

## PROBLEMS OF SCREENING FOR POVERTY STATUS

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### Introduction

Survey sample designs often call for oversampling population subgroups of particular interest. One method by which oversampling is operationalized is to conduct a separate screening interview to identify characteristics of interest. Although this procedure is quite effective for static characteristics subject to low levels of measurement error and little or no change over time, for characteristics such as poverty status, the approach suffers due to both the dynamic nature of the measure and the propensity of error in reports of income. The 1987 National Medical Expenditure Survey (NMES) used a screening interview conducted in the fall of 1986 to identify individuals of interest for oversampling: the elderly, poor, functionally limited, blacks, and Hispanics. Poverty status was based on the response to a single income question (Edwards and Berlin, 1989). In contrast, the income data collected for the 1987 calendar year paralleled the questions used in the March Supplement to the Current Population Survey. Detailed information on twenty-six different income categories was collected separately for each reporting unit (RU) member (where RU is defined as a group of individuals related by blood, marriage, or adoption). Previous research has shown that the use of a single income

question, while minimizing nonresponse, results in measures of income that are significantly understated as compared to data obtained from several detailed questions (Bureau of the Census, 1979). In addition, the movement into and out of poverty, estimated to be between 25 and 46 percent in any two adjacent years further confounds the problem of screening for poverty status (Duncan, 1984; Bureau of the Census, 1989). The research reported here attempts to disentangle the components of observed changes in poverty status between the time of a screener conducted in 1986 and the time of an interview survey for 1987 into actual change and measurement error.

### Methodology

Of the 5,920 persons in the NMES sample who were in RUs reporting income below the poverty line at the time of the screener in the fall of 1986, 3,646 of these persons were in RUs in round 4 of the survey that reported annual income placing them above poverty thresholds in 1987. This means that nearly 62 percent of the sampled persons who were poor at the time of the screener were no longer poor in 1987, a turnover rate far in excess of the rates cited above.

By contrast, 6.5 percent (1,506) of the 23,173 individuals who were above the poverty threshold as reported

at the time of the screener were poor in 1987 on the basis of income reported in round 4 of NMES. However, on balance the flows out of poverty between the screener and the 1987 NMES survey year more than offset the flows into poverty. Even though the persons flowing into poverty were weighted relatively more heavily (because the screener not poor were undersampled relative to the screener poor), there were still 6.3 million more (weighted) individuals that moved out of poverty than moved into poverty between the screener and 1987.

Differential rates of attrition are one possible explanation for the observed differences in the number of individuals exiting poverty between the screener and the fourth round of interviews. A comparison of the distribution of population characteristics between those in the first round of the study and those in the fourth round of the study showed no significant differences. Thus, there is little evidence that the exit from poverty discussed above is due to differential response rates for those below and above the poverty line.

The magnitude of the movement from screener poverty to near-poor or nonpoor status in 1987 suggests that income was likely to have been underreported by a considerable number of the screener poor, resulting in an inefficient sample. The methodology for the research presented here was designed to distinguish between households exiting poverty between 1986 and 1987 who were likely to have underreported their income at the time of the screener and those who were

likely to have reported their income and their movement out of poverty accurately.

Up to now the discussion has focussed on estimates of the number of persons who changed poverty status based on their household's reported income between the screener (1986) and the NMES survey year (1987). However, the analysis presented in the remainder of the paper will refer only to households (or as defined for NMES, "reporting units" (RUs)), not individuals. Of particular interest are the 2,418 RUs who reported that their incomes were below the poverty threshold on the screener, and the 1,362 RUs in this group (56 percent) who reported incomes for 1987 in Round 4 of NMES that placed them above the poverty threshold.

Two models are estimated in the analyses:

1. To distinguish those RUs who actually moved out of poverty from those who "escaped" due to underreporting of income in the screener, a regression model for "normal" or "permanent" income of the RU was estimated. The normal income model has a long-standing tradition in the economics literature on consumer behavior (Friedman, 1975; Modigliani and Brumberg, 1954; and Mayer, 1972) and in the present context enables us to identify empirically the "permanently" and the "transitorily" poor and not-poor family units. Logarithmic normal family income was estimated as a function of various socioeconomic, demographic attributes of the RU and its members including age, family composition, family size, health status,

homeownership, race/ethnicity, Census division, SMSA status, education, employment status, gender and marital status. A sample of 12,019 RUs reporting income on the screener and in R4 of NMES was used to estimate this model.

2. A logistic regression model estimated the probability that an RU would exit poverty between the screener and 1987 as reported in NMES. This second model included all of the RUs reporting income in 1986 below the poverty threshold for that year (n=2,418). It also included the same independent variables as the normal income model as well as three variables indicating additions of persons to the RU during 1987 because of birth, marriage, or for some other reason, and two variables indicating subtractions of persons from the RU in 1987 either due to death or for some other reason including divorce or institutionalization.

Using the model developed in (1) above, a subset of the RUs who escaped poverty (n=1,362) were divided into two distinct groups, those with predicted permanent poverty status below the poverty line (and therefore those least likely to have underreported their income at the time of the screener) and those with predicted permanent income above the poverty threshold (earmarked as the group most likely to have underreported their screener income).

Those RUs earmarked as most likely to have underreported their screener income were further separated into two groups--those likely to change and those not likely to change their poverty status--based on

the equation described in #2 for the probability of exiting poverty. The subgroup predicted to be most likely to exit poverty is hypothesized to have reported their screener income accurately because their escape from poverty was explainable based on the characteristics of the RU and any compositional changes it incurred over the course of the survey year. The subgroup predicted to be most unlikely to exit poverty is hypothesized to be the subgroup most likely to have underreported their income and poverty status at the time of the screener.

If there were no income underreporting at the time of the screener, we would have expected about 25 to 46 percent of the 2,418 RUs who were poor at the screener to escape poverty during 1987 (i.e. about 600 to 1,100 RUs). Given the 1,362 RUs that "escaped" poverty (56% of those initially reported poor), we expected our empirical approach described above to identify roughly between 250 to 750 RUs who were likely to have underreported their screener income and poverty status.

The results of the normal income model (1) indicate that over half of the variation in observed family income in NMES is explained by systematic attributes of normal or permanent income. The remainder is attributed to random or nonsystematic effects which produce what is labeled as "transitory income" in the economics literature.

Estimates of models (1) and (2) were used to predict the poverty status of RUs in 1987 and the probability of a screener poor RU escaping poverty. The distribution of

the predicted probabilities of exiting poverty for the 1,362 screener poor RUs who reported escaping poverty in 1987 is illustrated in Figure 1. As expected, this distribution is skewed left towards zero and has over half of the sample observations with a predicted probability in excess of 0.6.

Of the 1,362 RUs who left poverty between the screener and the NMES survey year, 143 of them were predicted to be below the poverty threshold based on the characteristics that determine their "normal" income status (Figure 2). We consider these RUs to be accurate income reporters in both the screener and in Round 4 of NMES, because we ascribe their movement out of poverty to some "windfall" income that has temporarily enabled the RU to escape poverty during the survey year.

The remaining 1,219 RUs who escaped poverty between the NMES screener and the survey year, all had characteristics associated with a level of "normal" income that would place them above the poverty line. Of this group, 738 RUs also exhibited characteristics that would help explain the change in poverty status that in fact took place for them between 1986 and 1987. This was proxied by a predicted probability of escaping poverty between these two years of 0.6 or greater. The remaining 481 RUs did not possess a sufficient mix of the traits that would explain their change in poverty status--they each had an estimated value of the probability of exiting poverty of less than 0.6. It is this latter group that our analysis identifies as the RUs most likely to have underreported

their income at the time of the screener and to have been misleadingly labeled as "screener poor" for the survey. Because the movement out of poverty appeared to be "explainable" for the former group of 738 RUs, our analysis suggests that the low incomes reported by them at the time of the screener were accurately reported but abnormally low because of negative-valued transitory income during 1986.

### **Alternative Sampling Approaches**

The use of a single question to screen for income, if the NMES experience is typical, is inefficient. Over half of the cases sampled as "below poverty" were categorized as being above the poverty line for the survey year of interest. If reported prior-year poverty status in response to a single income question is a poor way to screen for poverty status during the survey year, then what alternatives are there to identify this population for oversampling purposes? To address this issue two separate logistic regression models were estimated for the probability of an RU being poor during the 1987, the target group for oversampling purposes. These results show that the "R<sup>2</sup>" value for a survey-year poverty status model containing the correlates of normal income (and normal poverty status) is greater than the "R<sup>2</sup>" value for the same model consisting of just the reported screener poverty status. Using a cutpoint of 0.6 for the probability of being poor, 65 percent of those RUs predicted to be poor during the survey year based on the normal income

model were in fact poor during 1987. This is an efficiency rate (that is the proportion not exiting poverty) over 20 percentage points greater than the 44 percent rate achieved with the reported screener poverty measure. This suggests that oversampling on the basis of family characteristics that are most highly correlated with poverty will better identify the RUs that will be below poverty during the survey year than oversampling solely on the basis of income reported at the screener. If both demographic characteristics and the screener reported income are used for selection, the proportion of RUs predicted to be poor in the survey year rises to almost 71 percent, reducing the inefficiency (that is the proportion exiting poverty) observed in NMES from 56 percent to 29 percent. An alternative survey strategy would have been to collect more detailed information on the screener about the 1986 income and poverty status of the RU. Apart from the additional time and dollar cost, as well as the threat of nonresponse, we note that even if more accurate 1986 income data were collected, a relatively high percentage of those RUs below poverty in 1986 would still be expected to escape poverty by the following survey year (based on findings from SIPP and PSID concerning movement into and out of poverty between years).

## Conclusion

The problem of identifying the poor for sampling purposes is confounded by movement into and out of poverty in any two years and the error associated with respondent's reports of

income. The research presented here suggest that the use of a single RU-level income question which tends to produce underreported income and overreported poverty status exacerbates the problem.

Because of the rather sizable flows out of poverty that are ordinarily expected between successive years, we do not recommend tactics designed to collect more accurate income and poverty status on a screener. Instead, a potentially more effective way of assuring that the survey-year poor will be oversampled would be to oversample on the basis of a sufficient number of characteristics of the "normal" or "long-term" poverty status of an RU collected in a screener interview.

(References available upon request).

Figure 1. Estimated Probabilities of Leaving Poverty for Screener-Poor Reporting Units Not in Poverty in 1987

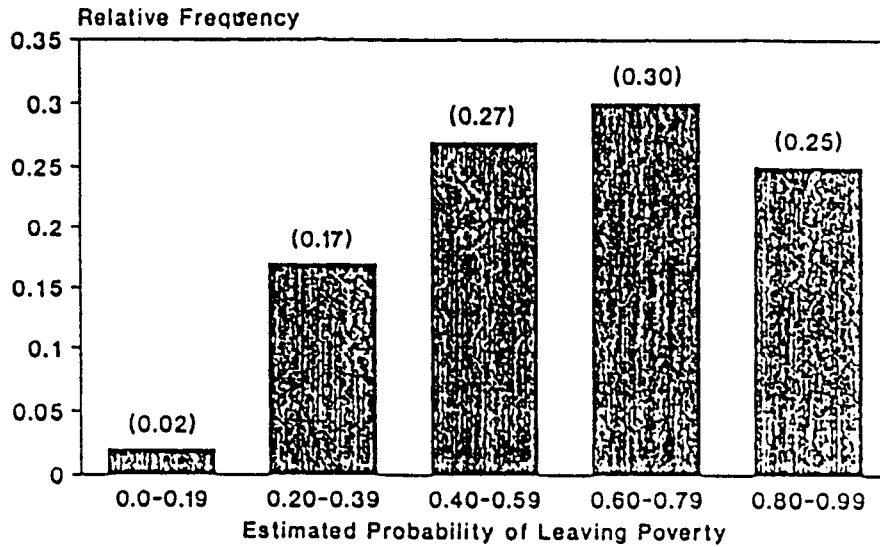


Figure 2. Sample Decomposition of RUs in Poverty at the Screener Who Left Poverty in 1987

