit pension wealth, defined contribution pension wealth held outside 401(k)s, social security, consumer durables and future earnings (see John Karl Scholz and Kara Levine, 2002, for more detail on this measure). We adjust family net worth for family size using a household equivalence scale, and in the case of the 1989, 1992, and 1995 surveys, it is also adjusted for the CPI-U to reflect constant 1998 dollars.

Total family income includes PEU income from all sources, including before tax wages and salaries, interest income, dividends, net gains or losses from sales of stocks, bonds, or real-estate, net rent, trust income, other royalties, unemployment or workers compensation, child support or alimony, welfare assistance, social security or pension payments, and all other forms of income. Like our wealth measure, total family income is adjusted for family size and the CPI-U.

The use of a family-size-adjusted version of income and wealth requires some further discussion and justification. Our household equivalence scale is defined as $(A + .6*C)^{.65}$, where A is the number of adults in the family and C is the number of individuals under 18 in the family, plus the number of children under 18 that the household head has outside the household. A

similar two-parameter equivalence scale that weights children less than adults and allows for economies of scale has recently been suggested by the National Research Council for use in measuring poverty (Kathleen Short et al., 1999). The new OECD modified equivalence scale also takes these two factors into account (Tony Atkinson et al., 2002). The use of an equivalence scale reflects the assumption that when income is used to purchase consumption goods, including health prevention and maintenance, it must be shared between family members. Similarly, we assume that if families save for precautionary health purposes, they do so for all members in the family. In the case of a large health shock, although it can be argued that the entire unconsumed portion of family income and wealth may be made available to the affected person, other consumption needs will still necessarily limit the finances available to an individual depending on his or her family size. To evaluate the effects of using a family-size-adjusted version of income and wealth, we compare our final results to those obtained when a family-size adjustment is not used.

Distributional characteristics of wealth and income, both unadjusted and adjusted for the household equivalence scale, are shown in Table 1.⁵ On average, total family income and wealth are approximately twice the size of income and wealth adjusted for family size.

3.3 Demographic and Other Explanatory Variables

Age and race are the primary characteristics that we assume influence the relationship between wealth and health and are explored in this study. Age is a continuous measure and is included along with its squared term in all models. Our race measure differentiates non-Hispanic whites from all other races and ethnicities.

Other measures relevant to this study include gender, marital status, education, time preference, and the smoking status of survey respondents. We categorize respondent's marital status as being either single or married/cohabiting. Cohabiting partners are similar to married individuals in that they are part of the family's primary economic unit as defined in the SCF. Single individuals include those who are widowed, divorced, or separated. Our education variable is based on reports of received degrees, or years of schooling (<12, 12, 13-15, 16, 17+) when highest degree was unknown. We include measures of time preference for saving in our analysis as a proxy for the individual discount rate that has been theorized to confound the relationship between health and wealth. The time preference variables are based on the following survey question: "In planning your family's saving and spending, which of the time periods is most important to you?" A response of "next few months" or "next year" are considered a short planning horizon; a response of "next few years" or "next 5-10 years" are considered medium-length time preference; those responding "longer than 10 years" are coded as having long-horizon time preferences. Individuals who smoke are also more likely to have higher discount rates as well as poor health. Smoking status was only collected in the 1995 and 1998 surveys, but is included in models along with survey year dummies that should be interpreted as including this effect. Summary statistics for each of these measures are shown in Table 2, overall and by health status. Note the particularly large differences in health status by race and by educational level.

In addition to the variables listed in Table 2, other measures were also included in the analysis. These include region of residence, health insurance status, farm ownership, whether the householder has any dependents, and expected inheritance. These measures were excluded from

our primary analyses presented here for various reasons and are described in more detail in the sensitivity analysis discussion in Section 6 of this paper.

4. METHODOLOGICAL APPROACH

We explore the relationship between health and wealth by first inspecting the crude association between the two measures and comparing it to the relationship that we find between health and income. We then estimate probit models of poor or fair health that adjust for various additional demographic and individual characteristics. We consider possible differences in age and race before choosing a final model. Predicted probabilities based on this model are then used to characterize the shape of the health gradient. It is important to remember that no causal relationship can be attributed to the relationships that we find with this cross-sectional data. Our goal is to describe associations, perhaps gaining insight to the potential underlying causal mechanisms relating wealth to health.

When estimating probit models, a general linear additive form is assumed between functions of our explanatory variables and the probability of reporting poor or fair health, such that our model takes the form

$$\Pr(\text{Reporting Poor or Fair Health}) = \alpha + \gamma f(Z) + \beta X$$

where Z consists of measures of income and wealth and X consists of other individual and demographic characteristics.

The choice of the function f is important in that it largely influences the shape of the estimated gradient. Our choice of the inverse hyperbolic sine (IHS) transformation was based on model fit.⁶ The IHS with a scale parameter of θ is defined as $\ln(\theta x + \sqrt{\theta^2 x^2 + 1})$.⁷ Unlike the log function, the IHS transformation allows for the inclusion of negative values in our analysis, approximating linearity for magnitudes less than $1/\theta$ and approximating a log function for larger magnitudes. The IHS has been used to transform measures of wealth by other researchers, including Karen Pence (2001) and Arthur Kennickell (2002).

We use a scale parameter of $1/2,000$ for wealth and $1/5,000$ for income when estimating models of poor/fair health. We found no additional predictive power in having race-specific scale parameters; the chosen parameters provided the best fit for both non-Hispanic whites and for individuals of other races and ethnicities.

While we primarily use the IHS, we considered a variety of other transformations, including a log form of income and wealth, as well as quantiles. We also estimated splines for income and wealth terciles. Results using these transformations are described in the sensitivity analysis in Section 6.

5. RESULTS

5.1 The Crude Relationship between Wealth, Income, and Health

In Figure 1 we compare the percentage of household heads reporting poor or fair health by family-size-adjusted income and wealth deciles. We use deciles, dividing the weighted population into ten equal-sized groups ranked by income and wealth, to smooth the data and to

show distributional differences. The crude health gradient is notable for both wealth and income: those in a higher income and wealth group are less likely to report poor or fair health. While over 40 percent of individuals with the lowest 10 percent of income report poor or fair health, less than 10 percent of those in the highest income category do so. The shape of the crude health gradient in wealth is similar to that of income: over 30 percent of those with the least wealth reported poor or fair health.

The gradient in income appears steeper than that of wealth at the first few deciles, reflecting larger health inequality between low-income groups than between low-wealth groups. A different perspective is gained from changing the scale of the axes. Figure 2 provides the same information as Figure 1, but at the median of each income and wealth decile (in thousands of dollars). From the perspective of dollar amounts, the health gradients are much more nonlinear than those shown in Figure 1. It can also be seen from this figure that although rates of poor health decline with household-size-adjusted income up to approximately \$50,000, most of the improvement in health is seen in the first \$15,000 of net worth.

Race-specific figures of percentage in poor or fair health by decile medians are shown in Figures 3 and 4. The curves for non-Hispanics whites (Figure 3) are similar to those for the entire population. Among other races and ethnicities (Figure 4), the percentage in poor or fair health has greater variability, reflecting in part the smaller sample sizes for each income and wealth decile group.

What is hidden in these figures is the degree to which wealth is simply a reflection of income. Figure 5 shows the distribution of income and wealth in the population. For example, over 3 percent of the population has wealth in the 10th income and 10th wealth deciles (i.e.,

income in the top 10 percent of the income distribution and wealth in the top 10 percent of the wealth distribution.) A much smaller percentage of the population has such high wealth, but has lower levels of income. Although income and wealth are correlated (0.297), there is also much variation between the two measures. This is reflected in the positive probability of having relatively high or low income compared to wealth. Over 20 percent of those in the 5th wealth decile have incomes in the 3rd or 8th income deciles. We can use this variation to distinguish any additional link between health and wealth unexplained by income.

5.2 Adjusting for Other Explanatory Variables

We also need to consider the degree to which age and other factors are influencing the health gradient. For instance, given that the oldest individuals in this age cohort tend to be less healthy but have higher incomes and wealth, averaging over individuals of different ages may be dampening the gradient. In addition to age, we also expect race, gender, marital status or family type, education, time preference for saving, and smoking status to be related to both economic status and health. Non-Hispanic whites, married or cohabiting individuals, those with higher education, and nonsmokers tend to have both higher levels of income and wealth as well as better health.

We begin by estimating the likelihood of reporting poor or fair health without our economic variables, and then incrementally add each set of economic variables before including both in our model. The estimated probit parameters and standard errors are presented in Table 3. Model 1 includes just demographic characteristics; Model 2 adds a transformed income measure

to the first model; Model 3 replaces income with transformed wealth; and Model 4 includes measures of both income and wealth.

In Model 1, the estimated parameters are generally as expected. Adjusted for the other included factors, older individuals are more likely to report poor or fair health than younger individuals, nonwhites or Hispanics are more likely than non-Hispanic whites to report poorer health, and males are more likely than females to report poorer health. Consistent with previous literature, we also find that being married or cohabiting is associated with better health for men, but not for women.⁸ A well-known relationship between health and education is also apparent in this SCF sample (Catherine Ross and Chia-Ling Wu, 1996). Heads of households with lower educational levels are more likely to report poor or fair health than those with higher educational levels. We also find that those who smoke are more likely to report poor or fair health than those who do not smoke, and that household heads with shorter time preferences are more likely to report poorer health than those who primarily consider their long-term future when saving. With one exception, all these relationships are unchanged when income, wealth, or both income and wealth are added in Models 2–4, respectively. The exception pertains to marital status. Once income and wealth are taken into account, women who are married are more likely to report poor or fair health than women who are not married. Finally, although insignificant, the year dummies capture any differences over time or across surveys. We include them in all estimated models, but do not show their parameter estimates in future tables for brevity.

Now we consider the role of income and wealth in these models. The commonly observed positive relationship between income and health is apparent in Model 2. Including income results in a reduction of the parameter estimates for education, an alternative measure of

SES. We consider the relative importance of income to education by calculating the predicted probabilities for a typical individual with varying income and education levels, holding all other variables constant at their modes or means (except for income and wealth, which are held at their medians when fixed). Specifically, the prototype is a 39-year-old white married female who does not smoke, who has a high school diploma, and who has a medium-term time preference of 2 to 10 years. The probability of reporting poor or fair health for a prototypical individual with income at the 10th, 50th and 90th income percentile is 0.263, 0.141, and 0.079, respectively. Meanwhile, the probability of reporting poor or fair health is 0.255, 0.141, 0.102, 0.075, and 0.072 for an individual with no high school diploma, a high school graduate, some college, a college degree, and a graduate education, respectively. Based on these statistics, the relationship between income and health is comparable to that of education and health in this specification.

The coefficient for the transformed wealth variable is similarly negative and statistically significant in Model 3, where income is replaced by wealth. Note that the transformed income and wealth measures have different scaling factors and thus the parameter estimates cannot be compared directly in magnitude. By comparing predicted probabilities, we find that the role of wealth in this model is slightly smaller than that of income in Model 2. The probability that an individual with wealth at the 10th, 50th and 90th wealth percentile reports poor or fair health is 0.250, 0.150, and 0.104, respectively.

When the specification includes both income and wealth (Model 4), holding other factors fixed, both are still negatively related to the probability of reporting poor or fair health. The parameter estimates are smaller in magnitude, but still reflect significant differences in health. Under this model, we predict that the probability of reporting poor or fair health for a

prototypical individual with income at the 10th, 50th and 90th income percentile is 0.239, 0.141, and 0.087, respectively; the predicted probabilities for the 10th, 50th and 90th wealth percentiles are 0.197, 0.141 and 0.112.

5.3 Age Differences

Given that individuals tend to have greater health problems as they age, and that wealth accumulation as well as incomes increase with age, it is plausible that the health gradient differs throughout the life course. In fact, House et al. (1994) found that the income-health relationship has an upside-down U shape over the span of the adult life, the relationship being stronger at higher ages until approximately age 65, and decreasing thereafter. Given that our sample consists of only those under the age of 55, we explore only the first portion of this hypothesis. We test whether the income-health and income-wealth relationships are increasing in age in Table 4, Model 5, by adding age by income and age by wealth interaction terms to Model 4. (Although not shown in the table, the explanatory variables shown in Table 3 are also included in this specification and their parameter estimates are comparable to those of previously estimated Model 4.) While the health-income link does not differ significantly by age, Model 5 does suggest that the wealth-health relationship does change over the life course. Wealth is more strongly associated with better health at older ages than at younger ages. This relationship is illustrated in Figure 6, which shows the predicted probability of reporting fair or poor health for various wealth levels, by age.

5.4 Race Differences

Based on Model 5, nonwhites are 1.3 ($se=.08$) times more likely to report poor or fair health than non-Hispanic whites, holding all other variables constant. There are also large and well-known differences in savings between blacks and whites. These may have implications for the health-wealth dynamic as well as for levels of health and wealth. We consider the possibility that the health-wealth and health-income relationships differ over racial groups by allowing the wealth and income terms of Model 5 to vary by race. The resulting parameter estimates for the complete set of interaction terms are labeled Model 6, and appear in the second column of Table 4.

We find that the relationship between income and health does not significantly differ between the two racial/ethnic groups. This is not, however, the case for wealth. In particular, while the health-wealth link increases with age among non-Hispanic whites, it does not for other races and ethnicities. For parsimony, we exclude the age by income and income by race interaction terms in our final specification, which is shown in the last column of Table 4 as Model 7.

5.5 The Shape of the Health Gradient

To interpret the differing degree of relationship between health and our two economic measures, income and wealth, we calculate predicted probabilities based on our final model (Model 7) varying both measures. Figure 7 shows the three-dimensional income- and wealth-health gradient for a prototypical individual. Given the rare occurrence of negative income, we show the curve only for income values that are close to zero or positive. The income-health

gradient is steepest for the first \$10,000 positive dollars and then continues to decline, but less steeply, afterwards. This curve is consistent with the shape of the health gradient in income found in previous studies: it is the inverse of the concave relationship first illustrated by Preston (1975). Meanwhile, compared to the crude percentages and the income-health gradient, the health gradient in wealth declines less. But as before, the wealth-health gradient is steepest at very low levels of wealth (about zero).

To supplement this curve, we show the predicted probabilities of poor or fair health for the 10th, 25th, 50th, 75th and 90th income and wealth percentiles for prototypical individuals in Table 5. As reflected in the three-dimensional gradient, the probabilities for income decline more steeply and steadily than those for wealth throughout their respective distributions.

Note that the prototype that Figure 7 is based on is a 39-year-old white married female who does not smoke, who has a high school diploma, and who has a medium-term time preference of 2 to 10 years. To illustrate the differences in age and race, we create similar predicted probability curves for a prototype with the same characteristics, only varying race and age. The curve for a prototype that is nonwhite is shown in Figure 8; the curve for a prototype that is white and age 54 is shown in Figure 9; and the curve for a prototype that is nonwhite and age 54 is shown in Figure 10.

The starkest difference between the curves is seen between the white 54-year-old prototype in Figure 9 and the others. At this highest age, we estimate that the health gradient in wealth for non-Hispanic whites is very large, rivaling that of income throughout the income distribution. In comparison, the health gradient in wealth is much weaker for nonwhites (Figures

8 and 10), although the predicted probabilities of poor/fair health are themselves are in general higher than those of prototypical whites of a similar age.

In summary, we find that wealth and health are indeed related among individuals between the ages of 25 and 54, even after taking family income into account. The relationship between wealth and health, however, is different from that between income and health. Rather than finding a slowly declining wealth gradient, our model suggests that there may be a wealth threshold at a very low but positive level of net worth that is associated with better health. We also find that the relationship between wealth and health increases at higher ages among the non-Hispanic whites of this cohort aged 25–54.

6. SENSITIVITY ANALYSES

6.1. Model Specification

The appropriateness of our model for measuring the strength of the relationship between wealth and health was tested in a number of additional ways not yet described in the paper. In this section we describe the results of these specification tests. First, we compare our results to those obtained when using other functional forms of income and wealth, and when excluding smoking status and time preference variables. We also tested the inclusion of various other measures in our models, and whether there were any significant differences between single and married individuals, and over time.

Note that the precise degree of curvature and form in the predicted probability curves shown in the previous section is determined by our model choice, and while we choose Model 7

as the specification based on theory and the best fit to our data, other choices are possible and may result in slightly differing interpretations. As an illustration, we compare the results of Model 7 to a similar model estimated using income and wealth unadjusted for family size. The parameter estimates for both models are provided in Table 6. Note that the scaling factor for the inverse hyperbolic sine transformation for raw income and wealth is different from that for the adjusted measures of income and wealth.⁹ The resulting parameter estimates are fairly consistent in both specifications. Given the different transformations, however, the predicted probability curve for the raw income and wealth model, not shown here, is smoother – the health gradient is less steep in terms of dollar amounts for both income and wealth, and declines substantially over a longer interval.

Parameter estimates for probit models using various other transformations of the adjusted income and wealth variables are shown in Table 7. We exclude the age interaction terms so that the parameter estimates can be more easily interpreted. The results are generally consistent with those obtained using the IHS transformation. When taking the log, including quantile dummies, or when estimating a spline linear function for income and wealth terciles, wealth is significantly related to health among whites. A predicted probability curve for the log model (with age interaction terms), shown in Figure 11, is similar in appearance to those obtained with using the IHS transformation. The non-parametric estimates based on quantiles of the income and race-specific wealth distributions confirm that wealth and health are most strongly related at the low end of the wealth distribution.

Model specifications that exclude some key explanatory variables provide additional confirmation of our results. Time preference variables may be capturing individual's

expectations of their life span as a function of their health, and thus may be endogenous. When excluding time preference variables from our model, as shown in Table 8 (Model 8), we find that there is little effect on the estimated relationship between wealth and health status. When we estimate our model excluding smoking status, which was only measured in two of the four survey years, this change in model specification had little effect on our parameters of interest.

Additional variables tested but not included in our final model include region of residence, expected inheritance, farm ownership, the presence of dependents, and health insurance. The results of these models for our variables of interest are shown in Table 9. While living in the South is often linked to differences in health and socio-economic measures, this was not the case in our sample after adjusting for other variables. We also included a measure of whether or not a respondent expected to receive a significant inheritance in the future, which was also insignificantly related to health. Individuals who own farms made up a large portion of those who reported negative income (although not wealth.) Nevertheless, farm ownership was not related to health in our multivariate analysis; nor did this measure affect the relationship between income and health or wealth and health. We also tested the importance of having dependents in the family on our health outcome. While having dependents is positively related to health, we find little change in our estimated parameters of interest. Finally, we hesitantly consider the inclusion of health insurance in our analysis. Our hesitancy stems from the additional dynamic relationship between income, access to care, and health insurance. When we do include measures of public and private insurance in our model, we find that private insurance is related to better health and public insurance is related to reports of poor or fair health relative to those without insurance. We interpret from this latter finding that the insurance variables

reflect another degree of socio-economic status. The receipt of public insurance may also reflect a selection problem, where only those who become ill and receive care are enrolled in public health insurance programs. The inclusion of these variables in our model, however, has very little impact on our measures of interest. Our study findings are not affected by these measures.

We also tested for any significant differences between single and coupled household in their relationship between health and our economic measures. We found that we cannot reject the hypothesis that the health-wealth link is the same for singles and coupled individuals. Estimating the models separately for the two groups confirms that there are no notable differences in their parameter estimates.¹⁰

Year-specific estimates of the relationship between health, income, and wealth are generally consistent with those found in our preferred model, providing additional support for our findings. In particular, income and wealth are negatively related to having poor or fair health in each of the four years. However, the link between health and wealth is more tenuous among non-whites than among whites – year specific parameters for non-whites were inaccurately estimated.

6.2 Unit of Analysis

In the case of couples, it is not obvious that the household head, defined as the person most familiar with the family finances, should be the unit of analysis. The health of both individuals heading the family may be of interest as both individuals commonly influence savings choices and health spending. The models presented also suggest that gender may play a different role in the health of single compared to couple household heads. To explore this relationship further, we use the proxy health reports of spouses or partners and analyze data for

both individuals in a couple.¹¹ We do this in two ways. First we estimate Model 5 for married household heads and spouses separately. Then we analyze the health of coupled females and compare the results to an analysis of coupled males.¹² In both these comparisons, we find no important difference in the estimated parameters. We conclude that choosing to analyze the health of the head of household rather than their spouse or partner has little effect on our results.

7. DISCUSSION

7.1 Implications of Our Findings

Although we cannot attribute causal relationships between health status and socio-economic status based on our analysis, our study does provide some insight as to plausible mechanisms relating the two. One theory suggests that wealth is related to health only through income or education. Our findings provide some evidence refuting this hypothesis. Another “common factor” theory suggests that differences in time discount rates result in both savings and investment in health, explaining the correlation between the two variables. When excluding time preference variables from our model, we find that there is little effect on the estimated relationship between wealth and health status. If our time preference measures appropriately capture differences in discount rates, this provides evidence that the estimated wealth-health relationship is not due to this common factor.

The kink in the shape of the health gradient at wealth values close to zero is consistent with a number of theories. The steep slope in health at very low positive wealth may reflect disabled individuals or individuals who are very ill and have depleted their savings, or it may

reflect that individuals with even small savings can use them to cover emergency health costs and thus can better weather health shocks. The latter explanation could have important implications in terms of providing a strong savings incentive for individuals of low wealth. This result may also suggest that analyses such as those of Robert and House (1996), that measure wealth by distinguishing those with low levels of wealth versus all others, may be capturing the important aspects of wealth as it relates to health.

Our finding regarding the age variation in the wealth-health link is interesting for a number of reasons. Previous research has suggested that the income-health relationship is stronger by age through age 54 (House et al. 1994). Our findings suggest that among this cohort, it is actually wealth rather than income that is differentially related to health depending on age. This result can be explained in a number of ways: wealth may be measuring permanent income - cumulative health effects due to previous low income, or employment effects due to previous poor health; costly health shocks that affect wealth occur later in life resulting in a stronger health-wealth link later in life; or the result may be reflecting the tendency for older individuals who are less healthy and have short life expectancies to spend down their savings.

7.2 Limitations of This Study

Although we find a positive relationship between health and wealth, providing some support to causal mechanisms that suggest such a relationship, our findings cannot refute the possibility that we have measured combined effects of multiple and conflicting causes. In fact, we expect that this is the case.

In addition, although the quality of the SCF wealth measurement is perhaps preferable to that available in any other U.S. survey, the SCF does not collect pension and social security wealth information from respondents. Pension and social security are instead measured as income. Although this may be appropriate for those receiving benefits, it underestimates the resources that individuals have available to them at retirement. We argue, however, that there should be little effect of pension and social security wealth on the health dynamics of individuals who are not near retirement. Meanwhile, it should be understood that any effects of health on pension and social security, via employment for instance, will not be captured in our measured correlation.

A difficulty that may have a larger impact on our study is the change in the survey questionnaire in 1995, described in the Data section of this paper. The newly added smoking question may have had an impact on responses regarding general health that we analyze in this study. The year dummies that are included in our model capture any changes that affected everyone equally. If certain types of individuals were differentially affected by the change, then our estimates could be affected. It is possible, for instance, that female smokers would be more likely than male smokers to report poor health if they had just been asked whether they smoke. Of most concern would be if those of a particular wealth or income type were more likely to respond differently about their health in the two different questionnaire scenarios. We have no way of distinguishing time trends from these types of changes.

Finally, this study is limited in that we analyze only a single, self-reported measure of health. We also evaluate only the relationship between health and overall net wealth, and not its components. Both need to be investigated further.

8. CONCLUDING REMARKS

Using the Survey of Consumer Finances, one of the best sources of data regarding wealth in the U.S., we find that wealth is indeed related to health net of income. Holding demographic and other individual characteristics fixed, both income and net worth are positively associated with fewer reports of poor or fair health. Among non-Hispanic whites, this relationship increases by age for 25-54 year olds. Although other researchers have found a similar pattern in the age relationship income and health, we find that the differential economic-health relationship by age is due to wealth, not income. Interestingly, the varying nature of health-wealth relationship by age is not present among non-whites and Hispanics.

The shape of the health gradient in wealth differs from that of income, and provides some interesting questions for future research. While health differences persist throughout the wealth distribution, a large change in health occurs at very low levels of net worth, at the first few positive thousands of dollars. In comparison, the income gradient is much smoother. One possible explanation for the steep health gradient in wealth around zero is the availability of financial resources to recover from health shocks. Another is that the wealth gradient is capturing differences between individuals with and without disabilities. The degree to which either of these is the case is a question for future research.

Our findings strongly support the need for additional studies focusing on the health-wealth link among younger populations, and particularly between races. Although we do find a positive relationship between wealth and health, more research is needed to understand what

processes underlie this relationship. Also of interest is whether or not our findings are applicable to other health outcomes and specific wealth types.

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Table 1. Weighted Wealth and Income Summary Statistics (Standard Errors) for Household

Heads Aged 25-54

	Total Family Income or Wealth*	Family Income and Wealth Adjusted for Family Size*
Income		
Average Income	58,440 (1,370)	31,290 (766)
10 th Percentile	10,516 (221)	5,519 (180)
25 th Percentile	22,072 (377)	11,694 (240)
50 th Percentile (Median)	40,758 (591)	21,808 (329)
75 th Percentile	66,083 (1,201)	35,395 (557)
90 th Percentile	100,723 (3,026)	56,337 (1,426)
Wealth		
Average Net Worth	189,921 (11,353)	99,604 (5,817)
10 th Percentile	0 (0.4)	0 (0.4)
25 th Percentile	7,116 (398)	3,790 (177)
50 th Percentile (Median)	49,309 (1,909)	25,805 (726)
75 th Percentile	150,024 (6,579)	78,383 (3,791)
90 th Percentile	364,735 (26,060)	192,835 (12,319)

Standard errors adjusted for sampling and imputation variance.

* Both income and wealth are adjusted for CPI-U to reflect 1998 dollars.

Table 2. Weighted Demographic Summary Statistics (Standard Errors) for Household Heads

Aged 25-54

	Overall	Health Status	
		Excellent/Good	Fair/Poor
Average Age	38.8 (0.04)	38.5 (0.06)	40.4 (0.2)
Non-Hispanic White (%)	74.2 (0.7)	77.3 (0.7)	58.5 (1.4)
Male (%)	45.2 (0.5)	46.2 (0.5)	40.1 (1.2)
Married or Cohabiting (%)	64.2 (0.5)	65.7 (0.6)	56.3 (1.2)
Education			
No HS Diploma (%)	10.6 (0.4)	7.2 (0.3)	28.0 (1.0)
HS Diploma (%)	31.4 (0.5)	30.1 (0.6)	38.2 (1.1)
Some College (%)	28.2 (0.5)	29.5 (0.5)	21.6 (1.0)
College Degree (%)	19.1 (0.4)	21.2 (0.5)	8.3 (0.6)
More College (%)	10.7 (0.4)	12.0 (0.4)	4.0 (0.5)
Smokes (%)	15.5 (0.3)	14.0 (0.3)	23.0 (0.8)
Time Preference for Saving			
Short Horizon (%)	35.7 (0.6)	33.2 (0.6)	48.1 (1.2)
Medium Horizon (%)	47.3 (0.6)	48.5 (0.6)	41.2 (1.2)
Long Horizon (%)	17.0 (0.4)	18.2 (0.5)	10.7 (0.8)
Sample Size	9,164	7,914	1,250

Standard errors adjusted for sampling and imputation variance.

Table 3. Probit Estimates of Poor or Fair Health of Household Heads Aged 25-54

	Model 1	Model 2	Model 3	Model 4
Intercept	-1.106*	-0.981*	-1.438*	-1.205*
	(0.398)	(0.401)	(0.399)	(0.402)
Age	0.042*	0.045*	0.052*	0.050*
	(0.020)	(0.020)	(0.020)	(0.020)
Age Squared	-0.0003	-0.0003	-0.0003	-0.0003
	(.0003)	(.0003)	(.0003)	(.0003)
Non-Hispanic White	-0.309*	-0.212*	-0.236*	-0.183*
	(0.039)	(0.039)	(0.038)	(0.039)
Male	0.128*	0.277*	0.195*	0.294*
	(0.050)	(0.051)	(0.050)	(0.051)
Married or Cohabiting	-0.023	0.120*	0.091*	0.167*
	(0.039)	(0.041)	(0.040)	(0.041)
Male and Married or Cohabiting	-0.281*	-0.409*	-0.350*	-0.431*
	(0.062)	(0.063)	(0.062)	(0.063)
Education (No HS Degree)				
HS Diploma	-0.546*	-0.416*	-0.478*	-0.394*
	(0.047)	(0.047)	(0.047)	(0.047)
Some College	-0.828*	-0.614*	-0.720*	-0.581*
	(0.051)	(0.052)	(0.052)	(0.053)
College Degree	-1.094*	-0.779*	-0.950*	-0.741*
	(0.055)	(0.058)	(0.058)	(0.060)
Graduate Education	-1.171*	-0.804*	-1.006*	-0.762*
	(0.068)	(0.076)	(0.072)	(0.078)

Smokes	0.240*	0.209*	0.191*	0.185*
	(0.041)	(0.041)	(0.040)	(0.040)
Time Preference (Short Horizon)				
Medium Horizon	-0.221*	-0.155*	-0.163*	-0.130*
	(0.033)	(0.034)	(0.034)	(0.035)
Long Horizon	-0.306*	-0.211*	-0.206*	-0.164*
	(0.051)	(0.054)	(0.053)	(0.055)
1989 Survey	-0.057	-0.050	-0.058	-0.051
	(0.049)	(0.050)	(0.049)	(0.050)
1992 Survey	0.007	-0.005	-0.006	-0.011
	(0.037)	(0.037)	(0.037)	(0.037)
1995 Survey	0.011	0.012	0.021	0.019
	(0.039)	(0.041)	(0.040)	(0.041)

Transformed Income		-0.359*		-0.301*
		(0.023)		(0.024)
Transformed Net Worth			-0.111*	-0.069*
			(0.009)	(0.010)

Standard errors are adjusted for sampling and imputation variance.

*Significance is at the .05 level

Table 4. Probit Estimates of Poor or Fair Health of Household Heads Aged 25-54,

With Age and Race by Income and Wealth Interaction Terms

	Model 5	Model 6	Model 7
Transformed Income	-0.346*		-0.300*
	(0.105)		(0.024)
Transformed Net Worth	0.043		
	(0.044)		
Age * Transformed Income	0.001		
	(0.003)		
Age * Transformed Net Worth	-0.003*		
	(0.001)		
Non-Hispanic Whites			
Transformed Income		-0.381*	
		(0.124)	
Transformed Net Worth		0.063	0.037
		(0.049)	(0.044)
Age * Transformed Income		0.002	
		(0.003)	
Age * Transformed Net Worth		-0.004*	-0.003*
		(0.001)	(0.001)
Other Races and Ethnicities			

Transformed Income	-0.324*	
	(0.128)	
Transformed Net Worth	-0.038	-0.022
	(0.087)	(0.067)
Age * Transformed Income	-0.0001	
	(0.003)	
Age * Transformed Net Worth	0.00004	-0.001
	(0.002)	(0.002)

Standard errors are adjusted for sampling and imputation variance. All other variables shown in Table 3 for Model 4 are included in these specifications, but not shown here.

Table 5. Predicted Probability and Relative Risk of Reporting Poor or Fair Health for a Prototypical Individual (Model 7)

	Predicted Probability
Income Percentile (at Median Wealth)	
10 th	.240 (.019)
25 th	.185 (.016)
50 th	.141 (.014)
75 th	.111 (.012)
90 th	.087 (.011)
Wealth Percentile (at Median Income)	
10 th	.206 (.020)
25 th	.176 (.016)
50 th	.141 (.014)
75 th	.123 (.013)
90 th	.109 (.012)

Standard errors are adjusted for sampling and imputation variance.

Table 6. Comparing Models Using Income and Wealth Adjusted for Family Size and
Unadjusted for Family Size

	Adjusted (Model 7)	Unadjusted
Intercept	-1.137 (0.409)	-1.508 (0.404)
Age	0.038 (0.022)	0.062* (0.021)
Age Squared	-0.000 (0.000)	0.0003 (.0002)
Non-Hispanic White	-0.098 (0.059)	-0.114 (0.059)
Male	0.284* (0.051)	0.222* (0.051)
Married or Cohabiting	0.159* (0.042)	0.301* (0.044)
Male and Married or Cohabiting	-0.416* (0.064)	-0.355* (0.064)
Education (No HS Degree)		
HS Diploma	-0.392* (0.047)	-0.395* (0.046)
Some College	-0.582* (0.052)	-0.588* (0.053)
College Degree	-0.743* (0.060)	-0.758* (0.059)

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Graduate Education	-0.753*	-0.769*
	(0.078)	(0.078)
Smokes	0.180*	0.172*
	(0.040)	(0.040)
Time Preference (Short Horizon)		
Medium Horizon	-0.125*	-0.124*
	(0.035)	(0.034)
Long Horizon	-0.160*	-0.171*
	(0.055)	(0.055)

Transformed Income	-0.300*	-0.314*
	(0.024)	(0.024)
Non-Hispanic Whites		
Transformed Wealth	0.037	-0.036
	(0.044)	(0.043)
Age * Transformed Wealth	-0.003*	-0.003*
	(0.001)	(0.001)
Other Races and Ethnicities		
Transformed Wealth	-0.022	-0.025
	(0.067)	(0.064)
Age * Transformed Wealth	-0.001	-0.0003
	(0.002)	(0.001)

Standard errors are adjusted for sampling and imputation variance. Year dummies are included in these specifications, but not shown here.

Table 7. Probit Estimates of Poor or Fair Health of Household Heads Aged 25-54: Sensitivity Analyses Models With Varied Specifications of Wealth and Income

	Income	Wealth for Non-Hispanic Whites	Wealth for Other Races/Ethnicities
Inverse Hyperbolic Sine	-0.303* (0.024)	-0.081* (0.011)	-0.036* (0.017)
Log Model			
Log of Positive Values	-0.250* (0.022)	-0.067* (0.013)	-0.007 (0.016)
Dummy for Those ≤ 0	-2.096* (0.268)	-0.258 (0.138)	0.131 (0.148)
Non-Parametric - Quantiles			
1 st Quantile	0.805* (0.068)	0.443* (0.073)	0.199* (0.096)
2 nd Quantile	0.398* (0.067)	0.205* (0.079)	0.015 (0.108)
3 rd Quantile	0.269* (0.062)	0.182* (0.076)	-0.008 (0.095)
4th Quantile	0.230* (0.066)	0.060 (0.070)	0.034 (0.100)
Tercile Spline			
Level	-0.028* (0.007)	-0.005 (0.003)	-0.001 (0.009)
1 st Tercile	0.007	-0.0004	-0.005

	(0.011)	(0.004)	(0.010)
2 nd Tercile	0.021*	0.005*	0.006
	(0.004)	(0.001)	(0.004)

Standard errors are adjusted for sampling and imputation variance. All other variables shown in Table 3 are included in these specifications.

Table 7. Probit Estimates of Poor or Fair Health of Household Heads Aged 25-54: Sensitivity Analyses Models With Varied Specifications of Wealth and Income

	Non-Hispanic Whites			Other Races and Ethnicities	
	Income Parameter	Wealth	Wealth*Age	Wealth	Wealth*Age
Inverse Hyperbolic Sine	-0.300*	0.037	-0.003*	-0.022	-0.001
	(0.024)	(0.044)	(0.001)	(0.067)	(0.002)
Log Model					
Log of Positive Values	-0.250*	0.021	-0.002	0.043	-0.001
	(0.022)	(0.053)	(0.001)	(0.057)	(0.001)
Dummy for Those <= 0	-2.092*	-0.047	-0.002	0.079	0.001
	(0.269)	(0.567)	(0.014)	(0.516)	(0.013)
Non-Parametric - Quantiles					
1 st Quantile	0.808*	-0.052	0.012	-0.675	0.023*
	(0.066)	(0.372)	(0.009)	(0.412)	(0.010)
2 nd Quantile	0.402*	-0.202	0.010	-0.266	0.007
	(0.066)	(0.389)	(0.009)	(0.535)	(0.013)
3 rd Quantile	0.272*	0.160	-0.0002	-0.524	0.013

	(0.063)	(0.407)	(0.009)	(0.480)	(0.012)
4 th Quantile	0.231*	0.777	-0.017	-0.897	0.022*
	(0.065)	(0.429)	(0.010)	(0.486)	(0.011)
Tercile Spline					
Level	-0.026*	-0.032	0.0008	-0.031	0.0007
	(0.007)	(0.017)	(0.0004)	(0.017)	(0.0004)
1 st Tercile	0.006	-0.048	0.002	0.034	-0.001
	(0.011)	(0.109)	(0.003)	(0.037)	(0.0009)
2 nd Tercile	0.019*	-0.022*	0.0006*	0.067	-0.002
	(0.004)	(0.009)	(0.0002)	(0.094)	(0.002)

Standard errors are adjusted for sampling and imputation variance. All other variables shown in Table 3 are included in these specifications.

Table 8. Probit Estimates of Poor or Fair Health of Household Heads Aged 25-54: Sensitivity Analyses Models Excluding Smoking and Time Preference Variables

	Model 7	Model 8	Model 9
Smokes	0.180*	0.184*	
	(0.040)	(0.040)	
Time Preference (Short Horizon)			
Medium Horizon	-0.125*		-0.127*
	(0.035)		(0.035)
Long Horizon	-0.160*		-0.164*
	(0.055)		(0.055)

Transformed Income	-0.300*	-0.308*	-0.302*
	(0.024)	(0.024)	(0.024)
Non-Hispanic Whites			
Transformed Wealth	0.037	0.037	0.034
	(0.044)	(0.044)	(0.044)
Age * Transformed Wealth	-0.003*	-0.003*	-0.003*
	(0.001)	(0.001)	(0.001)
Other Races and Ethnicities			
Transformed Wealth	-0.022	-0.021	-0.028
	(0.067)	(0.067)	(0.068)
Age * Transformed Wealth	-0.001	-0.001	-0.0004
	(0.002)	(0.002)	(0.002)

Standard errors are adjusted for sampling and imputation variance. All other variables shown in Table 3 are included in these specifications, but not shown here.

Table 9. Probit Estimates of Poor or Fair Health of Household Heads Aged 25-54: Sensitivity Analyses Models With Additional Variables

	Model 7	Model 10	Model 11	Model 12	Model 13	Model 14
Residence in the South		-0.016 (0.032)				
Expected Inheritance			0.044 (0.045)			
Farm Ownership				-0.006 (0.142)		
Any Dependents					-0.132* (0.038)	
Health Insurance (No Insurance)						
Public Insurance						0.231* (0.047)
Private Insurance						-0.167* (0.040)

Transformed Income	-0.300*	-0.300*	-0.301	-0.300*	-0.321*	-0.246*
	(0.024)	(0.024)	(0.024)	(0.024)	(0.025)	(0.025)
Non-Hispanic Whites						
Transformed Wealth	0.037	0.037	0.035	0.037	0.040	0.043
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
Age * Transformed Wealth	-0.003*	-0.003*	-0.003*	-0.003*	-0.003*	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Other Races and Ethnicities						
Transformed Wealth	-0.022	-0.021	-0.023	-0.022	-0.024	-0.004
	(0.067)	(0.068)	(0.067)	(0.067)	(0.067)	(0.068)
Age * Transformed Wealth	-0.001	-0.001	-0.001	-0.001	-0.000	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)

Standard errors are adjusted for sampling and imputation variance. All other variables shown in Table 3 are included in these specifications, but not shown here.

Figure 1. Percent With Poor or Fair Health By Income and Wealth Deciles, Ages 25-54

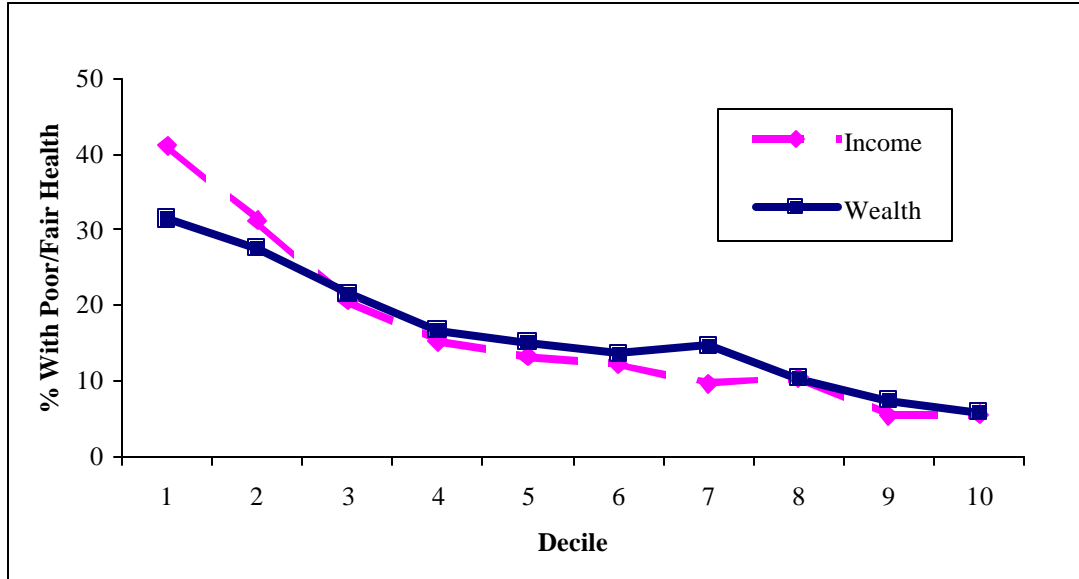


Figure 2. Percent With Poor or Fair Health By Income and Wealth Deciles at Decile Medians (in Thousands), Ages 25-54

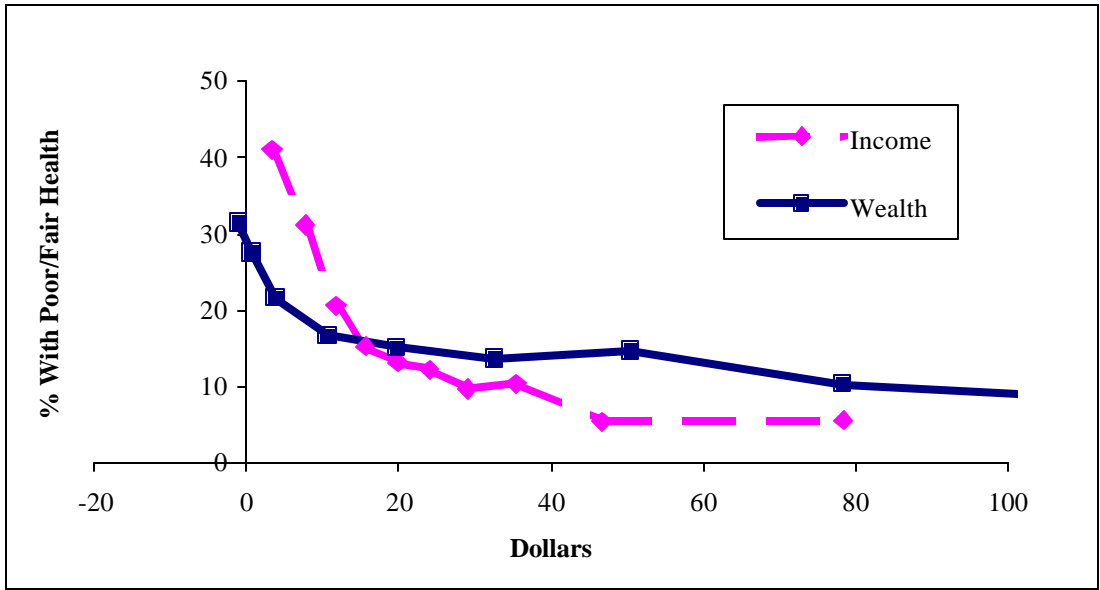


Figure 3. Percent With Poor or Fair Health By Income and Wealth Deciles at Decile Medians (in Thousands): Non-Hispanic Whites

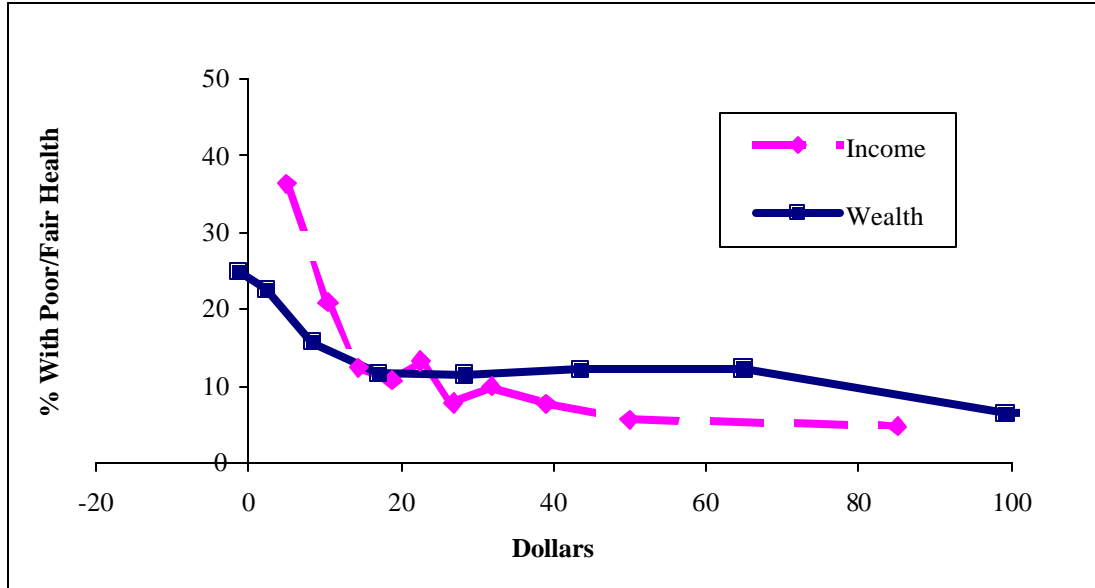


Figure 4. Percent With Poor or Fair Health By Income and Wealth Deciles at Decile Medians (in Thousands): Other Races and Ethnicities

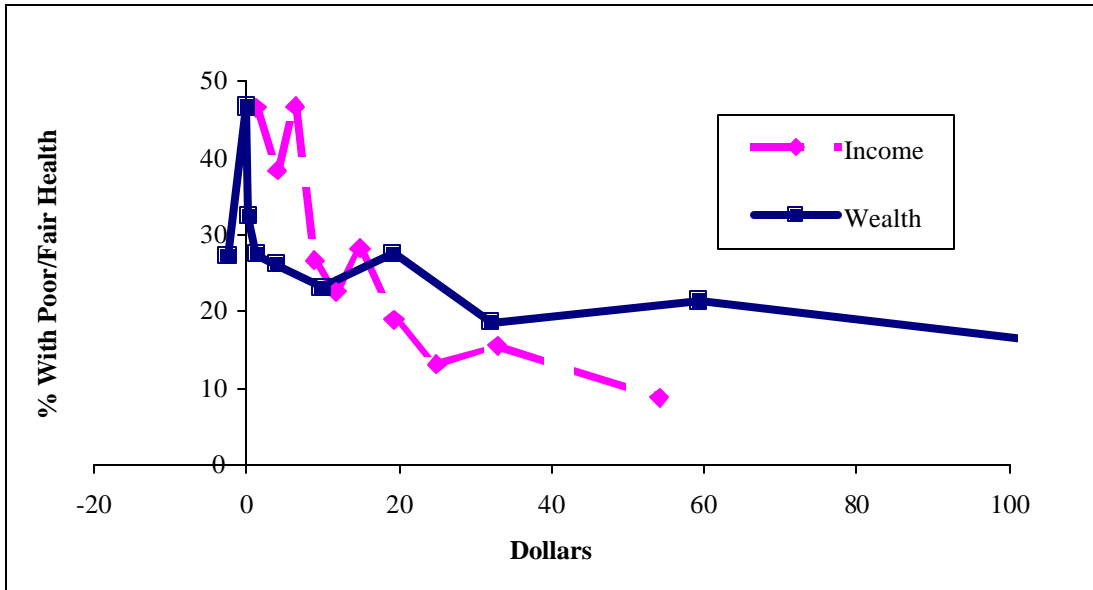


Figure 5. Distribution of Income and Wealth Deciles, Ages 25-54

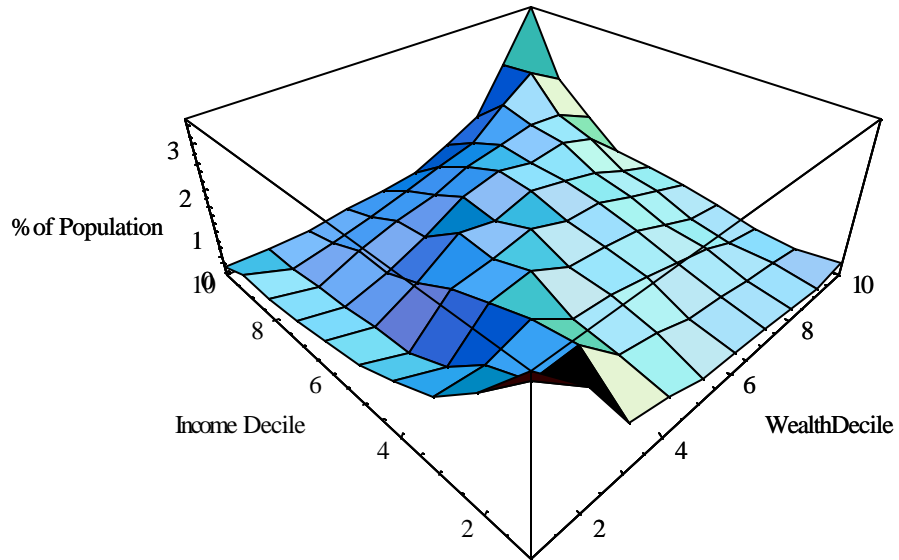


Figure 6. Predicted Probabilities of Poor or Fair Health for a Prototypical Individual

With 10th, 25th, 50th, 75th, and 90th Percentile Wealth, by Age

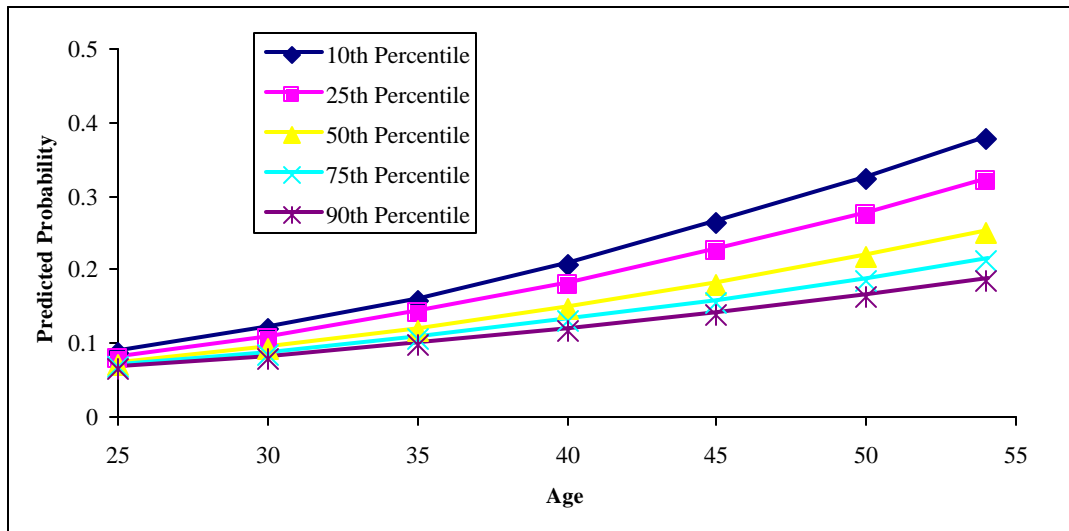


Figure 7. Predicted Probability of Fair/Poor Health by Income and Wealth (in Thousands)

For a Non-Hispanic White Prototype With Average Characteristics

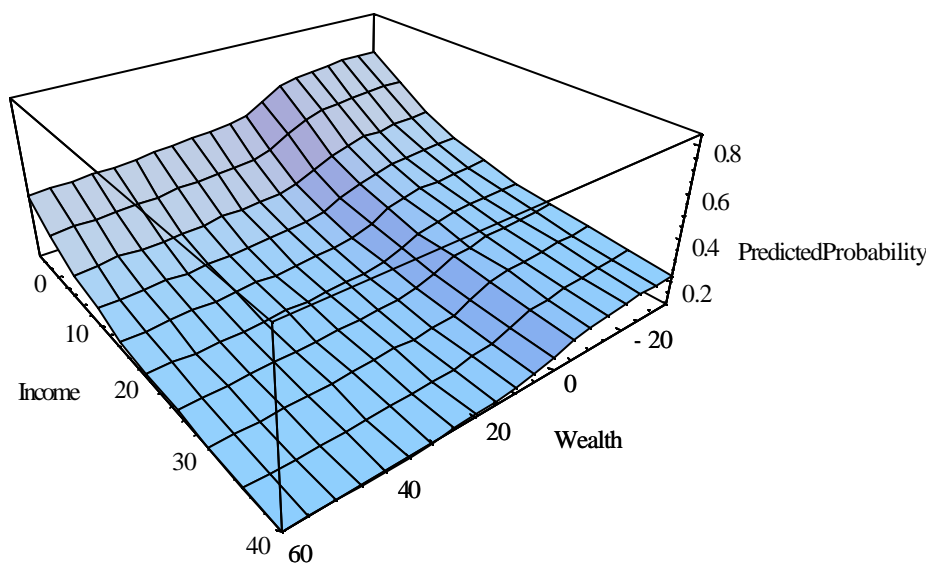
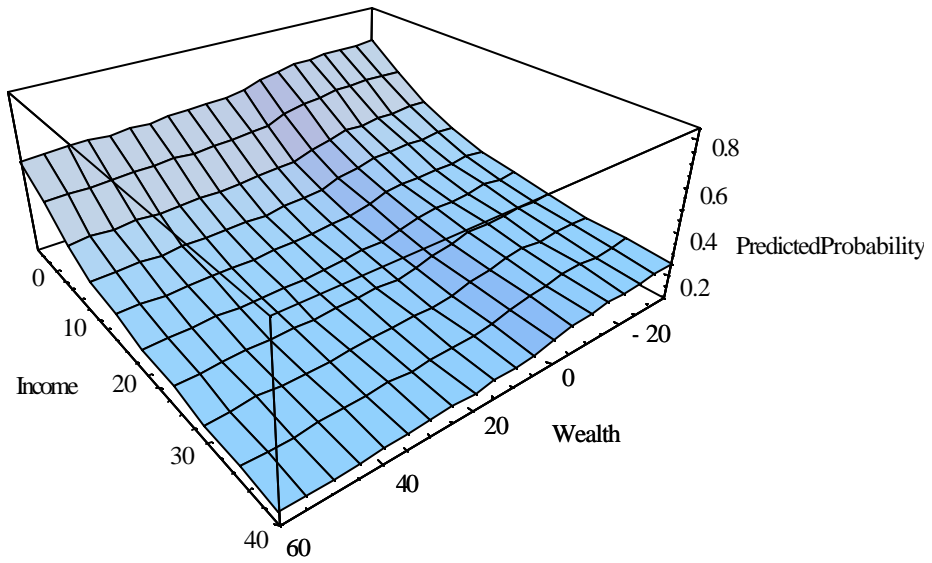


Figure 8. Predicted Probability of Fair/Poor Health by Income and Wealth (in Thousands)

For a Non-White Prototype With Average Characteristics



**Figure 9. Predicted Probability of Fair/Poor Health by Income and Wealth (in Thousands)
For a 54-Year Old Non-Hispanic White Prototype With Average Characteristics**

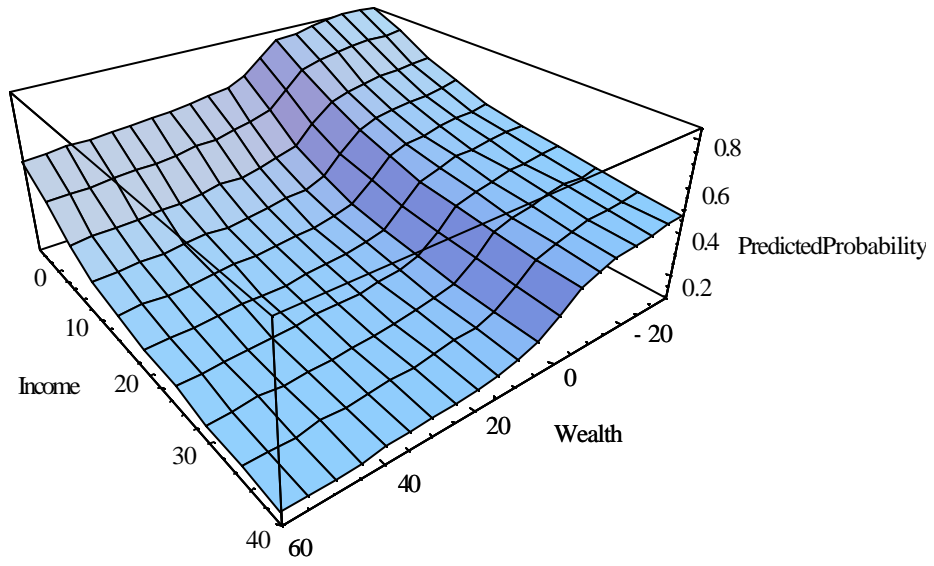


Figure 10. Predicted Probability of Fair/Poor Health by Income and Wealth (in Thousands) For a 54-Year Old Non-White Prototype With Average Characteristics

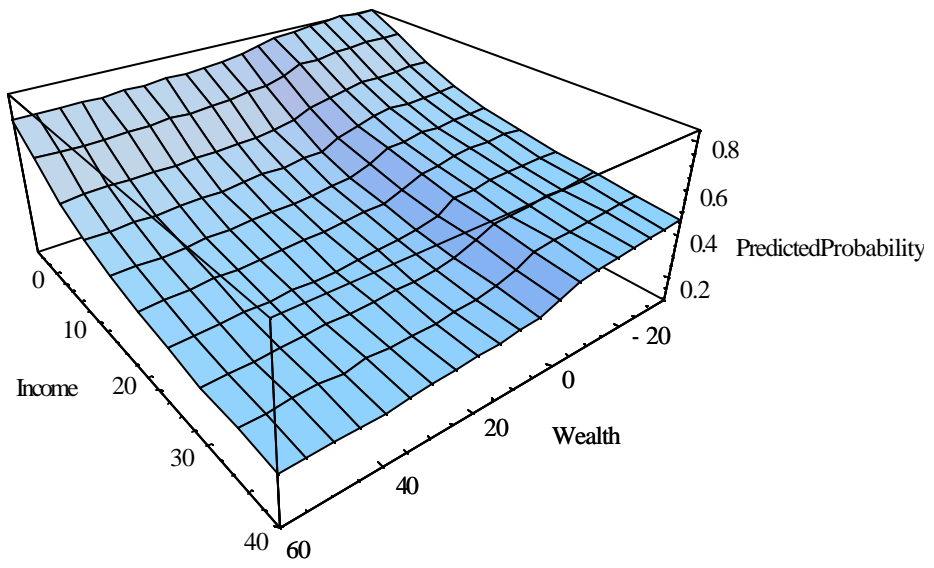
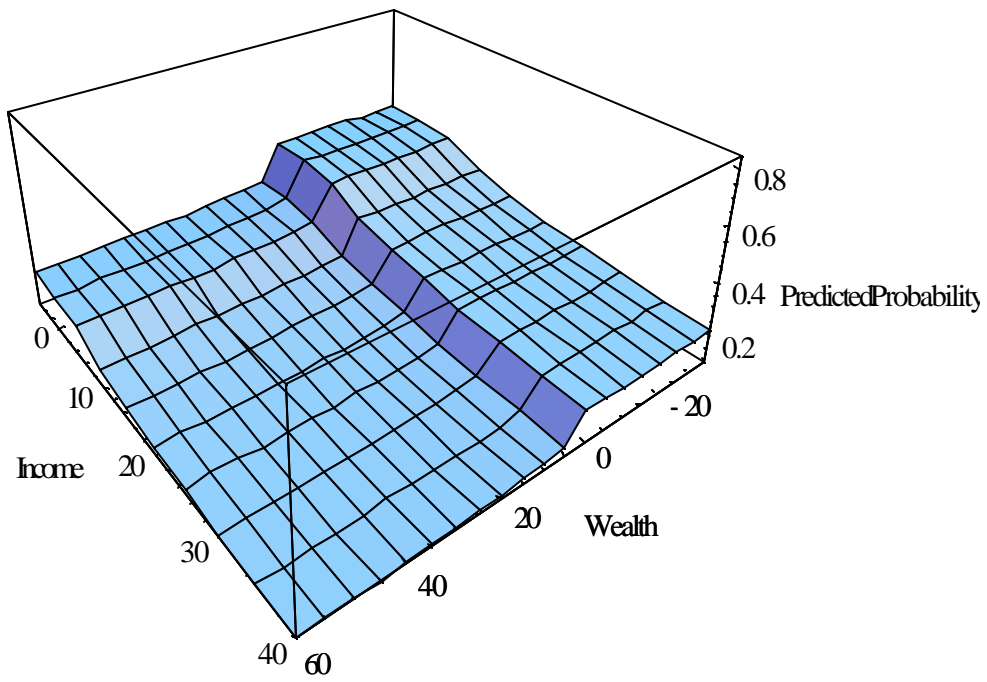


Figure 11. Predicted Probability of Fair/Poor Health by Income and Wealth (in Thousands) Based on a Model With Logged Income and Wealth



APPENDIX 1. Parameter Estimate and Standard Error Calculation in the SCF

The appropriate methods for calculating parameter estimates and standard errors using the Survey of Consumer Finances (SCF) are described in the 1998 SCF codebook (Board of Governors of the Federal Reserve System, 2000). Additional details regarding the weighting procedure can be found in Kennickell et al. (1996), and in other sources found on the SCF Federal Reserve website (<http://www.federalreserve.gov>.) Here we summarize the methods that we used in the paper.

The SCF has a complex sampling frame. To address concerns for respondents' privacy, details regarding the sampling are not made available to users of the public data. However, a file of 999 replicate weights and multiplicity factors for each of the weights are made available to users to approximate variation in the data using a bootstrap technique. The SCF data is also multiply-imputed; each respondent has five records (or implicates) of data reflecting the various imputed values. Thus, parameter estimates and standard errors must be adjusted to account for the imputation method as well as for the sampling scheme.

The SCF recommends that the Repeated Imputation Inference (RII) method be used to calculate point estimates and standard errors.¹³ Appropriate point estimates are calculated by averaging the point estimates obtained by analyzing each of the five implicates separately. We use SCF weight variable X42001 for these calculation. Appropriate standard errors are given by:

$$\text{Sqrt}((6/5)*\text{Imputation Variance} + \text{Sampling Variance})$$

The Imputation Variance is the variance of the five implicate estimates, or the sum of the squared deviation of the point estimates for each of the five implicates minus their mean, divided by $(5 - 1 = 4)$.

The Sampling Variance is estimated using the bootstrap technique with the provided 999 replicate

weights and multiplicity factors, where the multiplicity factors reproduce sampling with replacement. It is equal to the sum of the squared deviations of the point estimates obtained using each of the 999 bootstrap replicates minus their mean, divided by $(999 - 1 = 998)$. The bootstrapped replicates are based on only the first of the five implicate values.

The models reported in this paper were estimated using the Stata programming language (Stata Corporation, 1999).

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¹The limited previous research has suggested that health and certain dimensions of wealth are related among U.S. working-age adults. Stephanie Robert and James House (1996) find such a link between various health outcomes and having \$10,000 or more in assets; Patricia Drentea and Paul Lavrakas (2000) find a negative relationship between credit card debt and health. (See discussion below.)

²Other heuristic discussions regarding health effects of wealth and wealth effects of health can be found in Lawrence Kotlikoff (1989), James P. Smith (1999), and Smith and Raynard Kington (1997).

³For additional examples of studies including health as an independent variable in wealth equations, see Peter Diamond and Jerry Hausman (1984), Altonji and Doraszelski (2001), and Robert Avery and Micahel RoRendall (1997). For a comparison of such models between whites and blacks, see Altonji and Doraszelski (2001).

⁴See Smith (1995) and Wolff (1999) for a comparison of the wealth measure in the SCF to those in other surveys.

⁵The SCF has a complex sampling frame, and missing data are multiply imputed. Taking these factors into account, all estimates calculated in this study account for multiple imputation, while all standard errors and confidence intervals are bootstrapped to adjust for both sampling and imputation variance. We provide some detail regarding the calculation of point estimates and their standard errors in Appendix 1.

⁶We used a number of tests of goodness-of-fit, including various versions of R^2 and pseudo- R^2 measures and the BIC criterion.

⁷See John Burbidge et al. (1988) and James MacKinnon and Lonnie Magee (1990) for further details regarding this transformation.

⁸See for example Paul Leigh (1983), Goldman et al. (1995), and I. Waldron et al. (1996).

⁹The scaling factor for unadjusted income is 1/7000 while the scaling factor for wealth is 1/3000. In comparison 1/5000 and 1/2000 were used in the transformation of adjusted income and wealth, respectively.

¹⁰ These results are not shown.

¹¹ The SCF does contain age, gender, and education of spouses/partners. Race and time preference measures are assumed to be the same for both individuals.

¹² In the case of same-sex couples, we include only the household head in the analysis.

¹³ See Montalto and Sung (1996) for a detailed explanation of RII in the SCF.