

NBER WORKING PAPER SERIES

THE EFFECT OF MENTAL  
DISTRESS ON INCOME:  
RESULTS FROM A COMMUNITY SURVEY

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Working Paper No. 2433

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
Cambridge, MA 02138  
November 1987

Richard Frank received financial support for this work from NIMH Grant MH42338-01. The research reported here is part of the NBER's research program in Health Economics. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

The Effect of Mental Distress on Income:  
Results from a Community Survey

ABSTRACT

We employ a unique data set from a community based survey to assess the effect of mental distress on earnings. The main advantage of the data is that detailed measurements of mental health status were made on all subjects in the study. This means that our population-based measure of mental distress does not rely on a patient having had contact with the health care system and obtaining a diagnosis from a provider. The use of diagnosis-based measures may introduce measurement-error bias into the estimates. Our results show that the presence of mental distress reduces earnings by approximately 21% to 33%. To assess the magnitude of any measurement-error bias we present a estimates of models using measures of mental health both on a population-wide basis and on a diagnosis basis. The estimated impact of mental illness on earning is only 9% lower using the using the diagnosis-based measure. The conclusion drawn from this is that little bias is introduced by using the diagnosis-based measure.

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## I. Introduction

Economists have long been interested in the social cost of illness. Not surprisingly, much of the attention has been focused on the labor market. In this work we employ a unique data set from a community based survey to assess the effect of mental distress on earnings. The main advantage of the data is that detailed measurements of mental health status were made on all subjects in the study. This means that our measure of mental distress does not rely on a patient having had contact with the health care system and obtaining a diagnosis from a provider.

Relying on health status measures obtained from contacts with the medical sector is common in much of the analysis of the impact of illness on earnings. The use of these measures may introduce measurement-error bias into the estimates. The measurement error arises because mentally-ill individuals who did not seek medical care will appear as "mentally healthy" in the data. The measurement error is the result of some individuals selecting to obtain medical care and others not. Since the selection of medical care is likely to be a function of some of the exogenous determinant of earnings such as education, there is reason to believe that the measurement error may be correlated with other right-side variables in the earnings function and thus bias the estimates.

Two important advantages of diagnosis-based measures make them preferable if the measurement-error bias can be demonstrated to be small. First, diagnosis based measures are available in many data sets whereas population-based measures are not, and second, diagnosis-based measures are substantially easier and cheaper to collect. One objective of our research is to investigate the degree of the bias.

Our results show that the presence of mental distress reduces earnings by approximately 21% to 33%. These estimates are of the same order of magnitude as were found in previous studies, which are surveyed in detail in section II. To assess the magnitude of any measurement-error bias we present a estimates of models using measures of mental health both on a population-wide basis and on a diagnosis basis. The estimated impact of mental illness on earning is only 9% lower using the using the diagnosis-based measure. The conclusion drawn from this is that little bias is introduced by using the diagnosis-based measure.

## II. Background

Several studies of the impact of mental disorders on earnings have been reported in the literature. These include Bartel and Taubman (1979, 1986) and Benham and Benham (1981) who have used micro data to systematically assess the separate effect of mental distress on earned income<sup>1</sup>. All of these articles use diagnosis-based measures of mental distress.

Bartel and Taubman (1979, 1986) made use of the National Academy of Science - National Research Council (NAS-NRC) panel of twins to analyze the impact of various illnesses on labor market activity. These data presented a unique opportunity to study the persistence of the effects of illness on earnings overtime. This is an especially salient issue for mental illness since it is often a chronic condition.

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<sup>1</sup> Studies by Levine and Levine (1974) and Cruze et al (1981) have made aggregate estimates of lost earnings due to mental illness. Those studies will not be treated here.

In Bartel and Taubman (1979) estimates were made of the impact of diagnoses of psychosis and neurosis, made at various points over a 25 year time period, on 1973 earnings. The results indicated that recent diagnoses of mental disorders were associated with a significant and large reduction in earnings relative to individuals with no mental disorders. They report a roughly 24% reduction in 1973 earnings attributed to the presence of a psychiatric diagnosis made between 1968 and 1973. In contrast, a psychiatric diagnosis made in the years 1948 to 1954 had no effect on 1973 earnings. The size of the estimated effects on earnings underscore the disabling nature of mental disorders.

The subsequent paper by Bartel and Taubman (1986) probed the link between mental illness and reduced earnings further. They did so by using a finer definition of mental disorder, which differentiated psychoses from neuroses from other disorders. Also, earnings throughout the period were used thereby making fuller use of the panel design. The results indicated that recent (1 to 5 years) diagnoses of psychosis were linked to a 37% reduction in earnings compared to unimpaired individuals. A psychotic diagnosis made 11 to 15 years previously was estimated to reduce earnings by 27%. Recent neuroses were found to reduce earnings by about 11%, while neuroses uncovered 11 to 15 years earlier reduced earnings by 13%, a somewhat puzzling finding.<sup>2</sup> Other mental disorders only had a significant impact when they were recent. The estimated effect was a 24% reduction in earnings.

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<sup>2</sup> The impact reported were calculated by transforming the estimated coefficients (b) in the following manner  $IMPACT = e^b - 1$ .

Benham and Benham (1981) used a sample of 244 men who were studied at two points in time over a 30 year period. Data from personal interviews, clinic, hospital and military records were used to assign lifetime diagnoses of mental disorders. The impact of psychosis, sociopathy, alcoholism, and neurosis on earnings were analyzed. The diagnoses therefore reflected whether an individual had ever experienced a diagnosable mental disorder. Thus, the impacts of more chronic conditions such as psychoses should have more pronounced impacts than more transient disorders such as neuroses (independent of initial severity).

The estimated impacts for psychoses on weekly earnings ranged from a reduction of 27% to a reduction of 35%. Sociopathy had no significant impact on earnings nor did alcoholism. Neurosis surprisingly had a significant positive impact on weekly earnings equal to about a 23% increase over individuals with no such disorder. These results again suggest that serious mental disorders can have a pronounced and rather long lasting impact on labor market outcomes.

### III. Data

This work uses data from the Baltimore ECA survey, which is one of five in the Epidemiological Catchment Area study (Eaton et al. 1981). The study, which was principally aimed at establishing prevalence and incidence estimates for mental disorders in the adult population of East Baltimore, collected detailed information on health and mental health care utilization.

The survey was based on a longitudinal design which included two face-to-face interviews 1 year apart and a telephone interview between personal con-

tacts (for a total of 3 waves of data collection). The geographic area covered by the Baltimore ECA is the eastern third of Baltimore City, an area with a population of 241,000 which was 38% black and where 19% of the population is Medicaid eligible. The field survey was designed to obtain household interviews with one randomly selected person from those 18 to 64 years of age and with every household member 65 or older; proxy respondents were accepted for 2.7% of subjects who were ill or had language problems. The overall response rate in the baseline survey was 78% which resulted in 3481 completed interviews. The followup six month telephone survey and the one year household survey had response rates of 83% and 81% of the original sample respectively. The longitudinal sample was compared to the baseline sample for evidence of systematic selection by respondents (Shapiro et al. 1984). Only minor differences were found between the two samples which should not influence analyses of income. The questionnaire used in the household survey contained a battery of mental health and health status measures.

At the core of the ECA data base is the Diagnostic Interview Schedule (DIS), a structured questionnaire administered by lay interviewers that include data for computer generated diagnoses according to the criteria specified in the Diagnostic and Statistical Manual, Third Edition (DSM)III of the American Psychiatric Association. Other mental health status measures include: a score on the Mini-Mental State Examination (Minimental), a question as to whether a disability day occurred due to an emotional problem, and a 20 item version of the General Health Questionnaire (GHQ) (Goldberg 1972). The GHQ identifies current symptoms of distress and demoralization and is designed to identify individuals at high risk of emotional distress. While the scale

provides a numerical index of symptomatology (the properties of which are not clear) a score of 4 or more has been shown by Goldberg to designate individuals at high risk of having a diagnosable mental disorder which implies non-linearity in the numerical scale.

All three waves of the ECA collected detailed health care utilization information. Thus, a complete picture of utilization based on three consecutive six month recall periods is possible. The complete health and mental health status battery was only administered during the two face-to-face interviews. Nevertheless, the panel design allows us to study the impact of mental health status at one point in time on earnings over the subsequent year. This makes causal inferences somewhat clearer in this study than in traditional cross section study designs. The analysis performed below uses a sample of 882 males between the ages of 18 and 64 to study the impact of mental problems on earnings.

#### IV. The Model and Measurement of Variables

We employ the standard model of earnings, where the log of income is expressed as a linear function of education and other demographic variables one of which is mental-health status. The demographic variables used in specifications estimated below draw on the human capital formulation of earnings. That is, an individual's wage rate is equal to his or her marginal product which depends on ability, investments in the acquisition of skills and work effort. Mental disorders may effect productivity in a variety of ways. They may make skill acquisition more costly and thereby result in lower skill levels among the mentally ill. Mental problems may decrease the intensity of



work effort either through factors such as absenteeism or by diminished cognitive function.

The rest of this section is devoted to discussing the measurement of the variables used to estimate the earnings functions. Table 1 presents descriptive statistics and variable definitions for the variables discussed below.

The dependent variable is defined as an individual's gross contribution (from all sources) to his household's income. This is not the ideal measure of earnings because it includes unearned income. The data set does identify sources of unearned income, most of which is derived from transfer programs. It is possible to include dummy variables on the right hand side of the earnings equations which, in principle, control for unearned income (this point is addressed in greater detail in the discussion of model specification). The level of income is measured in \$1000 to \$5000 increments dependent on the level of income.<sup>3</sup> We used a Kolmogorov-Smirnov test to assess the distribution of the income variable. The lognormal distribution of earnings could not be rejected at the 0.20 confidence level. The income variable is transformed into logs in the regression models presented below.

Measuring mental health status is a difficult problem where any solution is subject to important caveats (Ware et al. 1983). The approach taken here draws on the previous work of Shapiro et al. (1985) and Frank (1987). The ECA is a rich source of information on mental health status; the DIS, GHQ and self report questions provide three separate and somewhat different assessments of

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<sup>3</sup> There was an open ended category at the 50,000 dollar level. We used census data from 1980 for the relevant census tracts to estimate the mean of that category. It was roughly 67,00 dollars. Thus some measurement error is present.

signs, symptoms and distress associated with mental health problems. Each of the indicators of mental health status is limited in various ways. The DIS and standardized diagnoses made by clinicians had very uneven rates of agreement across psychiatric diagnoses (Anthony et al., 1985). The GHQ was originally designed as an aid to primary care clinicians in evaluating mental health status. It's stability has been questioned in previous research (Shapiro et al. 1985). Self reported disability due to a mental disorder is generally viewed as a strict criteria requiring rather severe distress.

The approach taken in this research to measuring mental distress is based on Shapiro et al.'s (1985) measure of need. Our measure makes use of all three measures of mental health status: A DSMIII diagnosis is measured by the DIS and the Minimental (score of less than 18); a GHQ score indicating at least four symptoms of psychiatric distress; and a self reported disability day due to a mental or emotional problem. Because we are reluctant to rely on any single indicator we set a criteria that an individual had to be identified as suffering from mental or emotional problems by at least two of the three indicators to be considered in mental distress. In order to make the indicators consistent with one another we used the two week version of the DIS and the self report questions. Our measure of mental distress is thereby an indicator of a clustering of signs and symptoms of a mental disorder. In this study we use a simple dichotomous variable equal to one when at least two indications are present and zero otherwise. In a previous analysis Frank (1987) used this indicator both as a dichotomous variable and as an ordinal variable that could take on a value from zero to three. In that analysis he found that little added information resulted from use of the ordinal variable.

In order to trace the consequences of using a measure of mental health status which depends on contact with a service provider we experiment with a mental health status measure which is an interaction of the mental distress variable defined above with utilization of health services where a mental problem was discussed.<sup>4</sup> This diagnosis-based measure will allow us to compare our mental distress measure with one that is similar to the one used by Bartel and Taubman (1979, 1986).

Several socio-demographic variables are specified in the earnings models to account for the human capital of individuals. These variables include age (specified as a quadratic), sex, race, marital status, and educational attainment measured in years of schooling. In order to account for household effects such as other income sources and demand for goods and services we measure the number of children in a subject's household, and the number of other adults in the household. Finally we include dummy variables that account for the receipt of various sorts of transfer payments. These are: welfare unemployment compensation, social security, and disability payments.

## V. Estimation

The earnings function is estimated using two different specifications and two different estimators. Since we could not reject a lognormal distribution for income and some of the observations reported zero income, we estimated a Tobit model where the non-zero observations are transformed into logs. This approach will result in unbiased and consistent estimates. However, since

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<sup>4</sup> This is a self reported question of each subject. Some validation studies have been done of this approach and have found the responses to be quite accurate.

only 8% of the observations had values of zero for income, we also used ordinary least squares to estimate a model where the dependent variable is specified as the log of income plus one. This approach is not strictly appropriate and may not result in consistent estimates.

Two general specifications are used with both of the estimators. The first model includes the indicators of transfer payments so that the other coefficients in the model can be interpreted as measuring impacts on earned income (total income net of transfer payments). However, since we were concerned with the potential endogeneity of the transfer income indicators, a version was estimated using only variables that were clearly exogenous. This meant excluding the the transfer program dummy variables from the regression. Both specifications are reported using the two approaches to estimation.

Finally, we estimated a version where the mental health variable only took on a value of one if both the mental health status criteria were met and contact with a health care provider had been made. This was meant to approximate a diagnosis-based mental health status variable similar to that used by Bartel and Taubman.

## VI. Results

Table 2 presents parameters estimates and t-statistics for the five earnings models. Columns 1-3 report ordinary least squares regressions on the log of earnings (plus one). The first two columns present results using the population-based measure of mental health status. The third column presents results which use the diagnosis-based mental health status measure. The fourth and fifth columns report Tobit estimates on the log of earnings. Both of the Tobit models use the population-based mental health status measure.

The coefficient estimates for most variables are consistent with the findings of previous research. For example, years of schooling is positively and significantly related to earnings. The elasticities implied by the coefficient estimates vary between 0.40 and 0.61 depending on whether the transfer income dummy variables were included or excluded. The coefficients for racial status, age and marital status were all significantly different from zero at conventional levels. Nonwhite racial status and being unmarried reduced earnings while increasing age increased earnings but at a decreasing rate.

The variable of primary interest is the measure of mental distress (MENTAL). The magnitude of the coefficient estimate is quite sensitive to model specification. In both the OLS and Tobit models the exclusion of the transfer income variables increased the estimated coefficient for the MENTAL variable by over 50%. The eligibility criteria for several of the transfer programs are related to mental disorder. For instance, one can qualify for Supplemental Security Income on the basis of chronic mental illness. Similarly, one can receive Social Security Disability payments due to a disabling mental condition. We therefore suspect that biases due to omitted variables are of more concern than simultaneous equations bias.<sup>5</sup> This leads us to prefer results based on the specifications which include the transfer payment indicators. The coefficients were not sensitive to the estimator used. Although the estimates for the Tobit models were substantially more precise than in the OLS models (as might be expected).

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<sup>5</sup> This is especially true when analyzing the male population where only welfare transfer payments are strictly income linked and only 2% of the sample received such transfers.

Table 3 presents the earnings impacts implied by the coefficient estimates. The results suggest that individuals meeting our criteria for mental distress earn between 21% (in the model with transfers) and 33% (in the model without transfers) less than otherwise similar individuals.

Comparing columns (1) and (3) of Tables 2 and 3 allow us to trace the consequences of using a mental health status measure that is conditioned on use of health care services. Roughly 50% of the subjects with a mental problem are misclassified using the indicator which depends on services utilization. However, the coefficient estimates for MENTAL are only slightly lower for the regression reported in column (3). The differences in the estimated earnings impact amount to 1.8 percentage point (not a significant difference). One explanation for this is that the most severe cases of mental disorder are substantially more likely to obtain care than are less severely ill individuals. For instance the rate of utilization is far higher for patients with major depressive disorders than for panic disorder. Thus, because individuals who are least dysfunctional are least likely to seek care the bias from the use of the mental health status variable conditional on use is small.

## VI. Concluding Remarks

Mental disorders are seriously disabling conditions. The onset of illnesses are disruptive and impose substantial costs to society. In the research presented here we used a rich data set from a community survey to estimate the effect of a clustering of indicators of mental distress had on earnings of adult males. The results show a substantial impact, which is consistent with several previous studies.

We also examined the degree to which relying on health status measures which require contacts with the health care system cause bias in estimates of the impact of illness on earnings. The results suggest that the bias is small because the most severe cases are most likely to seek care.

Further work on the social costs of specific disorders would be useful. Unfortunately the data set used here does not have sufficient numbers of cases in many key diagnostic categories to pursue such questions. Moreover, the DIS diagnostic instrument may introduce sufficient measurement error when used by itself as to decrease confidence in findings.

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TABLE 1  
Descriptive Statistics

	Mean	SD
Age (Years)	37.64	14.96
Race (1=Nonwhite)	0.29	0.46
Marital Status (scale 1=married, 2= widowed 3=Divorce, 4=single)	2.15	1.30
Education (Years of schooling)	10.96	3.33
Mental (Mental health status 1=problem)	0.21	0.41
Adults (Number in household)	2.10	0.98
Kids (Number in household)	0.57	1.04
Income	21,187	14,594

TABLE 2

Regression Results  
Ln (Earnings) for Males  
Column

Variable	(1)	(2)	(3)	(4)	(5)
Education	0.36 (2.12)	0.57 (3.32)	0.036 (2.18)	0.033 (3.85)	0.056 (6.35)
Race	-0.195 (1.79)	-0.269 (2.37)	-0.189 (1.75)	-0.198 (3.56)	-0.276 (4.72)
Marital	-0.182 (4.14)	-0.192 (4.18)	-0.181 (4.11)	-0.196 (8.57)	-0.206 (8.73)
Age	0.034 (1.92)	0.021 (1.21)	0.035 (1.94)	0.036 (3.49)	0.187 (2.00)
(Age) <sup>2</sup>	-4.9e <sup>-04</sup> (2.50)	-3.64e <sup>-04</sup> (2.02)	-4.9e <sup>-04</sup> (2.50)	-5.1e <sup>-04</sup> (3.48)	-3.4e <sup>-04</sup> (3.61)
Mental	-0.240 (2.09)	-0.381 (3.20)	-0.217 (1.81)	-0.246 (4.07)	0.403 (6.39)
# Kids	0.006 (0.12)	0.021 (0.38)	0.009 (0.18)	0.009 (0.33)	0.021 (0.80)
# Adults	0.114 (2.26)	0.132 (2.50)	0.116 (2.31)	0.115 (4.26)	0.133 (4.79)
Unemp.	-0.567 (2.12)	-	-0.577 (2.15)	-0.631 (3.81)	-
Welfare	-2.97 (9.17)	-	-3.016 (9.340)	-3.037 (15.06)	-
Soc.Sec.	-0.148 (0.81)	-	-0.148 (0.82)	-0.125 (1.18)	-
Disable	-0.404 (2.23)	-	-0.429 (2.39)	-0.415 (4.20)	-
Constant	9.102 (17.65)	9.034 (17.06)	9.064 (17.61)	9.145 (33.18)	9.143 (33.12)
R <sup>2</sup>	0.19	0.11	0.19	-	-
N	881	881	881	881	881
F	17.23	12.86	17.11	-	-
Log Likelihood	-	-	-	-2966.61	-2746.70

TABLE 3  
The Impact of Mental Distress on Earning

Model (columns from Table 2)				
(1)	(2)	(3)	(4)	(5)
-21.3%	31.6%	19.5%	21.8%	33.2%