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## Two Subjective Definitions of Poverty: Results from the Wisconsin Basic Needs Study

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TWO SUBJECTIVE DEFINITIONS OF POVERTY:  
RESULTS FROM THE WISCONSIN  
BASIC NEEDS STUDY\*

The Wisconsin Basic Needs Study (BNS) is a longitudinal survey of the economic well-being of Wisconsin households. Economic well-being is measured in various ways. Not only are data collected on objective household characteristics such as income, expenditures, employment, and other demographic characteristics, but subjective items are also included in the questionnaires to measure a variety of self-assessments of the economic situation of the household. In this note we report on results obtained with some of the subjective items from the first wave of the survey (conducted from March to May 1981). The items are used to operationalize two definitions of a poverty line for the U.S., based on a methodology proposed by Goedhart et al. [4], who applied their methods to data from The Netherlands. In later papers by van Praag et al. [15, 16], the methods were applied to member countries of the European Community.

Our aim here is to investigate the empirical feasibility of the methods in a U.S. context. In Section I we briefly describe both definitions, and in the second section the data and operationalizations are discussed. The empirical results, presented in Section III, turn out to be quite similar to those of the earlier Dutch and European studies. Nevertheless, a number of methodological questions remain which should be addressed before a definitive judgment on the value of the approach can be made. Some of these questions are addressed in the concluding section.

### *I. THE DEFINITION OF POVERTY*

The poverty line concept adopted in Goedhart et al. [4] can be described as follows. It is assumed that an individual is able to state which income level is minimal, in the sense that below that income the individual is not able to make ends meet. We call this income the individual's *minimum income*,  $y_{min}$ .<sup>1</sup> Of course,  $y_{min}$  is subjective—that is, it may depend

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1 By "income" we invariably mean "after-tax household income." The words "family" and "household," as well as "he" and "she," are used interchangeably.

on the individual's personal circumstances, it may be subject to reference group influences, or it may depend on previous consumption levels. Let us assume for the time being that an individual's  $y_{min}$  depends only on his own income  $y$  and family size (the number of family members)  $fs$ :

$$(1) \quad y_{min} = f(y, fs)$$

It seems reasonable to assume that  $y_{min}$  increases with both  $y$  and  $fs$ . Let us assume, moreover, that for a given family size,  $fs$ , there exists an income level  $y_{min}^*$  such that

$$(2) \quad y_{min}^* = f(y_{min}^*, fs)$$

Under these conditions, everyone living in a family of size  $fs$  considers income to be too low to make ends meet if  $y < y_{min}^*$  and to be sufficient to make ends meet if  $y \geq y_{min}^*$ . This makes  $y_{min}^*$  a natural candidate for the definition of a poverty line. Note that in this formulation  $y_{min}^*$  depends on  $fs$  alone. Logically there is no barrier to differentiating the poverty line according to other characteristics, such as the age or sex of the family head or the number of earners in a family.

We shall denote  $y_{min}^*$  as the "subjectively defined poverty line" or, simply, the subjective poverty line. Note that the judgments required for the estimation of this poverty line are those of individuals about *their own* situation. This contrasts with other approaches, such as those based on experts' judgments about the situations of others (see, for example, Orshansky [6]) or those based on the judgments of a representative group of citizens about hypothetical situations (for example, Rainwater [7]).

An alternative definition considered in earlier papers is the "politically determined poverty line." Under this definition, the poverty line is an income level corresponding to a specific point on a continuous welfare scale. The choice of a specific point—that is, the welfare level attached to the poverty line—is made through the political process. In the next section we describe the operationalization of both definitions of the poverty line.

## II. DATA AND OPERATIONALIZATION

The data used in the analysis are from the first wave of the BNS.<sup>2</sup> The interviews were conducted by personal interviewers in respondents' homes during the period March to May 1981.

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2 For a more detailed description of the study design, see Colasanto [2].

Respondents for the BNS were selected from five populations, using different sampling procedures. The first sample ( $N = 878$ ) is a cross-section sample of Wisconsin households selected through area probability sampling methods. The second sample is a systematic sample from administrative lists of December 1980 recipients of assistance from the Aid to Families with Dependent Children program ( $N = 142$ ). The other three samples were selected through random-digit-dialing telephone sampling procedures and were screened over the phone to determine eligibility. These telephone samples represent the populations of female-headed households with dependent children ( $N = 164$ ), households headed by a person over the age of 65 ( $N = 304$ ), and low income households ( $N = 328$ ). The data have been weighted to compensate for the different probabilities of selection of respondents in the five samples. The weighting procedure allows the results to be generalized to the state population of households as a whole. The weighted sample size is the same as the unweighted size ( $N = 1816$ ).

The overall response rate is 67 percent. There was substantial variation in the response rate over subsamples, due to differences in the form of the initial contact with respondents (personal visit from the interviewer, letter and return postcard from the Wisconsin Department of Health and Social Services, or telephone call from the interviewer). The response rate is 72 percent for the cross-section sample, 43 percent for the AFDC sample, 73 percent for the female-head sample, 63 percent for the aged sample, and 72 percent for the low income sample. The sampling weights incorporate adjustments for nonresponse.

A household is defined in the BNS as a single person living independently, or as a set of people living together who are either (a) related by blood, marriage, or other legal arrangements, or (b) share most major expenses. The respondent is the person with the most responsibility for the financial well-being of the household. In cases where two or more people share the financial responsibility equally, the respondent was determined by a random process.

A respondent's minimum income,  $y_{min}$ , is measured by asking the *minimum income question* (MIQ): "Living where you do now and meeting the expenses you consider necessary, what would be the very smallest amount of income *per month*—after taxes—your household would need to make ends meet?"

As an operationalization of the amount of welfare a respondent would derive from different income levels, the individual *welfare function of income* (WFI) has been adopted (see, for example, van Praag [12], van Praag and Kapteyn [13]). A respondent's WFI is measured by asking the *income evaluation question* (IEQ):

I'm going to ask you to think about the amount of money *per month*—after taxes—that would make you feel *terrible* about your household's income; then we will work up to an amount that would make you feel *delighted* about your household's income. It may help if you look at this list with me while I ask the questions.

Let's start at the top with *terrible*. How much income *per month* and after taxes would leave you feeling *terrible* about your household's income?

Now let's move to *unhappy*. As we go to each next level, each of your answers should be larger than the one before, of course.

*Income Evaluation Sheet*

	Amount
Terrible .....	\$
Unhappy .....	\$
Mostly dissatisfied .....	\$
Mixed .....	\$
Mostly satisfied .....	\$
Pleased .....	\$
Delighted .....	\$

For reasons given in the aforementioned articles, we assign the numbers 1/14, 3/14, . . . , 13/14 to the labels “Terrible,” “Unhappy,” . . . , “Delighted.”<sup>3</sup> Thus, an individual's response to the IEQ yields seven pairs of income and welfare levels, where welfare is measured on a [0,1] scale. It should be stressed that the use of the word “welfare” does not imply anything more, nor anything less, than that the numbers on the [0,1] scale represent some dimension of well-being defined by the labels in the IEQ. For each respondent we measure the WFI by fitting a lognormal curve through the seven pairs of income and welfare levels. Thus, an individual's WFI is described by the two parameters,  $\mu$  and  $\sigma$ , of the fitted lognormal curve. The parameter  $\mu$  describes the location of an individual's WFI, and  $\sigma$  describes its slope. Again, we refer to the earlier papers for details and a justification for this procedure.<sup>4</sup>

An individual's WFI measures the relation between income and the welfare the individual expects to derive from it, where welfare is measured on a [0,1] scale. The word “expects” is used deliberately. Although respondents presumably know how they feel about their own income, they may easily be mistaken about the amount of satisfaction (welfare) associated with income levels different from their own. This tendency is brought out by the observation in the earlier studies that the parameter  $\mu$  depends on income and family size. So, if income changes, the WFI

3 Note that the labels correspond to the Delighted/Terrible scale used by Andrews and Withey [1].

4 See also van Herwaarden and Kapteyn [11] for tests of the assumed lognormal shape of the WFI.

shifts. For example, if an individual who currently earns \$30,000 a year states that \$40,000 a year would make him “pleased,” this judgment is based on his current WFI. If his own income actually increases to \$40,000, his WFI would shift to a new position. Quite possibly, according to the new WFI, \$40,000 will no longer make him feel “pleased,” but maybe just “mostly satisfied.” In the subsequent analysis the dependence of the location of an individual’s WFI on his own income and family size will be taken into account.

The income measure used in the analysis is total household income for 1980. The total measure is derived from separate questions about the receipt of income by source (30 categories). After all sources had been ascertained, the interviewer asked for the amount of income received from each source in 1980 by anyone in the household. Total income was not computed for cases where the respondent either refused to report or didn’t know the income amount for a major income source—that is, wages, salaries, business income, or farm income (2.8 percent had missing income information for a major source).

The income amounts reported were before-tax amounts. After-tax incomes were estimated for this analysis. In the estimation it was assumed that all married couples filed joint income tax returns and that every household used the standard deduction. Extra personal exemptions were given for respondents and their spouses over the age of 65. Taxes could not be estimated for the 13.9 percent of households with complex structures (for example, two families or unrelated people living together), and therefore these households are excluded from the analysis. The 1980 state and federal tax tables were used to calculate the tax burden of respondents given their total 1980 household income. Social Security income, income from welfare, child support, veteran’s benefits, workers’ compensation, survivor’s benefits, foster child care payments, unemployment compensation (up to the allowable limit) and (for state taxes only) a portion of military income were not taxed. Income from all other sources was taxed at the same rate.

### III. EMPIRICAL RESULTS

As in the earlier analyses, relation (1) is specified as a loglinear relationship:

$$(3) \quad \ln y_{min} = \alpha_0 + \alpha_1 \ln fS + \alpha_2 \ln y + \epsilon$$

where  $\epsilon$  is an error term satisfying the classical assumptions. Suppressing the error term and combining (1), (2), and (3) yields the poverty line

$$(4) \quad y_{min}^* = \exp\left[\frac{\alpha_0 + \alpha_1 \ln fS}{1 - \alpha_2}\right] = \exp\left[\frac{\alpha_0}{1 - \alpha_2}\right] \cdot fS^{\alpha_1/(1-\alpha_2)}$$

Note once again the dependence of the poverty line on family size. The dependence is completely determined by  $\alpha_1/(1 - \alpha_2)$ , which approximately represents the percentage increase in  $y_{min}^*$  if  $fs$  increases by 1 percent.

On the basis of the BNS sample, (3) is estimated as

$$(5) \quad \ln y_{min} = 0.820 + 0.244 \ln fs + 0.439 \ln y$$

$$(0.022) \quad (0.021)$$

$$R^2 = 0.45 \quad \text{Standard error} = .432 \quad N = 1372$$

with standard errors in parentheses.<sup>5</sup>

The subjective poverty line implied by these estimates is presented in the first column of Table 1. The column headed "Welfare Level" is explained below. The next to last column in the table presents equivalence scale values that represent the poverty line for each family size expressed as a percentage of the poverty line for a family of four. The last column presents equivalence scale values for The Netherlands from Goedhart et al. [4]. Before discussing these results, we present the results regarding the political poverty line.

Following the earlier research, a log-linear relationship is specified to explain the location parameter  $\mu$  of the WFI on the basis of family size and income:

$$(6) \quad \mu = \beta_0 + \beta_1 \ln fs + \beta_2 \ln y + u$$

with  $u$  an error term satisfying the classical assumptions. The BNS estimation results are

$$(7) \quad \mu = 0.978 + 0.204 \ln fs + 0.445 \ln y$$

$$(0.023) \quad (0.021)$$

$$R^2 = 0.42 \quad \text{Standard error} = .443 \quad N = 1372$$

As in previous research, no significant relationship could be found between the slope parameter  $\sigma$  and income or family size.

Suppressing the error term  $u$ , taking  $\sigma$  equal to its sample mean (0.49), and using the estimates in (7), one can compute for any income level and family size the corresponding welfare level. This procedure yields the second column in Table 1. Conversely, for a given family size and welfare level, one can use (7) and  $\sigma$  to compute the income needed to reach that welfare level. Thus, for any welfare level deemed minimal by

5 Income is measured by thousands of dollars per annum. We considered an alternative specification of equation (5), which included four dummy variables, rather than a single continuous variable, to represent family size. There is no improvement in the fit of the data to this model, so we present the model that parallels the earlier research.

TABLE 1  
POVERTY LINES DERIVED FROM EQUATIONS (4) AND (5)

Family Size	Poverty Line	Welfare Level	Equivalence Scale Values	
			BNS	Goedhart et al. <sup>a</sup>
1	\$ 4,313	0.37	55	65
2	5,831	0.39	74	81
3	6,955	0.40	88	92
4	7,882	0.41	100	100
5	8,686	0.41	110	107
6	9,402	0.42	119	113
7	10,054	0.42	128	119
8	10,656	0.43	135	123

a Based on their equation (12).

TABLE 2  
POLITICALLY DETERMINED POVERTY LINES

Family Size	Welfare Level			Equivalence Scale Values	
	0.40	0.45	0.50	BNS	Goedhart et al. <sup>a</sup>
1	\$ 4,659	\$ 5,212	\$ 5,825	60	69
2	6,011	6,724	7,515	78	83
3	6,977	7,805	8,723	90	92
4	7,755	8,675	9,696	100	100
5	8,418	9,417	10,525	109	106
6	9,001	10,070	10,254	116	112
7	9,526	10,656	11,910	123	116
8	10,005	11,193	12,510	129	121

a Based on their equation (3).

politicians, we can compute the corresponding political poverty line in dollars. These are presented in Table 2 with their associated equivalence scale values.

Turning now to a discussion of Table 1, we notice that the BNS equivalence scale values are more dispersed than those obtained in the Dutch study by Goedhart et al. [4]. They are also more dispersed than the values reported by van Praag, Hagenaars, and van Weeren [15] for member countries of the European Community. This may reflect the higher level of public services provided for families with children in The Netherlands (and other European countries)—for example, inexpensive

day care facilities, low or zero school tuition, and heavily subsidized housing.

To compare the BNS equivalence scale values for the subjective poverty line with the equivalence scale values implied by the official U.S. poverty line requires a further differentiation of the subjective poverty line. The U.S. poverty line is not only differentiated according to family size, but also according to the age (below or over 65) and sex of the family head, and whether the household is farm or nonfarm. The subjective poverty line can be differentiated according to the same factors by adding dummy variables to equation (5). This yields

$$(8) \quad \ln y_{min} = 0.770 + 0.259 \ln fs + 0.449 \ln y + 0.037 (FEM) \\
\quad \quad \quad (0.024) \quad (0.021) \quad (0.031) \\
\quad \quad \quad + 0.038 (AGED) - 0.091 (FARM) \\
\quad \quad \quad (0.032) \quad (0.063) \\
R^2 = 0.45 \quad \text{Standard error} = .432 \quad N = 1372$$

where  $FEM = 1$  if the household is headed by a female and there are no adult males in the household, 0 otherwise;  $AGED = 1$  if the respondent (household head) is 65 or older, 0 otherwise; and  $FARM = 1$  if anyone in the household is currently a self-employed farmer, 0 otherwise.

Table 3 presents the BNS equivalence scale values implied by this estimation and the corresponding U.S. poverty line equivalence scale values. The dispersion of the values is quite similar for these two equivalence scales calculated for the U.S.<sup>6</sup> For example, for nonfarm families with male heads under age 65, the U.S. poverty line equivalence scale ranges from 53 for a one-person household to 134 for a six-person household. The BNS equivalence scale ranges from 52 to 121 for the same families.

There are two notable differences between the scales. The BNS equivalence scale implies that female-headed households and older people need a higher income to make ends meet than male-headed or young households of the same size (note the positive coefficients for  $FEM$  and  $AGED$  in equation (8)). This is the opposite of the assumption implicit in the U.S. poverty line, and also of the results obtained by Danziger et al. [3], where female-headed and aged households are allocated lower incomes. However, the BNS coefficients for  $FEM$  and  $AGED$  are only marginally larger than their standard errors in the estimation results.

6 The subjective poverty line is expressed as an after-tax amount, while the U.S. poverty line is a pre-tax amount. The equivalence scale values for the U.S. poverty line change slightly when taxes are taken into account. The greatest changes are for families of size five or six (where the values are reduced). Eleven of the 16 values do not change, or change by only 1. Overall, the after-tax scale is less similar than the pre-tax to the BNS scale.

TABLE 3  
EQUIVALENCE SCALE VALUES, NONFARM FAMILIES<sup>a</sup>

Family Size and Sex of Head	Age of Head			
	<65		65+	
	BNS	U.S. <sup>b</sup>	BNS	U.S. <sup>b</sup>
1 male	52	53	56	47
1 female	56	49	60	47
2 male	72	66	77	59
2 female	77	64	83	59
3 male	87	78	94	
3 female	93	76	100	
4 male	100	100	107	
4 female	107	100	115	
5 male	111	118	119	
5 female	119	117	127	
6 male	121	134	130	
6 female	129	133	139	

- a The base household poverty level calculated from the BNS is \$7,761. The base household poverty level from the 1981 U.S. poverty line is \$9,291 [9].
- b Equivalence scale values implicit in U.S. poverty line. From [8].

When the actual income levels implied by the subjective poverty line are considered relative to the U.S. poverty line, we find that the BNS amount is \$1530, or 16 percent, less for a nonfarm family of four headed by a male under age 65 (note Table 3). The difference between the two poverty lines, when both are expressed as after-tax amounts, is reduced by approximately \$600, to 11 percent.<sup>7</sup> A similar result is reported in Goedhart et al. [4], where the subjective poverty line was estimated as lower than the statutory minimum income in The Netherlands. In contrast, Danziger et al. [3] obtained estimates of the subjective poverty line that were greater than the U.S. poverty line. In their data, which were from the sixth wave of the Income Survey Development Program of the Survey of Income and Program Participation, there was some ambiguity about the reporting task required of respondents to the minimum income question. Specifically, there may have been confusion on the part of the respondents about whether the income concept was before-tax or after-tax amounts. This may have caused an upward bias in their results.

7 Strictly speaking, the BNS subjective poverty line is valid for Wisconsin only. Using survey data from a state with a much higher or lower median income may yield different results. The median family income in 1979 was \$17,930 in Wisconsin and \$16,830 in the U.S. as a whole [10].

As a final comment on Table 1, we notice the low welfare levels associated with  $y_{min}^*$ . The welfare levels, which range from .37 to .43 in the BNS, approximately correspond to a verbal evaluation of income of “mostly dissatisfied.” This is a general finding with the approach. Goedhart et al [4] report a welfare level associated with  $y_{min}^*$  equal to 0.35 for a family of four. Van Praag, Hagenaaers, and van Weeren [15] report welfare levels ranging from 0.27 for France to 0.42 for Denmark. Using the BNS results, the after-tax income at the U.S. poverty line corresponds to a welfare level of approximately .45, or between “mostly dissatisfied” and “mixed.”

The income elasticities for  $y_{min}$  observed in the BNS data are comparable to those observed in the European studies. The BNS income coefficient from equation (5) is .439. When the 12 separate estimation results from Goedhart et al. [4], Danziger et al. [3], and van Praag, Goedhart, and Kapteyn [14] are combined, the median value of the income coefficient is approximately .49. Similarly, for  $\mu$  the median of the 19 income coefficients from Goedhart et al. [4], van Praag, Goedhart, and Kapteyn [14], and van Praag, Hagenaaers, and van Weeren [16] is .50, which is close to the BNS coefficient of .445 from equation (7).

Finally, let us turn to a discussion of the political poverty lines (Table 2). Once again, the equivalence scale we calculate is more dispersed than was found in the Dutch study. The dispersion is also greater than in most European countries. Van Praag, Hagenaaers, and van Weeren [15] report political poverty lines where only the equivalence scale values for Denmark show more dispersion than the BNS poverty lines. When we compare Table 2 and Table 1, we notice that the dispersion of BNS equivalence scale values in Table 2 is somewhat less than in Table 1. In view of the welfare levels associated with  $y_{min}^*$  in Table 1, it is not surprising that the dollar amounts associated with the politically determined welfare levels 0.45 and 0.50 are above those associated with the subjective poverty line.

#### IV. DISCUSSION

The BNS results are similar in many respects to the results obtained for The Netherlands in 1975 by Goedhart et al. [4] and results for the European Community obtained by van Praag, Hagenaaers, and van Weeren [15]. The most salient features of  $y_{min}^*$  are that it is somewhat lower than the U.S. poverty line and that it has a low welfare level associated with it. Both outcomes are in close agreement with the Dutch results.

It has been argued in Goedhart et al. [4] on methodological grounds that  $y_{min}^*$  has much to recommend it. There are, however, also some issues that deserve further investigation. The most crucial question is how re-

spondents interpret the phrase “the very smallest amount of income . . . your household would need to make ends meet.” In our analysis, we assume that the respondent expects to be able to subsist on that amount of money. It is of interest to know whether the respondent takes into account all necessary expenses, such as the replacement of worn-out durables. Before the results can be put into practice, a further investigation into the meaning attached to  $y_{min}^*$  is required. In itself, this requirement is not peculiar to the subjective approach. Judgments of experts as used to construct the Bureau of Labor Statistics’ worker family budgets, for example, also must be based on decisions as to what is and what is not necessary to subsist. The main difference is that in the subjective approach one uses the assessment of individuals about their own living situations rather than assessments generated by experts on someone else’s situation.

A second issue, which is relevant to any definition of a poverty line, is the extent to which cultural and social factors are incorporated. To put it differently, is poverty absolute or relative? With respect to the subjective poverty line, this question is answered rather straightforwardly. In principle, one would expect an individual’s  $y_{min}$  to be influenced by income or consumption patterns in the social reference group and by previous incomes (habit formation). Analogous to analyses by Kapteyn et al. [5], one can extend equation (3) to account for these factors. The data from subsequent waves of data collection in the BNS are ideally suited to investigate these two issues, and future analyses will consider them in depth.

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Diane Colasanto; Arie Kapteyn; Jacques van der Gaag

*The Journal of Human Resources*, Vol. 19, No. 1. (Winter, 1984), pp. 127-138.

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