2000, In D.S.Salkever & A. Sorkin (Eds.), Research in Human Capital and D Development (13 ed., Vol. 13, pp. 1-31). Stamford, CT: JAI Press.

THE RELATIONSHIP BETWEEN LABOR MARKET OUTCOMES AND PHYSICAL AND MENTAL HEALTH

EXOGENOUS HUMAN CAPITAL OR ENDOGENOUS HEALTH PRODUCTION?

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I. INTRODUCTION

The relationship of health and labor supply has been receiving increased interest by economists, as evidenced by the recent addition of a chapter on health and the labor market to the *Handbook of Labor Economics* (Currie & Madrian, 1999). Empirical research has suggested that health status plays an important role in explaining a variety of economic phenomena, such as earnings differentials (Chirikos & Nestel, 1985; Luft, 1975), retirement decisions (Mitchell & Anderson, 1989) and AFDC participation (Wolfe & Hill, 1995). Furthermore, failure to control adequately for health status is likely to bias estimates of the wage elasticity of labor supply, because of the high correlation between wage rate and health (Lambrinos, 1981).

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Although it has therefore become common to control for health status in studies of labor market outcomes, these studies are limited in several ways. Most data sets used for labor economics research tend to have a very restrictive set of health measures; indeed, many analyses control only for self-reported limitations on the respondent's ability to work. Few direct comparisons of the effects of various health measures on labor market outcomes exist, so it is not known which measures are most predictive. This information would be extremely helpful in designing future survey instruments, in order to maximize the usefulness of the databases for addressing questions about the work-health relationship, while minimizing the burden on respondents. In particular, mental health as a measure of human capital has tended to be ignored altogether, despite new and compelling evidence that mental health plays a significant role in determining at least some labor market outcomes (Ettner, Frank, & Kessler, 1997; Hamilton, Merrigan, & Dufresne, 1997). Another serious limitation of previous economic studies on the topic of work and health is that they have been based almost exclusively on older white men (Currie & Madrian, 1999), so very little is known about how health affects the labor market outcomes of women or other demographic groups.

Finally, the majority of labor economics studies assume that health is exogenous; even those studying the endogeneity of self-reported work limitations have based the analysis on the assumption that other measures of health are exogenous. For example, the economics literature on simultaneity in the relationship of employment and health primarily focuses on reporting bias. This bias arises from the incentives of unemployed persons to report work limitations due to a health condition in order to receive transfer payments or justify their employment status (Bound, Jaeger, & Baker, 1995; Chirikos & Nestel, 1984; Lambrinos, 1981; Maddox & Douglas, 1973; Parsons, 1982; Wolfe, 1984). As a result of the focus on reporting bias, "objective" measures of health (such as medical conditions or mortality) have frequently been assumed to be exogenous to employment and either used as instruments for, or compared to, more "subjective" measures of health (such as work limitations).[1] Although the assumption that "objective" health status is not influenced by employment and job characteristics is appropriate if the only source of endogeneity is reporting bias, it will not eliminate bias if "true" health status is also dependent on employment and job characteristics. In contrast to the assumptions made by labor economists, sociologists and epidemiologists put forth strong arguments for why intrinsic qualities of employment may influence mental and physical health.

This study seeks to extend the previous literature by addressing the following questions: (1) Which measures of health status are most predictive of labor market outcomes? In particular, what are the roles played by physical versus mental health?; (2) Which labor market outcomes are most sensitive to health status?; (3) Does treating health status as endogenous affect its estimated impact on labor market outcomes?; and (4) Are the relationships between labor market outcomes and mental and physical health different for men versus women?

The analyses are based on data for a national sample of non-elderly adults, from the 1995 Midlife in the United States (MIDUS) study conducted by the John D. and Catherine T. MacArthur Foundation Research Network on Successful Midlife Development. Because the MIDUS survey instrument was developed by an interdisciplinary team of researchers, it is ideally suited for this type of research, containing both a wide variety of physical and mental health measures as well as comprehensive information on job characteristics.

II. BACKGROUND

Theoretical arguments can be made for either a positive or negative effect of employment on both mental and physical health, making it difficult to predict the nature of the bias that might result from treating health status as an exogenous measure of human capital. Ezzy (1993) summarizes the theoretical arguments for expecting an association between unemployment and mental health. Researchers maintaining that employment is advantageous to one's mental health argue that workers are less prone to depression and other ills because of their greater opportunities for establishing social networks, achieving role satisfaction, and gaining power (Hibbard & Pope, 1985; Rosenfield, 1989; Waldron, 1980). However, the beneficial effects of employment on mental health arguably may be offset by the detrimental impact of occupational stress.

Likewise, it has been argued that the impact of employment on physical health is negative, because of occupational hazards or the physiological effects of the work overload and performance pressure associated with paid employment (Johnson, 1977; Waldron, 1976, 1980). House (1974) hypothesized that gender differences in life expectancy were due in part to occupational stress. He cites evidence that heart attack mortality differentials are declining over time, as more women enter the labor force and are subjected to the same level of stress as men. Other researchers have also found links between mental and physical health (Klitzmand et al., 1990; Steer et al., 1992; Tessler & Mechanic, 1978; Vaillant, 1979). These studies lend support to the argument that employment effects on mental health lead to related changes in physical health.

Even if employment does not have a direct influence on health, it may affect health indirectly, through income and health insurance coverage (Ettner, 1996). Both income and insurance increase access to medical services and hence presumably improve health. Another way in which employment and job characteristics may influence health indirectly is by reducing the amount of time available for engaging in either good health practices, such as exercise and making visits to the doctor in response to perceived symptoms (Waldron, 1980) or bad health habits, such as drinking. For these reasons, health may be correlated with the error term in employment and hours equations, even when controlling for the wage rate.

Thus a convincing argument can be made that even "objective" health measures should be treated as endogenous when studying outcomes in the labor market.

The traditional labor economics model assumed that individuals choose consumption and work hours to maximize utility, subject to time and budget constraints. Health might enter into the utility maximization problem through either the budget constraint (by lowering the offered wage rate), time constraint (by increasing sick days, hence reducing the maximum time available for labor and leisure), or the utility function (if people derive direct disutility from being in poor health. Grossman (1972a, 1972b) modified the labor-leisure choice model by noting that health is at least partially under the control of workers, thereby making it an argument in the utility maximization problem. He specified a health production function that allowed for a number of choice variables (e.g., medical inputs or time spent on health-producing activities) as well as the worker's exogenously determined health endowment. Grossman's model is compatible with the sociology theory simply by including employment and job characteristics directly in the health production function. In either case, health clearly needs to be treated as endogenous in the labor market outcome equations, which is the approach taken here.

III. METHODS

A. Data

The analyses are based on data from the 1995 Midlife in the United States (MIDUS) study of noninstitutionalized U.S. residents aged 25-74 who have telephones (MacArthur Foundation Research Network on Successful Midlife Development, 1998). The survey instruments were developed by the members and associates of the John D. and Catherine T. MacArthur Foundation Network on Successful Midlife Development, an interdisciplinary team of researchers, and included information on sociodemographic, economic, psychological, and medical characteristics of the respondent. MIDUS respondents first participated in a random-digit dialing telephone interview lasting approximately 40 minutes, with a response rate of 70 percent. Respondents to the telephone survey were then asked to mail back two written questionnaires. The response rate was 86.8 percent of telephone survey respondents, yielding an overall survey response rate of 60.8 percent for both parts of the survey. Financial incentives were used to ensure high response rates.

The sample analyzed here is respondents who completed both the telephone and mail surveys and were under age 65. The final overall sample size was 3,116, although the actual size of the sample used in any particular analysis may be somewhat smaller, due to line item nonresponse for the dependent variables. Analyses were performed separately for women ($N = 1,527$) and men ($N = 1,589$), due to the differences in their labor supply behavior, occupational choices and working conditions.

B. Dependent Variables

The labor market outcomes examined in this study include whether the respondent is currently employed and among the conditional sample of employed persons,[2] the following job characteristics: (1) occupational category (upper white-collar, lower white-collar, upper manual and lower manual); (2) whether the respondent is self-employed; (3) whether the respondent works the night shift; (4) the average number of weekly work hours (for up to two jobs combined); (5) an hourly earnings measure proxying for the wage rate, constructed by dividing earnings income by average weekly work hours multiplied by the number of weeks worked at a paid job during the previous year; (6) job demands on a scale from 0-8; (7) job skills on a scale from 0-16; and (7) job authority on a scale from 0-16. Self-employment is generally considered to be a positive outcome and night shift work a negative outcome, although it is possible to construct examples in which these generalizations do not hold.

The job demands scale is based on the worker's responses to the following questions: "How often do you have to work very intensively—that is, you are very busy trying to get things done?" and "How often do different people or groups at work demand things from you that you think are hard to combine?" The job skills scale is based on the questions: "How often do you learn new things at work?"; "How often does your work demand a high level of skill or expertise?"; "On your job, how often do you have to initiate things—such as coming up with your own ideas, or figuring out on your own what needs to be done?"; and "How often does your job provide you with a variety of things that interest you?" The job authority scale is based on the questions: "How often do you have a choice in deciding how you do your tasks at work?"; "How often do you have a choice in deciding what tasks you do at work?"; "How often do you have a say in decisions about your work?"; and "How often do you have a say in planning your work environment?" Responses to the individual questions range from 0 (never) to 4 (all of the time) and are summed to derive the score for the overall scale. Higher scores for the job demands scale are generally considered to be worse outcomes, while higher scores for the job skills and authority scales are generally considered to be better outcomes.

C. Independent Variables—Health Measures

The main explanatory factors of interest are physical and mental health. The MIDUS dataset contains a large variety of health measures, so the analysis was limited to testing the following sets of measures: (1) self-assessed overall health, (2) self-assessed mental and physical health, (3) a scale of functional limitations, (4) a set of indicators for self-reported medical conditions, and (5) a set of indicators for mental health and substance abuse conditions.

Self-assessed overall health is the answer to the question "Using a scale from 0 to 10 where 0 means 'the worst possible health' and 10 means 'the best possible

health', how would you rate your health these days?" Self-assessed mental and physical health are the responses to the questions "In general, would you say your physical (mental or emotional) health is..." Response categories range from 1 (poor) to 5 (excellent). The functional limitation scale is the sum of answers to the questions "How much does your health limit you in doing each of the following? (a) lifting or carrying groceries; (b) bathing or dressing yourself; (c) climbing several flights of stairs; (d) bending, kneeling, or stooping; (e) walking more than a mile; (f) walking several blocks; (g) walking one block; (h) vigorous activity (e.g., running or lifting heavy objects); (i) moderate activity (e.g., bowling or vacuum cleaning)." Possible responses to each question range from 0 ("not at all") to 3 ("a lot"), so the overall scale ranges from 0 to 27. The responses are unweighted except in the sense that some of the responses are nested; for example, persons who are limited in walking one block will have higher scores than persons who are limited in walking more than one mile, because they will report limitations for both.

Self-reported medical conditions are responses to the question "In the past 12 months, have you experienced or been treated for any of the following?" Indicators used here are for the following categories: (a) respiratory (asthma, bronchitis, or emphysema); (b) bone/joint disease (arthritis, rheumatism, sciatica, lumbago, recurring backache, other bone or joint diseases); (c) auto-immune (AIDS/HIV infection, lupus, other auto-immune disorders); (d) hypertension or high blood pressure; (e) chronic sleeping problems; (f) diabetes or high blood sugar; and (g) neurological (multiple sclerosis, epilepsy, stroke, other neurological disorders). Three other measures are included in this set, the first two indicators for whether the respondent reports ever having had a heart attack or cancer (other than skin) and the third a 1-8 scale of angina (chest pain).

The last set of measures included diagnoses of depression, generalized anxiety disorder and panic disorder, and indicators for drug and alcohol abuse. The presence of the mental disorders were assessed using a modified version of the Composite International Diagnostic Interview (CIDI), which was designed to allow DSM diagnoses to be constructed from a series of questions administered by non-clinicians. The drug and alcohol abuse indicators were coded as one if the respondent reports having engaged in any one of the following five substance-abuse-related behaviors during the past 12 months: (a) respondent was under the effects (or feeling after-effects) of the substance in a situation that increased the chances of getting hurt; (b) respondent had any emotional or psychological problems from using the substance; (c) respondent had such a strong desire or urge to use substance that could not think about anything else; (d) respondent had a period of a month or more when spent a great deal of time using substance or getting over effects; (e) respondent had to use more of the substance than usual to get the same effect, or respondent found that the same amount had less effect.

The initial analyses test these five sets of health measures sequentially. Subsequent analyses combine all of the health measures into a "parsimonious" specification that controls simultaneously for the following: (1) overall self-assessed

health; (2) the functional limitations scale; (3) the number of self-reported medical conditions; (4) an indicator for any mental health condition; and (5) an indicator for any substance-abuse-related behavior.

D. Independent Variables—Other

In addition to the health measures, the regressions control for other respondent and spouse characteristics hypothesized to influence outcomes in the labor market. Respondent characteristics include age (represented as a series of 0-1 indicators for ages 25-34, 35-44, 45-54, and 55-64); urbanicity (constructed by merging respondent's zip code to Census data); race (nonwhite vs. white); Hispanic ethnicity; marital status (married, divorced or separated, and widowed vs. never married); parental status (represented as total number of children and 0-1 indicators for the presence of children under age 6 and children ages 6-13); education (represented as a series of 0-1 indicators for less than high school, education beyond high school but no bachelor's degree, bachelor's degree, and graduate degree vs. high school diploma or general equivalency diploma); whether the respondent was born in the United States; the net assets of the respondent and spouse (divided by two for married respondents); whether the respondent grew up in a two-parent household; the educational attainment of the respondent's parents; and the 1995 unemployment rate in the respondent's state of residence. Certain spouse characteristics (e.g., age and race/ethnicity) were too collinear with the respondent's own characteristics to control separately, while others (e.g., earnings income) were potentially endogenous, particularly among men. Thus only spouse's education and health were controlled in the models. For regressors with sufficiently large numbers of missing values, indicators for missing data were included as separate controls in the model.

E. Statistical Analysis

Weighted descriptive statistics (proportions for dichotomous variables, means and standard deviations for continuous variables) for the outcome measures and explanatory variables are first calculated. Sample weights used for the descriptive statistics correct for differential probabilities of selection and for nonresponse in order to match the age, sex, race and educational composition of the U.S. population.[3] With multiple comparisons, it is possible for significant differences to be picked up simply by random chance. The discussion therefore focuses primarily on the estimates for which the p-value is lower than a relatively strict cutoff for Type I error, $\alpha = .01$. Furthermore, confidence intervals given are 99 percent rather than 95 percent. However, results significant at the 5 percent level are also mentioned.

Single-equation regression models are then used to estimate each of the outcome measures as a function of each of the sets of health measures in turn, controlling for the other determinants of labor market outcomes described above. Depending on the distribution of the outcome, the statistical model estimated is either a linear

regression,[4] a binary logistic regression or an ordered logistic regression. For each specification, the overall adjusted R^2 measure (ρ^2 for the logit regressions) is reported in order to compare the predictive ability of models containing different sets of health measures. The $\chi 2$ or F-statistic and corresponding p-value for the test of the joint significance of the health measures is also given.

For each outcome measure, the "parsimonious" specification described above is then estimated and the individual regressor effects shown. For employment, work hours and hourly earnings, the full set of regression estimates is presented and discussed. For the other job characteristics, only the effects of the health measures are presented. The tables give the coefficient estimates, standard errors, and p-values for the effects of the regressors on the continuous and ordered categorical outcomes. The effects of the regressors on the dichotomous outcomes are presented as odds ratios and confidence intervals. For categorical regressors, the odds ratios approximate the probability that the response will be in the given category when the factor is increased by one unit (e.g., going from 0 to 1 for a binary regressor), divided by the probability at the original value of the regressor. For continuous regressors, the odds ratios are defined similarly, but reflect the relative probability when the value is increased by one standard deviation above the mean.

The impact of simultaneity bias on the estimated effects of the health measures on labor market outcomes is examined through two types of sensitivity analyses. I first use two-stage instrumental variables methods to re-estimate the models. Separate identification of the effects of multiple measures of health status cannot plausibly be achieved, so only the equations controlling solely for self-assessed overall health are re-estimated. Potential instruments are the respondent's assessment of his or her own mental and physical health at age 16 (on scales from 1 to 5), the respondent's assessment of his or her own overall health 10 years ago (on a scale from 1 to 10), the health of the respondent's parents (on scales from 1 to 5), controlling for the parents' ages and whether they are still alive, and the number of physicians per 1,000 residents in the respondent's county.

Both the respondent's prior health status and parental health status (controlling for age) are hypothesized to capture the respondent's genetic and environmental "health endowment," although it is possible that parental health status may also directly affect the respondent's psychological well-being. To examine the sensitivity of the results to failure of the exclusion restriction, I also perform instrumental variables estimation based on two alternative subsets of instruments: (1) prior health of the respondent, and (2) parental health status.

Although the instrumental variables estimates are suggestive, any instrumental variables analysis[5] is inevitably limited. Thus I use an additional, substantially different method to try to examine the nature of the endogeneity bias. Among the conditional sample of workers, I re-estimate the equations for job characteristics as a function of health, controlling separately for the respondent's answers to the following two questions: (1) "Overall, what kind of effect does your job have on your physical health?" and (2) "Overall, what kind of effect does your job have on your

emotional or mental health?" Response categories were very positive, somewhat positive, neither positive nor negative (or balances out), somewhat negative, and very negative. Respondents with more than one job were instructed to give their best judgment of the combined effect of all jobs. Although the responses to these questions are likely to be collinear with the health measures, making it more difficult to find significant effects, the estimates should tend to be conservative, since in some sense, the reverse causality is being directly controlled.

IV. RESULTS

A. Descriptive Statistics

Tables 1a-d respectively present descriptive information on the labor market outcomes, health measures, other control variables, and instruments. Results are given separately for the female and male subsamples. About three quarters of the women and nine tenths of the men are employed. The sample appears to be somewhat skewed toward "high-end" workers. Among employed respondents, almost 40 percent are upper white-collar workers, that is, either professional, managerial, or self-employed. About one sixth of female workers and one fifth of male workers

Table 1a. Descriptive Statistics for Labor Market Outcomes

Variable	*Women (N = 1,527)*	*Men (N = 1,589)*
Employed	74%	90%
Occupational category		
Upper white collar	37%	39%
Lower white collar	32%	12%
Upper manual	3%	16%
Lower manual	28%	33%
Self-employed	15%	21%
Works nights at least once a week	15%	20%
Hours worked for pay in an average week, all jobs combined	40 (SD = 14)	49 (SD = 13)
Hourly earnings	\$13.30 (SD = \$24.66)	\$19.77 (SD = \$44.46)
Job demands scale (0-8 scale)	4.37 (SD = 1.47)	4.38 (SD = 1.27)
Job skills scale (0-16 scale)	9.87 (SD = 2.89)	10.57 (SD = 2.73)
Job authority scale (0-16 scale)	9.71 (SD = 3.86)	10.54 (SD = 3.51)

Table 1b. Descriptive Statistics for Health Measures

Variable	*Women (N = 1,527)*	*Men (N = 1,589)*
Had condition in past year:		
respiratory	15%	10%
bone/joint disease	31%	24%
autoimmune	2%	1%
hypertension	16%	14%
sleep problems	14%	11%
diabetes	4%	4%
neurological	2%	2%
Ever had heart attack	1%	1%
Ever had cancer	6%	2%
Had depression in past year	21%	11%
Had anxiety disorder in past year	5%	3%
Had panic attacks in past year	7%	6%
Behavior related to drug abuse in past year	2%	3%
Behavior related to alcohol abuse in past year	3%	8%
Self-assessed overall health (10 = best)	7.30 (SD = 1.89)	7.41 (SD = 1.52)
Self-assessed mental health (5 = excellent)	3.57 (SD = 1.03)	3.71 (SD = 0.93)
Self-assessed physical health (5 = excellent)	3.38 (SD = 1.04)	3.46 (SD = 0.91)
Angina scale (0-8 scale)	0.17 (SD = 0.55)	0.10 (SD = 0.38)
Functional limitations scale (0-27 scale)	4.91 (SD = 6.80)	3.19 (SD = 5.31)

are self-employed. The average weekly hours for all jobs combined was about 40 among female workers and 49 among male workers, with mean earnings per work hour of about $13 for the women and $20 for the men.

Among the entire sample, including workers and nonworkers, the most common health problems were bone/joint diseases, depression, hypertension, respiratory diseases, and sleep problems. On a scale from 1 (worst) to 10 (best), the average self-assessed health score was 7.30 (SD = 1.89) for women and 7.41 (SD = 1.52) for men. Separate measures for self-assessed physical and mental health showed that the average scores for the two were similar, with both women and men ranking their own mental health just slightly higher than physical health on average. The average score on the functional limitations scale was 4.91 (SD = 6.80) for women and 3.19 (SD = 5.31) for men. As an example, a score of 4 on this scale would correspond to reporting having some difficulty with two activities, such as climbing several flights of stairs and walking more than one mile.

Table 1c. Descriptive Statistics for Other Control Variables

Variable	*Women (N = 1,527)*	*Men (N = 1,589)*
Age group		
25-34	28%	31%
35-44	32%	34%
45-54	21%	23%
55-64	18%	12%
Education		
less than high school	13%	14%
high school	41%	36%
some college	27%	25%
bachelor's degree	13%	17%
graduate degree	7%	8%
Marital status		
Married or cohabiting	72%	83%
Separated or divorced	16%	9%
Widowed	3%	1%
Never married	9%	8%
Urban residence	74%	71%
Black	14%	10%
Other non-white race	10%	10%
Hispanic ethnicity	3%	3%
Children under 6	17%	22%
Children age 6-13	28%	34%
Foreign-born	5%	6%
Grew up in two-parent household	71%	76%
Spouse's education (married subsample)		
don't know	1%	2%
less than high school	15%	12%
high school	37%	41%
more than high school, no bachelor's	22%	25%
bachelor's degree	17%	16%
graduate degree	9%	5%
Spouse's physical health (married subsample)	3.38 (SD = 1.18)	3.63 (SD = 0.91)
Spouse's mental health (married subsample)	3.66 (SD = 1.28)	3.82 (SD = 0.95)
Net assets of couple (divided by 2 if married)	\$38,196 (SD = \$92,983)	\$43,519 (SD = \$89,322)
Total number of children	0.90 (SD = 1.20)	1.09 (SD = 1.23)
Father's education (1-5 scale)	1.97 (SD = 1.12)	1.99 (SD = 1.00)
Mother's education (1-5 scale)	1.92 (SD = 0.97)	1.96 (SD = 0.88)
State unemployment rate	5.45 (SD = 1.17)	5.45 (SD = 1.07)

Table 1d. Descriptive Statistics for Instruments

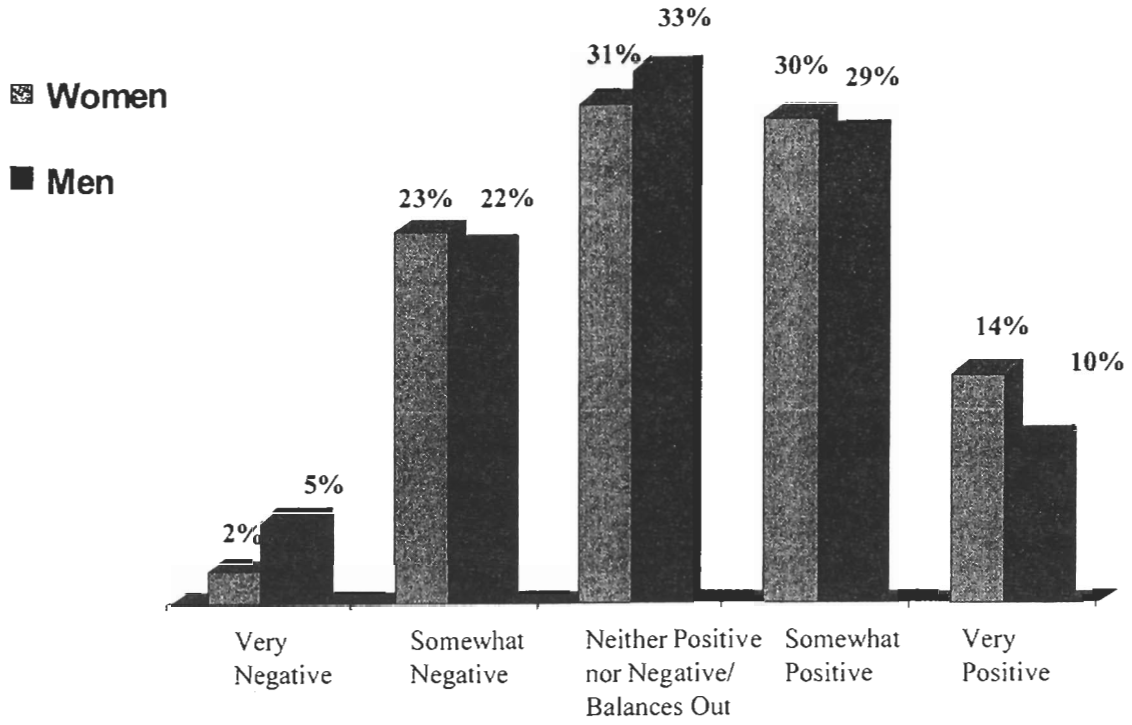
Variable	*Women (N = 1,527)*	*Men (N = 1,589)*
Father deceased	46%	43%
Mother deceased	27%	24%
Father's current health	1.40 (*SD* = 1.64)	1.54 (*SD* = 1.51)
Mother's current health	2.02 (*SD* = 1.66)	2.12 (*SD* = 1.42)
Father's age	33.71 (*SD* = 34.95)	35.91 (*SD* = 31.86)
Mother's age	46.68 (*SD* = 32.07)	47.94 (*SD* = 27.77)
Father's health when respondent was 16	3.24 (*SD* = 1.46)	3.31 (*SD* = 1.25)
Mother's health when respondent was 16	3.39 (*SD* = 1.31)	3.47 (*SD* = 1.08)
Respondent's mental health at age 16	4.00 (*SD* = 1.10)	4.06 (*SD* = 0.92)
Respondent's physical health at age 16	4.31 (*SD* = 0.95)	4.38 (*SD* = 0.77)
Respondent's health 10 years ago (10 = best)	8.12 (*SD* = 1.95)	8.36 (*SD* = 1.65)
Physicians per 1000 county residents	30 (*SD* = 18)	31 (*SD* = 17)

Note: Unless otherwise noted, health measures are self-reported on a scale from 1 (poor) to 5 (excellent).

Figures 1 and 2 show histograms corresponding to the responses to the self-report questions about how the worker's job affects his or her physical and mental health. The frequency distributions provide evidence that endogeneity may be a concern. In each case, about two thirds of the sample reported either positive or negative effects, with only about one third responding that their jobs had no net impact on their health. Interestingly, more workers reported positive than negative effects, probably reflecting selection, that is, that workers tend to choose jobs that will be beneficial to them and avoid jobs with adverse impacts. The distributions of responses to these questions were very similar for men and women, and for mental and physical health.

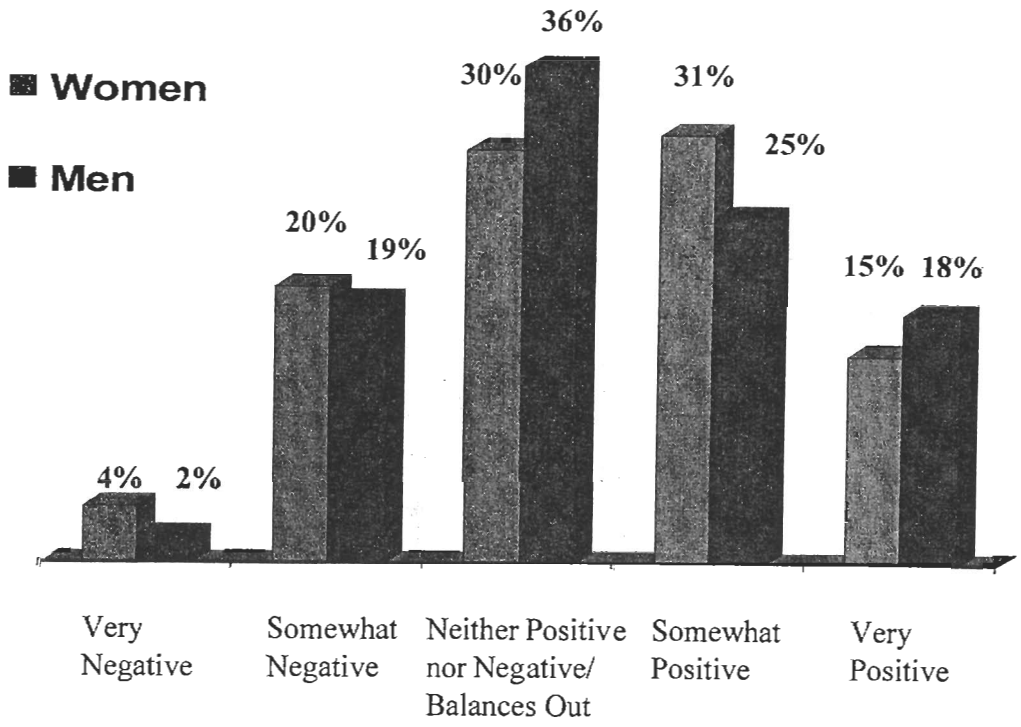
B. Predictive Ability of Health Measures

Tables 2a-b describe the predictive ability of different sets of health measures for women and men respectively. Health clearly has greater ability to predict employment than job characteristics conditional on employment. This result is consistent with the notion that workers with a given health problem who self-select into the labor force are those who are either least sick, best able to cope with their disability, or have jobs that can accommodate the disability. Furthermore, although all sets of health measures have good predictive power in the employment regressions, the scale of functional limitations was among the most predictive health measures for both the female and male samples. In contrast, there were no consistent patterns across men and women or across outcomes in terms of which health measures were the best predictors of each job characteristic.



Source: 1995 Mid-Life in the United States Study (N=3,116)

Figure 1. Self-Assessed Impact of Job on Physical Health Among Workers Aged 25-74



Source: 1995 Mid-Life in the United States Study (N=3,116)

Figure 2. Self-Assessed Impact of Job on Mental Health Among Workers Aged 25-74

Table 2a. Predictive Ability of Different Sets of Health Measures, Women

Dependent Variable	*Self-Assessed Overall Health*	*Self-Assessed Mental and Physical Health*	*Self-Reported Medical Conditions*	*Scale of Functional Limitations*	*Substance Abuse and Mental Health Measures*
Employment (N=1,527)	ρ^2=.18 χ^2 = 50, p<.0001	ρ^2=.17 χ^2 = 36, p<.0001	ρ^2=.18 χ^2 = 51, p<.0001	ρ^2=.19 χ^2 = 69, p<.0001	ρ^2=.16 χ^2 = 15, p=.009
Occupational choice (N=1,133)	ρ^2=.21 χ^2 = 1, p=.26	ρ^2=.21 χ^2 = 11, p=.005	ρ^2=.21 χ^2 = 6, p=.84	ρ^2=.21 ^{2} = 3, p=.08	ρ^2=.21 χ^2 = 3, p=.77
Self-employment (N=1,074)	ρ^2=.07 χ^2 = 1, p=.28	ρ^2=.07 χ^2 < 1, p=.76	ρ^2=.08 χ^2 = 10, p=.45	ρ^2=.07 χ^2 = 4, p=.05	ρ^2=.08 χ^2 = 13, p=.02
Works night shift (N=973)	ρ^2=.13 χ^2 < 1, p=.45	ρ^2=.12 χ^2 < 1, p=.89	ρ^2=.14 χ^2 = 9, p=.53	ρ^2=.13 χ^2 <1, p=.79	ρ^2=.13 χ^2 = 4, p=.54
Work hours (N=1,135)	adjusted R^2= .08 F<1, p=.41	adjusted R^2= .09 F=2, p=.10	adjusted R^2= .08 F<1, p=.88	adjusted R^2= .08 F=1, p=.31	adjusted R^2= .09 F=1, p=.34
Hourly earnings (N=1,012)	adjusted R^2= .04 F=1, p=.27	adjusted R^2= .04 F<1, p=.48	adjusted R^2= .04 F=1, p=.29	adjusted R^2= .04 F<1, p=.75	adjusted R^2= .04 F<1, p=.48
Job demands scale (N=1,073)	adjusted R^2= .05 F=6, p=.01	adjusted R^2= .06 F=8, p=.0003	adjusted R^2= .07 F=3, p=.0004	adjusted R^2= .05 F=4, p=.06	adjusted R^2= .04 F<1, p=.66
Job skills scale (N=1,073)	adjusted R^2= .16 F=3, p=.06	adjusted R^2= .16 F=4, p=.02	adjusted R^2= .16 F=2, p=.05	adjusted R^2= .16 F<1, p=.44	adjusted R^2= .16 F=2, p=.05
Job authority scale (N=1,073)	adjusted R^2= .16 F=5, p=.03	adjusted R^2= .17 F=12, p=.0001	adjusted R^2= .16 F=2, p=.04	adjusted R^2= .15 F<1, p=.91	adjusted R^2= .16 F=2, p=.17

Notes: Regressions also control for a constant term and the other regressors shown in Table 1c. The adjusted R^2 and ρ^2 measures are for the overall regression specification, while the χ^2 and F-tests are for the significance of the health measures only.

Table 2b. Predictive Ability of Different Sets of Health Measures, Men

Dependent Variable	*Self-Assessed Overall Health*	*Self-Assessed Mental and Physical Health*	*Self-Reported Medical Conditions*	*Scale of Functional Limitations*	*Substance Abuse and Mental Health Measures*
Employment (N=1,589)	ρ^2=.22 χ^2 = 30, p<.0001	ρ^2=.22 χ^2 = 34, p<.0001	ρ^2=.25 χ^2 = 68, p<.0001	ρ^2=.25 χ^2 = 74, p<.0001	ρ^2=.21 χ^2 = 19, p=.002
Occupational choice (N=1,389)	ρ^2=.16 χ^2 < 1, p=.63	ρ^2=.16 χ^2 = 3, p=.18	ρ^2=.16 χ^2 = 26, p=.004	ρ^2=.16 χ^2 = .5, p=.49	ρ^2=.16 χ^2 = 10, p=.08
Self-employment (N=1,286)	ρ^2=.12 χ^2 < 1, p=.47	ρ^2=.12 χ^2 = 7, p=.03	ρ^2=.13 χ^2 = 14, p=.19	ρ^2=.12 χ^2 = 2, p=.13	ρ^2=.13 χ^2 = 13, p=.02
Works night shift (N=1,196)	ρ^2=.06 χ^2 < 1, p=.65	ρ^2=.07 χ^2 = 7, p=.03	ρ^2=.08 χ^2 = 14, p=.16	ρ^2=.06 χ^2 =.0003, p=.99	ρ^2=.08 χ^2 = 23, p=.0004
Work hours (N=1,391)	adjusted R^2= .08 F<1, p=.51	adjusted R^2= .08 F=2, p=.13	adjusted R^2= .08 F=2, p=.02	adjusted R^2= .08 F<1, p=.49	adjusted R^2= .08 F=2, p=.09
Hourly earnings (N=1,289)	adjusted R^2= .07 F=3, p=.08	adjusted R^2= .07 F<1, p=.61	adjusted R^2= .08 F=2, p=.05	adjusted R^2= .07 F<1, p=.58	adjusted R^2= .07 F<1, p=.83
Job demands scale (N=1,306)	adjusted R^2= .08 F=12, p=.73	adjusted R^2= .08 F<1, p=.72	adjusted R^2= .10 F=3, p=.0002	adjusted R^2= .09 F=3, p=.11	adjusted R^2= .09 F=2, p=.08
Job skills scale (N=1,306)	adjusted R^2= .09 F<1, p=.67	adjusted R^2= .09 F=3, p=.08	adjusted R^2= .09 F=1, p=.36	adjusted R^2= .09 F=2, p=.14	adjusted R^2= .09 F=3, p=.01
Job authority scale (N=1,306)	adjusted R^2= .12 F<1, p=.54	adjusted R^2= .13 F=5, p=.008	adjusted R^2= .12 F=1, p=.37	adjusted R^2= .12 F=2, p=.19	adjusted R^2= .12 F=1, p=.40

Notes: Regressions also control for a constant term and the other regressors shown in Table 1c. The adjusted R^2 and ρ^2 measures are for the overall regression specification, while the χ^2 and F-tests are for the significance of the health measures only.

C. Regression Estimates of Effect of Health on Labor Market Outcomes

Tables 3a-b provide further evidence to support these conclusions, based on the "parsimonious" regression specification. When controlling simultaneously for a limited set of health measures, the scale of functional limitations is the most significant health predictor of employment among both the male and female subsamples, although self-assessed health is also significantly associated with employment among women and the number of medical conditions is associated with employment among men.

Among female workers, those with greater functional limitations were slightly more likely to be self-employed, those with more medical conditions held jobs that were more demanding, and those reporting better self-assessed health held jobs that had higher occupational rankings and required greater skills, although the effects were modest in magnitude. Among male workers, those suffering from depression, anxiety, or panic disorders were only half as likely to be self-employed and held jobs requiring fewer skills (about six tenths of a point on the 16-point scale), while those demonstrating substance-abuse-related behaviors were twice as likely to work nights at least once a week. In contrast, women demonstrating substance-related behaviors were less likely to work night shifts, although the result was only marginally significant.

D. Regression Estimates of Effect of Other Control Variables on Employment, Work Hours, and Hourly Earnings

Appendices A-C show the regression estimates for the other control variables from the "parsimonious" specification for employment, work hours, and hourly earnings. Men and women in the oldest age group (55-64) were significantly less likely to be employed and the effects were large, with odds ratios of .11 and .40 respectively. Among respondents who were employed, older workers also reported significantly fewer hours per week on average.

Family obligations affected men and women differently. Men who were married, separated, or divorced were almost three times more likely to be employed than men who had never been married, while marital status did not significantly affect the employment of the women in the sample. In contrast, having children, especially children under age 6, significantly reduced the employment rates and work hours of women but not men. However, among both male and female workers, those who were separated or divorced worked more than those who had never been married. Married men also worked more hours than unmarried men.

Education significantly increased the employment, work hours, and hourly earnings of women but not men; among male workers, those with a high school education appeared to work the most hours on average. Women with better educated spouses or spouses in better mental health were significantly less likely to work; in contrast, the education and health of wives did not appear to affect the

Table 3a. Effect of Individual Health Measures on Labor Market Outcomes, Women

Health Measure	*Employment*	*Self-Employment*	*Works Night Shift*
Self-assessed overall health	OR= 1.15 (CI=1.02, 1.30) (p=.002)**	OR= 1.15 (CI=0.96, 1.37) (p=.05)*	OR= 0.93 (CI= 0.76, 1.14) (p=.37)
Any mental disorder	OR= 0.70 (CI=0.45, 1.10) (p=.04)*	OR= 1.44 (CI=0.80, 2.60) (p=.11)	OR= 0.90 (CI=0.47, 1.73) (p=.69)
Any drug/alcohol abuse	OR= 2.17 (CI=0.71, 6.63) (p=.08)	OR= 1.02 (CI=0.30, 3.52) (p=.97)	OR= 0.28 (CI=0.06, 1.27) (p=.03)*
No. of medical conditions	OR= 0.95 (CI=0.81, 1.12) (p=.46)	OR= 0.89 (CI=0.70, 1.14) (p=.24)	OR= 1.15 (CI=0.90, 1.47) (p=.15)
Functional limitations scale	OR= 0.94 (CI=0.91, 0.97) (p<.001)***	OR= 1.05 (CI=1.00, 1.11) (p=.005)**	OR= 0.98 (CI=0.92, 1.04) (p=.34)
Health Measure	*Occupational Category*	*Work Hours*	*Hourly Earnings*
Self-assessed overall health	0.10 (SE=0.05) (p=.04)*	0.38 (SE=0.31) (p=.22)	$0.69 (SE=$0.51) (p=.18)
Any mental disorder	0.23 (SE=0.16) (p=.15)	0.43 (SE=1.03) (p=.68)	$0.86 (SE=$1.70) (p=.61)
Any drug/alcohol abuse	0.10 (SE=0.31) (p=.76)	–1.04 (SE=1.97) (p=.60)	–$0.18 (SE=$3.25) (p=.96)
No. of medical conditions	–0.02 (SE=0.06) (p=.72)	–0.10 (SE=0.41) (p=.80)	–$0.03 (SE=$0.67) (p=.96)
Functional limitations scale	0.03 (SE=0.01) (p=.02)*	0.13 (SE=0.09) (p=.14)	$0.12 (SE=$0.15) (p=.42)
Health Measure	*Job Demands Scale*	*Job Skills Scale*	*Job Authority Scale*
Self-assessed overall health	–0.03 (SE=0.03) (p=.35)	0.17 (SE=0.06) (p=.006)**	0.16 (SE=.08) (p=.05)*
Any mental disorder	0.07 (SE=0.11) (p=.56)	–0.01 (SE=0.21) (p=.95)	–0.37 (SE=.28) (p=.18)
Any drug/alcohol abuse	0.20 (SE=0.22) (p=.37)	0.30 (SE=0.41) (p=.46)	0.77 (SE=.54) (p=.15)
No. of medical conditions	0.13 (SE=0.04) (p=.003)**	0.13 (SE=0.08) (p=.13)	–0.09 (SE=.11) (p=.40)
Functional limitations scale	0.01 (SE=0.01) (p=.97)	0.02 (SE=0.02) (p=.21)	0.03 (SE=.02) (p=.23)

Notes: ***Significant at $p \leq .001$.
**Significant at $p \leq .01$.
*Significant at $p \leq .05$.
Odds ratios and 99 percent confidence intervals are for a one-unit increase in health. Regressions also control for a constant and all variables shown in Table 1c.

Table 3b. Effect of Individual Health Measures on Labor Market Outcomes, Men

Health Measure	*Employment*	*Self-Employment*	*Works Night Shift*
Self-assessed overall health	OR= 0.99 (CI=0.84, 1.17) (p=.90)	OR= 0.99 (CI=0.85, 1.16) (p=.88)	OR= 1.08 (CI= 0.91, 1.28) (p=.27)
Any mental disorder	OR= 0.81 (CI=0.42, 1.56) (p=.41)	OR= 0.49 (CI=0.24, 0.99) (p=.009)**	OR= 1.57 (CI=0.88, 2.81) (p=.05)*
Any drug/alcohol abuse	OR= 0.73 (CI=0.34, 1.58) (p=.30)	OR= 1.39 (CI=0.72, 2.71) (p=.20)	OR= 2.11 (CI=1.10, 4.05) (p=.003)**
No. of medical conditions	OR= 0.79 (CI=0.63, 0.99) (p=.007)*	OR= 0.91 (CI=0.71, 1.16) (p=.33)	OR= 1.05 (CI=0.82 1.34) (p=.63)
Functional limitations scale	OR= 0.91 (CI=0.88, 0.95) (p<.001)**	OR= 0.93 (CI=0.93, 1.04) (p=.36)	OR= 1.00 (CI=0.95, 1.06) (p=.97)
Health Measure	*Occupational Category*	*Work Hours*	*Hourly Earnings*
Self-assessed overall health	-0.03 (SE=0.04) (p=.47)	–0.18 (SE=0.28) (p=.52)	–$1.34 (SE=$0.91) (p=.14)
Any mental disorder	–0.21 (SE=0.17) (p=.22)	1.36 (SE=1.10) (p=.22)	-$4.56 (SE=$3.42) (p=.18)
Any drug/alcohol abuse	–0.33 (SE=0.19) (p=.08)	1.07 (SE=1.26) (p=.39)	$3.03 (SE=$3.93) (p=.44)
No. of medical conditions	–0.05 (SE=0.07) (p=.46)	0.18 (SE=0.44) (p=.68)	$0.71 (SE=$1.39) (p=.61)
Functional limitations scale	0.01 (SE=0.01) (p=.45)	–0.11 (SE=0.09) (p=.23)	–$0.05 (SE=$0.31) (p=.87)
Health Measure	*Job Demands Scale*	*Job Skills Scale*	*Job Authority Scale*
Self-assessed overall health	0.02 (SE=0.03) (p=.46)	0.05 (SE=0.06) (p=.45)	0.07 (SE=0.08) (p=.36)
Any mental disorder	0.09 (SE=0.12) (p=.44)	–0.59 (SE=0.24) (p=.01)**	–0.20 (SE=0.30) (p=.50)
Any drug/alcohol abuse	0.16 (SE=0.13) (p=.23)	0.32 (SE=0.27) (p=.23)	0.06 (SE=0.34) (p=.86)
No. of medical conditions	0.05 (SE=0.05) (p=.26)	–0.12 (SE=0.09) (p=.21)	–0.10 (SE=0.12) (p=.39)
Functional limitations scale	0.01 (SE=0.01) (p=.20)	0.04 (SE=0.02) (p=.03)*	0.05 (SE=0.03) (p=.06)

Notes: ***Significant at $p \leq .001$.
**Significant at $p \leq .01$.
*Significant at $p \leq .05$.
Odds ratios and 99 percent confidence intervals are for a one-unit increase in health. Regressions also control for a constant and all variables shown in Table 1c.

employment of husbands. Taken together, these results are consistent with the notion that women work more when they bear a greater proportion of the responsibility for the family's financial security, whereas full-time employment is the norm for men, regardless of what their wives do. These results are also consistent with the hypothesis that mental health affects employment, since the mechanism through which the spouse's mental health affects the respondent's employment is likely to be through the spouse's own job prospects.

Among workers, black women worked more hours per week than white women, while black men worked fewer hours per week than white men, but had higher earnings per hour. The latter finding might be attributable to reporting bias, if white men tend to overreport work hours relative to black men, hence biasing towards finding lower hourly earnings among the whites. Hispanic women had lower hourly earnings than non-Hispanic women. Weak evidence was also found that foreign-born women were less likely to be employed but that among those employed, hourly earnings were higher.

Men living in states with higher unemployment rates were less likely to be employed and female workers living in states with higher unemployment rates worked fewer hours per week. Surprisingly, higher unemployment rates were correlated with higher hourly earnings among men. Unemployment generally tends to have the greatest impact on the least well-trained and lowest-paid workers, so this finding could be related to selection into the labor force in areas of high unemployment.

Among male workers, those with greater family assets work more, and among both male and female workers, those with greater family assets have higher hourly earnings. These results may be due in part to endogeneity, if families have greater assets because the couple tends to work more or have higher wage rates. In this case, however, the significant *negative* effects of family assets on women's employment rates and conditional work hours are likely to be biased downward.

E. Sensitivity Analyses

Tables 4a-b show the results of the sensitivity analyses for men and women respectively. These analyses are based on a specification controlling for self-assessed overall health on a scale from 1 to 10, along with the other control variables shown in Table 1c. Among both women and men, the original estimates in the first column are close to the estimates in the third column from a specification controlling directly for reciprocal effects, that is, the impact of one's job on one's health.

Both sets of instruments (respondent and parental health) were highly significant in the first-stage regression of an instrumental variables analysis. The instrumental variables estimates were quite consistent with the original estimates. In particular, the large and highly significant increases in the probability of employment associated with better self-assessed health remained after instrumenting,

actually increasing slightly in magnitude. Instrumenting did eliminate a small but significant decrease in job demands associated with better self-assessed health among women, while it increased the magnitude and significance of two effects among men: a reduction in hourly earnings and an increase in job skills associated with better health. Although it seems counterintuitive that men reporting better health would have lower hourly earnings, this result may be due to the correlation that (by definition) exists between work hours and hourly earnings, which is constructed as total earnings divided by work hours.

Among the instrumental variables estimates that were statistically significant when using the full instrument set, the magnitudes did not appear to be particularly sensitive to the choice of instruments (Appendices D and E), although the estimates did lose statistical significance when only parental health was used, due in large part to the increased standard errors. The general pattern of results was similar to the original IV estimates, with two exceptions. Among male workers, use of parental health as the instrument revealed a large and highly significant positive effect of self-assessed health on job authority. Furthermore, its impact on occupational category was significant after instrumenting, but the direction depended on which instrument was used.

V. DISCUSSION

This study looked at the impact of physical and mental health on labor market outcomes, among a nationally representative sample of non-elderly adults in the United States. Health had greater predictive ability for employment than job characteristics. In particular, functional limitations were strong predictors of employment among both women and men, with respectively 6 percent and 9 percent reductions in the probability of working associated with each unit increase in the 0-27 functional limitations scale. Otherwise there were no patterns of results that were consistent for both men and women, or across labor market outcomes. In addition to functional limitations, strong predictors of employment included self-assessed health among women and the number of self-reported medical conditions among men.

Although no clearcut patterns emerged regarding the impact of different health measures on the job characteristics studied, the cases in which significant effects emerged did suggest that better health leads to better jobs. Furthermore, in comparing the roles played by mental versus physical health, mental disorders, and substance-abuse-related behaviors appeared to have significant effects in the expected directions at least as frequently as the physical health measures. Additional analyses suggested that the effects of health on labor market outcomes were not particularly sensitive to reverse causality. The estimates were very similar when controlling for the self-reported impact of job on health. Instrumental variables estimates of the impact of health on employment also tended to be similar to the original estimates, although statistical significance declined when using subsets of the instruments. The instrumental variables estimates of the effects of

Table 4a. Sensitivity Analyses, Specification Controlling Only for Self-assessed Overall Health on a Scale from 1 to 10, Women

Dependent Variable	*Single-Equation Estimates*	*Instrumental Variables Estimates*	*Single-Equation Estimates Controlling for Self-Assessed Impact of Job on Health*
Employment	OR= 1.31 (CI=1.19, 1.45) (p<.001)***	OR= 1.43 (CI=1.08, 1.90) (p=.001)***	N/A
Self-employment	OR= 1.07 (CI=0.91, 1.25) (p=.28)	OR= 0.83 (CI=0.56, 1.22) (p=.21)	OR= 1.06 (CI=0.90, 1.24) (p=.37)
Works night shift	OR= 0.95 (CI=0.80, 1.12) (p=.41)	OR= 1.13 (CI=0.71, 1.81) (p=.50)	OR= 0.97 (CI=0.81, 1.15) (p=.60)
Occupational category	0.05 (SE=0.04) (p=.25)	0.01 (SE=0.11) (p=.96)	0.07 (SE=0.04) (p=.10)
Work hours	0.22 (SE=0.27) (p=.41)	–0.41 (SE=0.73) (p=.57)	0.37 (SE=0.27) (p=.18)
Hourly earnings	$0.49 (SE=$0.44) (p=.27)	$0.92 (SE=$1.23) (p=.45)	$0.46 (SE=$0.45) (p=.31)
Job demands scale	–0.07 (SE=0.03) (p=.01)**	0.04 (SE=0.08) (p=.54)	–0.03 (SE=0.03) (p=.24)
Job skills scale	0.10 (SE=0.06) (p=.06)	0.23 (SE=0.15) (p=.13)	0.10 (SE=0.06) (p=.07)
Job authority scale	0.16 (SE=0.07) (p=.03)*	0.26 (SE=0.20) (p=.19)	0.13 (SE=0.07) (p=.07)

Notes: ***Significant at $p \leq .001$.
**Significant at $p \leq .01$.
*Significant at $p \leq .05$.
Odds ratios and 99 percent confidence intervals are for a one-unit increase in health. Regressions also control for a constant and all variables shown in Table 1c.

Table 4b. Sensitivity Analyses, Specification Controlling Only for Self-Assessed Overall Health on a Scale from 1 to 10, Men

Dependent Variable	*Single-Equation Estimates*	*Instrumental Variables Estimates*	*Single-Equation Estimates Controlling for Self-Assessed Impact of Job on Health*
Employment	OR= 1.31 (CI=1.15, 1.49) ($p<.001$)***	OR= 1.47 (CI=1.05, 2.07) ($p=.004$)***	N/A
Self-employment	OR= 1.04 (CI=0.91, 1.19) ($p=.48$)	OR= 0.82 (CI=0.60, 1.13) ($p=.12$)	OR= 1.03 (CI=0.90, 1.19) ($p=.55$)
Works night shift	OR= 1.03 (CI=0.88, 1.19) ($p=.65$)	OR= 1.17 (CI=0.82, 1.69) ($p=.26$)	OR= 1.07 (CI=0.92, 1.25) ($p=.27$)
Occupational category	–0.02 (SE=0.04) ($p=.64$)	–0.13 (SE=0.09) ($p=.16$)	–0.02 (SE=0.04) ($p=.62$)
Work hours	–0.17 (SE=0.25) ($p=.51$)	–0.93 (SE=0.60) ($p=.12$)	–0.10 (SE=0.25) ($p=.69$)
Hourly earnings	–$1.38 (SE=$0.79) ($p=.08$)	–$5.76 (SE=$1.91) ($p=.003$)**	–$1.15 (SE=$0.81) ($p=.16$)
Job demands scale	–0.01 (SE=0.03) ($p=.73$)	0.07 (SE=0.06) ($p=.24$)	0.01 (SE=0.03) ($p=.64$)
Job skills scale	0.02 (SE=0.06) ($p=.67$)	0.39 (SE=0.13) ($p=.002$)**	–0.07 (SE=0.05) ($p=.19$)
Job authority scale	0.04 (SE=0.07) ($p=.54$)	0.14 (SE=0.16) ($p=.37$)	–0.07 (SE=0.07) ($p=.29$)

Notes: ***Significant at $p \leq .001$.
**Significant at $p \leq .01$.
*Significant at $p \leq .05$.
Odds ratios and 99 percent confidence intervals are for a one-unit increase in health. Regressions also control for a constant and all variables shown in Table 1c.

health on job characteristics were somewhat more sensitive, again suggesting that the most robust effect of health status is on the probability of employment.

Although the paucity of significant health effects on labor market outcomes other than employment is consistent with the past research (Currie & Madrian, 1999), it is nonetheless surprising. The most likely explanation is selection. If the persons who choose to enter the workforce are those who are relatively healthy for their observable health category, who are best able to cope with their medical conditions or who are able to obtain jobs that accommodate their disabilities, then the impact of poor health conditional on employment will clearly be an underestimate of the unconditional effect.

The analyses are subject to certain inherent limitations. As with virtually all of the past studies in this area, whether acknowledged or not, separate identification of the effects of multiple health measures is not plausible. Nor do plausible exclusion restrictions exist that would allow the identification of the effect of selection into the labor force. The use of telephone interviews and written questionnaires may disproportionately exclude unemployed and indigent respondents, who may also be in poor health, hence biasing the estimated health effects downward. The absence of information on self-reported job limitations prohibits direct comparisons of the study findings with much of the previous research on the work-health relationship. MIDUS sample sizes are modest, so power may be low even with the single-equation estimates. Finally, instrumental variables assumptions are inevitably prone to possible failure of the exclusion restriction, although the relative strength of the correlation of the instruments with health status suggests that instrumenting is likely to improve the consistency of the estimates (Bound, Jaeger, & Baker, 1995; Staiger & Stock, 1997).

Taken as a whole, the results suggest that while health status is probably endogenous to employment, it may not make that much empirical difference to its estimated effect. This finding should be reassuring for those who wish to control for health status in their models but do not have suitable instruments. On the other hand, psychological health appears to be on a par with physical health as an important component of human capital, suggesting that labor economists should make a greater effort to expand the range of health measures included in survey instruments and analyses.

Finally, workers are probably self-selecting into jobs that maximize the beneficial effects (or minimize adverse effects) on their health. Extensions to the current analyses should examine the impact of health on labor market outcomes among particular subgroups of workers. For example, poorly educated workers or perhaps those who face racial discrimination in the labor force may be in a less enabling work situation, thereby demonstrating stronger adverse effects of disability on job characteristics. At the same time, observable and unobservable health effects on employment may be larger for these subgroups, leading to stronger selection effects. These hypotheses would be best studied in a larger sample that would allow for estimation within narrowly defined demographic subgroups.

APPENDIX A

Regression Results for Control Variables, Employment Odds Ratios, 99% Confidence Intervals and *P*-Values

Regressor	*Women (N = 1,527)*	*Men (N = 1,589)*
Age 35-44	1.53 (0.85, 2.76) (p=.06)	0.71 (0.29, 1.73) (p=.32)
Age 45-54	1.14 (0.59, 2.22) (p=.61)	0.61 (0.25, 1.49) (p=.15)
Age 55-64	0.40 (0.20, 0.80) (p<.001)***	0.11 (0.04, 0.27) (p<.001)***
Less than high school	0.44 (0.24, 0.82) (p<.001)***	0.78 (0.34, 1.75) (p=.42)
Some college	1.64 (1.04, 2.58) (p=.006)**	0.90 (0.48, 1.70) (p=.68)
Bachelor's degree	2.36 (1.22, 4.56) (p<.001)***	1.42 (0.63, 3.20) (p=.26)
Graduate degree	4.94 (1.94, 12.59) (p<.001)***	1.66 (0.62, 4.47) (p=.19)
Married or cohabiting	1.09 (0.47, 2.50) (p=.80)	2.89 (1.13, 7.40) (p=.004)**
Separated or divorced	1.48 (0.65, 3.37) (p=.22)	2.52 (0.92, 6.90) (p=.02)*
Widowed	1.06 (0.37, 2.99) (p=.89)	1.97 (0.31, 12.55) (p=.34)
Urban residence	1.05 (0.69, 1.59) (p=.78)	0.81 (0.45, 1.45) (p=.35)
Black	0.96 (0.50, 1.83) (p=.86)	1.30 (0.43, 3.97) (p=.54)
Other nonwhite race	0.88 (0.47, 1.65) (p=.61)	0.87 (0.35, 2.15) (p=.69)
Hispanic ethnicity	2.10 (0.73, 6.08) (p=.07)	1.53 (0.36, 6.56) (p=.45)
Children under 6	0.31 (0.16, 0.59) (p<.001)***	1.17 (0.39, 3.56) (p=.71)
Children age 6-13	0.50 (0.26, 0.94) (p=.005)**	0.98 (0.36, 2.68) (p=.95)
Foreign-born	0.54 (0.24, 1.18) (p=.04)*	1.02 (0.32, 3.22) (p=.97)
Father's education	0.93 (0.75, 1.16) (p=.39)	1.02 (0.75, 1.39) (p=.87)
Mother's education	1.06 (0.85, 1.31) (p=.48)	0.86 (0.64, 1.15) (p=.17)
Grew up in two-parent household	0.87 (0.57, 1.34) (p=.41)	1.42 (0.80, 2.53) (p=.12)
Spouse has less than high school	0.88 (0.42, 1.84) (p=.65)	0.83 (0.33, 2.08) (p=.61)
Spouse has some college	0.58 (0.32, 1.04) (p=.02)	0.94 (0.45, 1.94) (p=.82)
Spouse has bachelor's degree	0.45 (0.24, 0.86) (p=.002)**	0.74 (0.30, 1.82) (p=.39)
Spouse has graduate degree	0.26 (0.11, 0.59) (p<.001)***	1.30 (0.32, 5.17) (p=.63)
Spouse's physical health	1.06 (0.84, 1.35) (p=.51)	0.95 (0.70, 1.29) (p=.65)
Spouse's mental health	0.77 (0.61, 0.96) (p=.002)**	0.99 (0.73, 1.34) (p=.94)
Net assets of couple	0.70 (0.58, 0.83) (p<.001)***	0.88 (0.72, 1.09) (p=.14)
Total number of children	1.10 (0.80, 1.50) (p=.46)	1.09 (0.65, 1.81) (p=.67)
State unemployment rate	0.93 (0.78, 1.12) (p=.32)	0.78 (0.62, 0.99) (p=.007)**

Notes: Regressions also control for a constant term, missing parental and spouse education, and the health measures (self-assessed overall health, whether any mental disorder, whether reports any substance-related behaviors, number of medical conditions, functional limitations scale). Omitted categories are age 25-34, high school education, never married, and white non-Hispanic.

APPENDIX B

Regression Results for Control Variables, Hours Coefficient Estimates, Standard Errors and *P*-Values

Regressor	*Women (N=1,527)*	*Men (N=1,589)*
Age 35-44	0.14 (SE=1.24) (p=.91)	−2.02 (SE=1.04) (p=.05)*
Age 45-54	0.74 (SE=1.38) (p=.59)	−2.54 (SE=1.12) (p=.02)*
Age 55-64	−3.32 (SE=1.59) (p=.04)*	−7.19 (SE=1.46) (p<.001)***
Less than high school	−3.36 (SE=1.79) (p=.06)	−4.22 (SE=1.38) (p=.002)**
Some college	0.12 (SE=1.06) (p=.91)	−3.74 (SE=0.96) (p<.001)***
Bachelor's degree	2.00 (SE=1.41) (p=.16)	−1.41 (SE=1.12) (p=.21)
Graduate degree	6.21 (SE=1.68) (p<.001)***	−4.33 (SE=1.45) (p=.003)**
Married or cohabiting	0.97 (SE=1.71) (p=.57)	4.34 (SE=1.54) (p=.005)**
Separated or divorced	3.81 (SE=1.60) (p=.02)*	3.85 (SE=1.71) (p=.02)*
Widowed	2.61 (SE=2.52) (p=.30)	−1.18 (SE=5.16) (p=.82)
Urban residence	−0.48 (SE=0.98) (p=.62)	0.98 (SE=0.86) (p=.25)
Black	3.08 (SE=1.48) (p=.04)*	−5.44 (SE=1.57) (p=.001)***
Other nonwhite race	−1.39 (SE=1.46) (p=.34)	−1.38 (SE=1.35) (p=.31)
Hispanic ethnicity	8.24 (SE=2.33) (p<.001)***	3.55 (SE=2.07) (p=.09)
Children under 6	−4.26 (SE=1.53) (p=.005)**	−1.94 (SE=1.17) (p=.10)
Children age 6-13	0.14 (SE=1.44) (p=.93)	−0.51 (SE=1.19) (p=.67)
Foreign-born	−1.60 (SE=1.99) (p=.42)	−2.21 (SE=1.60) (p=.17)
Father's education	1.24 (SE=0.48) (p=.009)**	−0.72 (SE=0.45) (p=.11)
Mother's education	−1.18 (SE=0.50) (p=.02)*	0.26 (SE=0.49) (p=.60)
Grew up in two-parent household	−2.72 (SE=0.98) (p=.005)**	−1.33 (SE=0.96) (p=.17)
Spouse has less than high school	−0.66 (SE=1.90) (p=.73)	5.59 (SE=1.47) (p<.001)***
Spouse has some college	−0.08 (SE=1.37) (p=.95)	1.91 (SE=1.05) (p=.07)
Spouse has bachelor's degree	−1.57 (SE=1.57) (p=.32)	0.60 (SE=1.24) (p=.63)
Spouse has graduate degree	−3.65 (SE=2.04) (p=.07)	4.05 (SE=1.84) (p=.03)*
Spouse's physical health	−1.11 (SE=0.65) (p=.09)	0.39 (SE=0.54) (p=.48)
Spouse's mental health	1.28 (SE=0.60) (p=.03)	−0.91 (SE=0.52) (p=.08)
Net assets of couple	−0.17 (SE=0.05) (p=.001)**	0.14 (SE=0.04) (p<.001)**
Total number of children	−0.94 (SE=0.65) (p=.15)	0.27 (SE=0.51) (p=.60)
State unemployment rate	−0.75 (SE=0.36) (p=.04)*	−0.40 (SE=0.32) (p=.22)

Notes: Regressions also control for a constant term, missing parental and spouse education, and the health measures (self-assessed overall health, whether any mental disorder, whether reports any substance-related behaviors, number of medical conditions, functional limitations scale). Omitted categories are age 25-34, high school education, never married, and white non-Hispanic.

APPENDIX C

Regression Results for Control Variables, Hourly Earnings Coefficient Estimates, Standard Errors and *P*-Values

Regressor	*Women (N = 1,527)*	*Men (N = 1,589)*
Age 35-44	−4.14 (SE=2.03) (p=.03)*	1.81 (SE=3.30) (p=.58)
Age 45-54	−0.68 (SE=2.23) (p=.76)	1.26 (SE=3.52) (p=.72)
Age 55-64	−2.42 (SE=2.61) (p=.35)	−1.81 (SE=4.62) (p=.70)
Less than high school	−0.10 (SE=2.95) (p=.97)	−3.44 (SE=4.45) (p=.44)
Some college	1.97 (SE=1.76) (p=.26)	−7.02 (SE=3.04) (p=.02)*
Bachelor's degree	4.70 (SE=2.30) (p=.04)*	−4.92 (SE=3.49) (p=.16)
Graduate degree	9.28 (SE=2.76) (p<.001)***	6.45 (SE=4.56) (p=.16)
Married or cohabiting	0.008 (SE=2.81) (p=.99)	−0.07 (SE=4.77) (p=.99)
Separated or divorced	−1.73 (SE=2.61) (p=.51)	−1.67 (SE=5.36) (p=.76)
Widowed	0.09 (SE=4.18) (p=.98)	24.22 (SE=18.18) (p=.18)
Urban residence	1.58 (SE=1.63) (p=.34)	1.22 (SE=2.68) (p=.65)
Black	4.10 (SE=2.53) (p=.11)	11.94 (SE=5.21) (p=.02)*
Other nonwhite race	5.71 (SE=2.37) (p=.02)*	−4.47 (SE=4.21) (p=.29)
Hispanic ethnicity	−11.22 (SE=3.94) (p=.004)**	1.24 (SE=6.62) (p=.85)
Children under 6	1.78 (SE=2.58) (p=.49)	1.19 (SE=3.67) (p=.75)
Children age 6-13	0.19 (SE=2.42) (p=.94)	−5.80 (SE=3.75) (p=.12)
Foreign-born	7.01 (SE=3.40) (p=.04)*	1.25 (SE=5.05) (p=.81)
Father's education	−1.45 (SE=0.77) (p=.06)	−0.53 (SE=1.39) (p=.70)
Mother's education	2.00 (SE=0.81) (p=.01)**	1.74 (SE=1.53) (p=.26)
Grew up in two-parent household	−1.43 (SE=1.60) (p=.37)	4.28 (SE=3.05) (p=.16)
Spouse has less than high school	−4.35 (SE=3.14) (p=.17)	−5.42 (SE=4.65) (p=.24)
Spouse has some college	−1.11 (SE=2.26) (p=.62)	5.20 (SE=3.28) (p=.11)
Spouse has bachelor's degree	−0.82 (SE=2.59) (p=.75)	0.27 (SE=3.85) (p=.94)
Spouse has graduate degree	0.26 (SE=3.32) (p=.94)	7.77 (SE=5.89) (p=.19)
Spouse's physical health	−0.55 (SE=1.06) (p=.60)	−1.31 (SE=1.67) (p=.43)
Spouse's mental health	−0.50 (SE=0.97) (p=.61)	0.87 (SE=1.60) (p=.59)
Net assets of couple	0.22 (SE=0.09) (p=.01)**	0.81 (SE=0.11) (p<.001)***
Total number of children	0.39 (SE=1.08) (p=.72)	1.87 (SE=1.63) (p=.25)
State unemployment rate	1.03 (SE=0.59) (p=.08)	2.69 (SE=1.01) (p=.008)**

Notes: Regressions also control for a constant term, missing parental and spouse education, and the health measures (self-assessed overall health, whether any mental disorder, whether reports any substance-related behaviors, number of medical conditions, functional limitations scale). Omitted categories are age 25-34, high school education, never married, and white non-Hispanic.

APPENDIX D

Instrumental Variables Estimates of Effect of Self-assessed Overall Health on Labor Market Outcomes, Using Different Subsets of Instruments, Women (N = 1,527)

Dependent Variable	*All Instruments*	*Instruments: Respondent's Health at Age 16 and 10 Years Ago*	*Instruments: Parental Health*
Employment	OR=1.43 (CI=1.08, 1.90) (p=.001)***	OR=1.49 (CI=1.03, 2.15) (p=.005)**	OR=1.36 (CI=0.80, 2.31) (p=.14)
Self-employment	OR=0.83 (CI=0.56, 1.22) (p=.21)	OR=0.77 (CI=0.54, 1.11) (p=.07)	OR=0.91 (CI=0.45, 1.84) (p=.74)
Works night shift	OR=1.13 (CI=0.71, 1.81) (p=.50)	OR=1.29 (CI=0.85, 1.96) (p=.11)	OR=0.92 (CI=0.41, 2.07) (p=.79)
Occupational category	0.01 (SE=0.11) (p=.96)	–0.33 (SE=0.11) (p=.11)	–0.03 (SE=0.19) (p=.88)
Work hours	–0.41 (SE=0.73) (p=.57)	–0.17 (SE=0.80) (p=.83)	–1.79 (SE=1.29) (p=.17)
Hourly earnings	$0.92 (SE=$1.23) (p=.45)	$0.32 (SE=$1.35) (p=.81)	$1.36 (SE=$2.27) (p=.55)
Job demands scale	0.04 (SE=0.08) (p=.54)	0.11 (SE=0.09) (p=.20)	–0.10 (SE=0.14) (p=.47)
Job skills scale	0.23 (SE=0.15) (p=.13)	0.35 (SE=0.17) (p=.04)*	–0.03 (SE=0.26) (p=.92)
Job authority scale	0.26 (SE=0.20) (p=.19)	0.30 (SE=0.22) (p=.17)	0.22 (SE=0.34) (p=.52)

Notes: ***Significant at $p \leq .001$.
**Significant at $p \leq .01$.
*Significant at $p \leq .05$.
Odds ratios and 99 percent confidence intervals are for a one-unit increase in health. Regressions also control for a constant and all variables shown in Table 1c.

APPENDIX E

Instrumental Variables Estimates of Effect of Self-assessed Overall Health on Labor Market Outcomes, Using Different Subsets of Instruments, Men (N = 1,589)

Dependent Variable	*All Instruments*	*Instruments : Respondent's Health at Age 16 and 10 Years Ago*	*Instruments: Parental Health*
Employment	OR=1.47 (CI=1.05, 2.07) (p=.004)**	OR=1.49 (CI =1.03, 2.15) (p=.005)**	OR= 1.32 (CI = 0.68, 2.59) (p=.28)
Self-employment	OR=0.82 (CI=0.60, 1.13) (p=.12)	OR=0.77 (CI = 0.54, 1.11) (p=.07)	OR= 1.10 (CI = 0.64, 1.88) (p=.65)
Works night shift	OR=1.17 (CI=0.82, 1.69) (p=.26)	OR=1.29 (CI = 0.85, 1.96) (p=.11)	OR= 0.90 (CI = 0.45, 1.81) (p=.70)
Occupational category	–0.13 (SE=0.09) (p=.16)	–0.33 (SE=0.11) (p<.001)***	0.52 (SE=0.17) (p<.001)***
Work hours	–0.93 (SE=0.60) (p=.12)	–0.18 (SE=0.68) (p=.80)	–1.14 (SE=1.09) (p=.30)
Hourly earnings	–$5.76 (SE=$1.91) (p=.003)**	–$6.27 (SE=$2.20) (p=.004)**	–$3.15 (SE=$3.39) (p=.35)
Job demands scale	0.07 (SE=0.06) (p=.24)	0.17 (SE=0.07) (p=.02)*	–0.10 (SE=0.13) (p=.41)
Job skills scale	0.39 (SE=0.13) (p=.002)**	0.23 (SE=0.14) (p=.10)	1.26 (SE=0.30) (p<.001)***
Job authority scale	0.14 (SE=0.16) (p=.37)	–0.17 (SE=0.18) (p=.35)	1.62 (SE=0.38) (p<.001)***

Notes: ***Significant at p ≤ .001.
**Significant at p ≤ .01.
*Significant at p ≤ .05.
Odds ratios and 99 percent confidence intervals are for a one-unit increase in health. Regressions also control for a constant and all variables shown in Table 1c.

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NOTES

1. One notable exception is the study by Haveman and colleagues (1994), which specifies health as a function of hours and hours as a function of lagged health. However, Haveman and colleagues limit the sample to white males who participate in the labor force and focus on work limitations as the health measure of interest, so the findings may not generalize to other measures of health status or populations.

2. The lack of any plausible overidentifying restrictions precluded the estimation of a sample selection model, since these models lack robustness when identification is based on distributional assumptions alone.

3. Unlike the descriptive statistics, which require the use of sample weights in order to reflect the overall population from which the sample is drawn, the regressions are not weighted. The purpose of the regression is to establish associations between the outcomes and each regressor. As long as the regression controls for all of the confounding factors that might bias these associations if omitted from the model, weighting should not be necessary. Sensitivity analyses revealed almost no difference in the estimated effects or significance of the overall health status measure when sample weight was included as a separate regressor in the model, suggesting that this type of bias is not a major concern.

4. Square root and log transformations of the dependent variables were examined to see whether the distributions of the transformed outcomes more closely approximated normality than the untransformed outcomes. There were no clear-cut differences in performance, so the untransformed outcomes were used.

5. In particular, response bias may render the respondent's self-assessed health at age 16 endogenous itself, although it should be less so than current self-assessed health. Parental health may affect the respondent's labor market outcomes through informal caregiving responsibilities.

REFERENCES

Bound, J., Jaeger, D., & Baker, R. (1995). Problems with instrumental variables estimation when the correlation between the instruments and the endogenous explanatory variable is weak. *Journal of the American Statistical Association, 90*(430), 443-450.

Chirikos, T., & Nestel, G. (1984). Economic determinants and consequences of self-reported work disability. *Journal of Health Economics, 3*(2), 117-136.

Chirikos, T., & Nestel, G. (1985). Further evidence on the economic effects of poor health. *Review of Economics and Statistics, 67*(1), 61-69.

Currie, J., & Madrian, B. (1999). Health, health insurance and the labor market. In O. Ashenfelter & D. Card (Eds.), *Handbook of Labor Economics*. New York: North Holland.

Ettner, S. (1996). New evidence on the relationship between income and health. *Journal of Health Economics, 15*(1), 67-86.

Ettner, S., Frank, R., & Kessler R. (1997). The impact of psychiatric disorder on labor market outcomes. *Industrial and Labor Relations Review, 51*(1), 64-81.

Ezzy, D. (1993). Unemployment and mental health: A critical review. *Social Science and Medicine, 37*(1), 41-52.

Grossman, M. (1972a). The demand for health: A theoretical and empirical investigation. New York: Columbia University Press,

Grossman, M. (1972b). On the concept of health capital and the demand for health. *Journal of Political Economy, 80*(2), 223-255.

Hamilton, V., Merrigan, P., & Dufresne, E. (1997). Down and Out: Estimating the relationship between mental health and unemployment. *Health Economics, 6*(4):397-406.

Haveman, R., Wolfe, B., Kreider, B., & Stone, M. (1994). Market work, wages, and men's health. *Journal of Health Economics, 13*(2), 163-182.

Hibbard, J., & Pope, C. (1985). Employment status, employment characteristics and women's health. *Women and Health, 10*(1), 59-77.

House, J. (1974). Occupational stress and coronary heart disease: A review and theoretical integration. *Journal of Health and Social Behavior, 15*(1), 12-27.

Johnson, A. (1977). Recent trends in sex mortality differentials in the United States. *Journal of Human Stress, 3*(1), 22-32.

Klitzman, S., House, J., Israel, B., & Mero, R. (1990). Work, Stress, nonwork stress, and health. *Journal of Behavioral Medicine, 13*(3).

Lambrinos, J.(1981). Health: A source of bias in labor supply models. *Review of Economics and Statistics, 63*(2), 206-212.

Luft, H. (1975). The impact of poor health on earnings. *Review of Economics and Statistics, 57*(1), 43-57.

MacArthur Foundation Research Network on Successful Midlife Development. Conducting a National Survey of Midlife Development in the United States (MIDUS). (1998, June). Vero Beach, FL: The John D. and Catherine T. MacArthur Foundation.

Maddox, G., & Douglas, E. (1973). Self-assessment of health: A longitudinal study of elderly subjects. *Journal of Health and Social Behavior, 14*(1), 87-93.

Mitchell, J., & Anderson, K. (1989). Mental health and the labor force participation of older workers. *Inquiry, 26*(2), 262-271.

Parsons, D. (1982). The male labor force participation decision: Health, reported health, and economic incentives. *Economica, 49*(193), 81-91.

Rosenfield, S. (1989). The effects of women's employment: personal control and sex differences in mental health. *Journal of Health and Social Behavior, 30*(1), 77-91.

Staiger, D., & Stock, J. (1997). Instrumental variables regression with weak instruments. *Econometrica, 65*(3), 557-586.

Steer, R., Scholl, T., Hediger, M., & Fischer, R. (1992). Self-reported depression and negative pregnancy outcomes. *Journal of Clinical Epidemiology, 45*(10), 1093-1099.

Tessler, R., & Mechanic, D. (1978). Psychological distress and perceived health status. *Journal of Health and Social Behavior, 19(3),* 254-262.

Vaillant, G. (1979). Natural history of male psychologic health: Effects of mental health on physical health. *New England Journal of Medicine, 301*(23), 1249-1254.

Waldron, I. (1976). Why do women live longer than men? *Social Science Medicine, 10*(7-8), 349-362.

Waldron, I. (1980). Employment and Women's health: An analysis of causal relationships. *International Journal of Health Services, 10,* 435-454.

Wolfe, B. (1984). Measuring disability and health. *Journal of Health Economics, 3,* 187-193.

Wolfe, B., & Hill, S. (1995). The Effect of Health on the Work Effort of Single Mothers. *Journal of Human Resources, 30,* 42-62.