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Developing a New Poverty Line for the USA: *Are There Lessons for India?*

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Are There Lessons for India?

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This paper is drawn from a paper presented by Kathleen Short, Thesia I. Garner and David S. Johnson in August 1998, 'Redefining Poverty Measurement in the US: Examining the Impact on Inequality and Poverty', at a conference organized by the International Association for Research of Income and Wealth in Cambridge, UK.

Abstract

This paper reviews a procedure that is being followed in the United States of America (USA) to experimentally test and evaluate recommendations made for redefining poverty measurement in that country. The recommendations were made in 1995 by the US National Academy of Sciences (NAS) Panel on poverty measurement. In this paper these recommendations are reviewed and the impact of implementing the recommendations on measures of inequality and poverty are examined. In conclusion, a discussion concerning possible lessons for India is provided.

The recommended poverty measure (based on new measures of thresholds and resources) is examined in terms of its impact on inequality statistics, as well as poverty statistics, and results are compared to similar statistics based on the official measure. The standard Gini index, and three generalized entropy inequality measures are used to examine inequality. For the poverty analysis simple head count ratios, poverty gaps, and Foster-Greer-Thorbecke poverty measures are computed. Data from the 1991 U.S. Consumer Expenditure Survey (CE) Interview are used to produce the thresholds, and data from the 1992 through 1997 Current Population Survey (CPS), and in some analyzes, the 1991 panel of the Survey of Income and Program Participation (SIPP), are used to define resources.

The proposed measure produces a distribution of resources that is, in general, more equal than is the distribution of official income. The poverty analysis reveals that changes in the poverty rates based on the official and the experimental measures are similar over time. However, poverty as measured by the NAS measure is greater than official poverty. The experimental poverty measure yields a poverty population that looks slightly more like the total U.S. population in terms of various demographic and socioeconomic characteristics than does the current official measure. Geographically adjusting the thresholds results in greater equality and lower poverty rates than when non-adjusted thresholds are used.

With regard to India, poverty measurement is likely not to be based on income and expenditures primarily. Alternative measures based on other needs and resources are reviewed. However, regardless of the measure used, systematic evaluations of the measure are necessary and the USA model may be one to consider in this evaluation process.

In the 1996-7 budget for India, the Common Minimum Programme (CMP) announced by the government in June 1996 showed a strong commitment to the development of social sectors for achieving distributive justice. The Conference of Chief Ministers on Basic Minimum Services (held in New Delhi during the 4-5 July 1996) recommended the adoption of several objectives to provide these services. Among these are programs to assist the poor including the provision of public housing to all shelter-less poor families, streamlining the public distribution system targeted at families below the poverty line, increased funding for nutritional support for primary school students, and increased funding allocations for health.

In order to achieve these objectives it is necessary to identify those who are below the poverty line and in most need. However, this process is sensitive to the estimation procedure adopted. The official poverty measure used in India is based on food energy requirements and was originally developed by the 1979 Planning Commission and endorsed by the 1993 Planning Commission.[1] It is based on the nutritional norm of 2400 calories per person per day in rural areas and 2100 calories per persons per day in urban areas, and is defined as the level of average per capita total expenditures at which this norm is typically attained.

In 1993 an expert group was formed by the Planning Commission to consider methodological and computational aspects of estimation of the proportion and number of poor in India.[2] This Group conducted an extensive review and analysis of the methods that can and have been used to measure poverty in India. These include ones based on a hunger criterion, food share criterion, and consumption of calories criterion. For official poverty, consumption expenditure data from the National Sample Survey (NSS) are used. Issues addressed by the expert group included differences between urban and rural areas, inter-area price differences, and poverty statistics, among many other issues.

In 1998, the Department of Statistics commissioned a study: 'Counting the Poor: Where are the Poor in India?'[3] The purpose of this report was to produce recent poverty statistics for India using micro-level data. They produced estimates using NSS data from 1987-8 and 1993-4. Six poverty lines were used in the analysis. Head count ratios as well as severity indices were produced for urban and rural areas, as well as the states.

According to information from the Ministry of Finance, the methodology for the estimation of poverty is again under review by the Planning Commission.[4] The goal of this paper is not to suggest to the Government of India the poverty measure that is most appropriate for that country, but to review an approach that is being followed in the United States of America (USA) to evaluate recommendations for revising poverty measurement there. Based on this example, it is hoped that lessons for India can be drawn. Of course, we in the USA can also learn from India's experience and review of poverty measurement.

Poverty measurement enables us to identify who is 'poor' and how 'poor is poor.' Once appropriate measures for a country have been adopted, resulting data can be used to assist in

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[1] See Datt and Ravallion (1998). Gulab Singh of the Department of Statistics, Government of India told me that two alternative measures have been proposed. One is the share of total consumption expenditures allocated to food for a person, family, or household. The other is based on a National Sample Survey-Consumption Expenditure Survey section question in which respondents are asked 'Do you manage to get two square meals a day which you think are sufficient?' If the person says 'no' then the person is considered to be absolutately poor.

[2] See Planning Commission, July 1993.

[3] Dubey and Gangopadhyay, February 1998.

[4] Based on information provided by the Ministry of Finance, Government of India on the following web site: hhttp://www.nic.in.indiabudget/es97/CHAP1.HTM and /CHAP10.HTM.

policy development, planning, and the evaluation of poverty alleviation programs. Poverty statistics are important in that they provide us with indicators that reflect who we are as a country, a culture, and a society.

THE US EXPERIENCE

In the spring of 1995 the National Academy of Sciences (NAS) Panel on Poverty and Family Assistance (see Citro and Michael 1995) released a report in which they evaluated the current method of poverty measurement in the US and made recommendations for a change. In their report, the panel recommended changing the definitions of both the thresholds and the resources that are used to measure poverty. In this paper, we implement many of the panel's basic procedures, with slight modifications, to obtain experimental poverty thresholds and a 'new income' or resource measure. Although the panel did not address the issue of whether the new resource measure would be used as the basis for a new official income measure, we decided to examine the distribution of this measure since many of the calculations used to produce the resource measure are redistributional in nature (the panel stated that the new resource measure was to be used in conjunction with the new threshold and that the income to needs ratio based on the new measure would be relevant). One way to do this is to examine inequality in the experimental resource measure as compared to the official measure. The treatment of zero and negative incomes and resources is important for this part of the analysis. Poverty, based on the experimental and official definitions, also is examined in detail using a variety of measures. The thresholds used for this analysis are based on the interview component of the US Consumer Expenditure Survey (CEX) with data from 1989-91. Thresholds for 1992 through 1996 are produced using the all items Consumer Price Index for Urban Consumers (CPI-U). The inequality estimates are based on Current Population Survey (CPS) data for 1996. Poverty rates and distributions for 1991 are produced using family resource data that come from two different sources: the 1991 panel of the Survey of Income and Program Participation (SIPP) and the March 1992 Current Population Survey (CPS).[5] The panel recommended that the SIPP, rather than the CPS, become the official source of poverty statistics. Both surveys are used to produce estimates of poverty for the same year, 1991. Additional estimates for 1992 to 1996 are based on CPS data and are presented in order to examine the behavior of the experimental poverty rates over time. Foster-Greer-Thorbecke (1984) measures of poverty are produced for 1996 using CPS data alone.

With one exception, our results from the inequality analysis generally reveal there to be slightly more equality in the distribution of income when the experimental resource definition is used as compared to the current official measure of income regardless of the treatment of zero and negative values. This was expected due to the redistributional nature of the additions and subtractions to current gross money income. The opposite relationship between the experimental measure and official income occurs when both of the following conditions hold in combination: the inequality index is more sensitive to transfers at the lower end of the distribution, and the zero and negative values are truncated. We also find that the use of geographically adjusted thresholds results in resource distributions that are statistically significantly more equal than distributions based on thresholds with no geographic price adjustment.

Concerning poverty, we find that changes in the poverty rates based on the official and the experimental measures are similar over time. For 1991, use of the SIPP data results in lower

[5] See Appendix for a description of the three surveys. For these surveys, the homeless, persons in jails or prisons, and some military personnel are not sampled.

poverty rates than when the CPS data are used for both the current official measure of income and for the experimental measure. We show that using the experimental poverty measure yields a poverty population that looks slightly more like the total population in terms of various demographic and socioeconomic characteristics than does the current official measure. The poverty gaps resulting from the use of the experimental measure are generally less than the gaps based on the official measure. Only for the elderly and households with male householders are the gaps wider. However, using the Foster-Greer-Thorbecke (FGT) statistics reveals statistically significantly greater normalized gaps for the proposed measure. Greater severity in poverty also results with the proposed measure when the entire (negatives, zeroes, and positive values) distributions of income and resources are analyzed. Restricting the analysis to observations with positive incomes or resources results in poverty severity indices that are not statistically different for either measure of income.

The paper is divided into three remaining sections. First we present the panel's recommendations for producing the new poverty measure focusing on the thresholds and resources. The experimental thresholds used in this analysis are compared to the official thresholds for the reference unit. Also in this section we describe the new resource measure, followed by some basic statistics using data from the March 1997 CPS as a precursor to the inequality analysis. The second section includes a description of the inequality measures and our results for the proposed resource versus current income measures; also included is our poverty analysis using the new measure in contrast to the old measure. In the last section, we provide our conclusions.

Revising the Poverty Measure

Thresholds

The procedure recommended by the NAS Panel to calculate the thresholds for a particular year includes the use of CEX data. The data are to be used to determine the median expenditures (adjusted to current dollars) for food, clothing, shelter, and utilities for some reference family, for the three year period previous to the current year. However, the panel stated that if data from the most recent three years are available, then these should be used. In the panel's study and in this one, we define food to include food at home and food away from home, but not alcoholic beverages. Clothing includes apparel, upkeep, sewing materials, and related items. Shelter includes rent, maintenance and repairs, and insurance for renters; for owners, shelter is defined as including payments on mortgage interest (but not principal), property taxes, electricity, telephone, and such public services as water and sewer. The resulting thresholds are based on a percentage of the median level of expenditures for this basic bundle composed of food, clothing, shelter, utilities, and 'a little bit more.' The 'little bit more' would be accounted for by applying a small multiplier to the median expenditure value for the basic bundle. This additional amount would allow for other needs (e.g., household supplies, personal care). This is in contrast to the current official threshold that is based on food expenditures and a larger multiplier to account for other goods and services. See Citro and Michael (1995) for a description of the method used to derive the original official thresholds.

The panel recommended that the reference unit for the basic threshold should be one in which two adults and two children are present. This recommendation was operationalized by producing the thresholds for a consumer unit[6] composed of two adults and two children. This

[6] A 'consumer unit' comprises either: (a) all members of a particular household who are related by blood, marriage, adoption, or other legal arrangements; (b) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially

type of reference unit accounts for about 10 percent of all consumer units in the CEX Interview data file. Following the panel (Citro and Michael 1995) and Garner et al. (1998), we use the average of upper and lower values for the percentages and multipliers to obtain a poverty threshold for the reference unit. The formula for deriving the proposed reference unit poverty threshold is:

$$T = \left[\frac{(M_1 * P_1 * median) + (M_2 * P_2 * median)}{2}\right] = \left[\frac{(1.15 * 0.78) + (1.25 * 0.83)}{2}\right] * median\,, \quad (1)$$

$$= 0.96725 * median$$

where

T = the reference unit poverty threshold,

$M_{1,} M_2$ = multipliers for smaller and larger additional amounts,

$P_{1,} P_2$ = lower and higher percentages,

median = median expenditures for the basic bundle of food, clothing, shelter, and utilities.

The panel set the percentages of the median (P_1, P_2) at 78 percent and 83 percent. These percentages roughly correspond to the 30th and 35th percentile distribution of expenditures for the basic bundle for the reference unit. The multipliers (M_1, M_2) were set at 1.15 and 1.25. Mathematically, these factors collapse to median expenditures for the basic bundle multiplied by 0.96725 when we average the lower and upper ranges. Thus, the resulting threshold is very close to median expenditures for the basic bundle. The underlying assumption concerning these thresholds is that a family's basic needs can be met if its resources are above the threshold value.

For our analysis, we use 1991 thresholds based on the median of the three most recent years of data, 1989-91, with all expenditures updated to 1991 dollars. Specifically, the 1991 threshold is calculated by using the interview quarterly expenditure data (annualized) for 1989-91, updating the annualized expenditures to 1991 dollars (using the CPI-U for all items), estimating the median, and then multiplying by the factor, 0.96725.

To produce the thresholds for 1992 to 1996, we update the threshold from 1991 using the all items CPI-U. While the panel recommended updating by the change in median expenditures each year, Johnson et al. (1997) showed that the change in median expenditures were similar to the inflation rate over this entire period, but the annual changes were more volatile than the inflation rate.

The experimental and official thresholds for a consumer unit with two adults and two children are presented in Table 1. Experimental thresholds updated by the CPI-U and by the change in median expenditures are presented for comparison. As noted above, for this analysis, we use the ones updated by the CPI-U only. The experimental thresholds adjusted by the CPI-U are only slightly higher than the official thresholds; they are US$79 higher in 1991 and US$91 higher in 1996. If the change in median expenditures were used, the thresholds for 1992 through 1995 would be somewhat higher. As shown in an earlier paper (Johnson et al. 1997), there is a large standard deviation for the median expenditures for the reference family (about US$300). This is why for some years the change in the thresholds is larger than the inflation rate (for

independent; or (c) two or more persons living together who use their incomes to make joint expenditure decisions. Financial independence is determined by the three major expense categories: housing, food, and other living expenses. To be considered financially independent, at least two of the three major expense categories have to be provided entirely or in part by the respondent (USDL 1995).

example, 1993), while it is smaller in other years (for example, 1995 and 1996).

The panel recommended adjusting the reference threshold to reflect geographic differences in costs. They stated that poverty thresholds should be higher in areas with higher prices. In addition, because many spells of poverty are short, geographic adjustment is called for since families cannot be expected to quickly change location when they experience a decline in income. Kakwani (1993) also recommended that a household welfare measure should be adjusted to take into account regional price variations, since prices may vary substantially across regions. We follow the panel's recommendations and make a price adjustment using their inter-area housing price indices based on data from the 1990 census on gross rent for apartments. This is the same approach as followed by the panel. (Currently inter-area price indices for all items are not available for the entire US[7]) In our analysis, we examine whether this adjustment affects our inequality and poverty results.

The panel recommended the use of a two-parameter equivalence scale to produce thresholds for other types of units (for example, families). This scale explicitly accounts for the differing needs of adults and children and the economies of scale of living in larger families or households. This scale is

$$(A + PC)^F, \tag{2}$$

where

A = number of adults in the family,

C = number of children in the family,

P= adult-equivalent of one child, and

F= the economies of scale factor.

For our analysis we use $P=0.7$ and a scale economy factor $F=0.65$. These scales were chosen since they minimize the effect on overall poverty and are most similar to the current scales. However, we note that different equivalence scales can change one's results regarding inequality (see Coulter et al. 1992; Lancaster, Ray, and Valenzuela 1998a) and the composition of poverty (see Citro and Michael 1995; Lancaster, Ray, and Valenzuela 1998b; and Johnson et al. 1997).

Resources

Resources Definition: Following the panel's recommendation, we use an experimental resource measure that is based on annual gross money income (the income used for current official poverty measurement in the US) plus the value of various in-kind transfers, but which excludes selected expenses. In this paper we include the following in-kind transfers in both the CPS and the SIPP measures: food stamps, school lunch, and housing subsidies (see Shea et al. 1997). Benefits from the Women, Infants and Children (WIC) program, school breakfast, and energy assistance programs are added to the SIPP resource measure but not the CPS measure.[8] From the cash and in-kind transfers total we subtract the following expenses: work-related transportation

[7] Kokoski, Cardiff, and Moulton (1994) have produced experimental inter-area price indices for urban areas in the US

[8] To examine the impact on poverty when these three benefits are not included in the resource measure, we produced standardized poverty rates in an earlier study (Short et al. 1998a). Standardized rates were produced by adjusting the experiment thresholds by a percentage of the threshold to obtain an overall poverty rate equal to the official rate. Not including these three benefits increased the standardized experimental poverty rate by 0.2 percentage points in the SIPP measure in 1991.

and miscellaneous expenses,[9] child care expenses (see Short et al. 1996), medical out-of-pocket expenditures,[10] income and social security taxes, and child support payment. Our treatment of the latter two elements differs between the two surveys. In the CPS, taxes paid are modeled in every year, including the value of the Earned Income Credit (EIC) received. The SIPP collects information on taxes paid in an annual tax module; we are currently evaluating these data to develop a tax estimation procedure for the SIPP. For the purpose of this paper, we do not subtract taxes from income for the SIPP analysis.[11] Further, information on child support payments are not available in the CPS and, therefore, are not included in the CPS estimates reported here, but are subtracted from the SIPP resource measure.[12]

Descriptive Statistics: CPS 1996

Table 2 shows some basic descriptive statistics for the official money income measure and the alternative National Academy of Sciences (NAS) resource measure in 1996 using the CPS. These results are based on the incomes and resources of families and unrelated individuals;[13] data are weighted by persons. Looking at average income and resources, it is clear that the NAS measure results in a net subtraction (costs outweigh benefits) in the aggregate. The result of our implementation of the NAS measure for 1996 is that average family income is $37,573, down from $50,569 under the official definition. Median income is also much lower, $27,868 under the NAS definition, $37,992 under the official measure. The ranges of the two measures are also quite different, the NAS distribution being narrower, due again to the net deductions in that measure.

Inequality and Poverty

Unit of Analysis

For our inequality analysis, we show results for persons (these include persons living in families and those considered to be unrelated individuals), families and unrelated individuals, and families alone. Our poverty analysis includes results for these same groups, but not for all poverty measures. As noted earlier, the thresholds are based on consumer units; then the thresholds for the different families and unrelated individuals are produced using the equivalence

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[9] A fixed amount per week per working adult, not to exceed earnings, was subtracted. The panel estimate of $14.42 for 1992 was price-adjusted for other years.

[10] These expenditures are imputed (see Betson 1997a, 1997b).

[11] Our previous calculations have shown that accounting for taxes in our standardized experimental CPS measure increased the poverty rate by about 1.0 percentage point in 1991 (Short et al., 1998a).

[12] Calculations have shown that accounting for child support paid in the SIPP experimental measure increased the poverty rate by less than 0.1 percentage points in 1991 (Short et al., 1998a).

[13] The Census Bureau definition of a 'family' refers to a group of two or more persons related by birth, marriage, or adoption who reside together; all such persons are considered as members of one family. For example, if the son of the person who maintains the household and the son's wife are members of the household, they are treated as members of the parent's family. Every family must include a reference person. Two or more people living in the same household who are related to one another, but are not related to the householder, form an 'unrelated subfamily.' These unrelated subfamilies are excluded from the count of families and unrelated subfamily members are excluded from the count of family members. Beginning with the 1980 CPS, this procedure has been followed. The term 'unrelated individuals' refers to persons 15 years of age and over (other than inmates of institutions) who are not living with any relatives. An unrelated individual may (a) constitute a one-person household, (b) be part of a household including one or more other families or unrelated individuals, or (c) reside in group quarters such as a rooming house. Thus, a widow living by herself, or with one or more other persons not related to her, a lodger not related to the householder or to anyone else in the household, and a maid living as a member of his or her employer's household with no relatives in the household, are all examples of unrelated individuals (Census 1995 and Census Web page).

scale adjustment. Here we assume that a consumer unit composed of two adults and two children is like a family with the same composition. This assumption is supported by research conducted by Johnson et al. (1997) who found there to be no statistically significant difference in the median expenditures of two adult-two children consumer units and those of families composed of a married couple with two children.

For the person-level inequality analysis, we produce results with and without adjustments for differences in family composition. Specifically, first we conduct our inequality analysis of the income and resources of families and unrelated individuals (hereafter we refer to this group as 'families' unless otherwise noted); then we produce inequality indices using scale adjustments. To account for differences in family composition, we first simply use a per capita adjustment that accounts for differences in family size only. Then we use an adjustment that explicitly accounts for differences in needs between adults and children and for differences in economies of scale within the family. For this adjustment we use scale adjustment factors proposed by the NAS Panel (1995) and presented earlier in this paper. Implicit in these thresholds is an adjustment for differences in prices across geographic areas. To capture the implicit scales in the official and experimental thresholds, the value that we actually use for the inequality analysis of income or resources per equivalent adult is the income to needs ratio. This ratio is defined as the family income divided by the family threshold.

When the focus of one's research is the economic well-being of individuals, it is most appropriate to allocate the income values to each person in the family for the person-level analysis. This weighting results in the individual distribution, rather than the family distribution of incomes and resources. We follow this procedure in this study. Then we apply person weights from the income and resource data file to produce population estimates. For the family-based analysis, we use family population weights.

For the poverty analysis, thresholds, income and resources for different family types are used to determine poverty status. To obtain the person level results, the data are person-population weighted. For the families and unrelated individuals analysis and the families alone analysis, population weights for these groups are applied.

Inequality Analysis

Given that the operations we perform to compute the NAS measure are essentially redistributional in nature, we expect that the distribution of the experimental income measure will differ from the distribution of the current income measure. The subtraction of taxes and the addition of in-kind benefits are expected to be equalizing. However, the subtraction of medical expenditures and work-related expenditures could be more or less equalizing. Therefore we have no hypothesis concerning what the net effect of the changes taken together will be on the distribution of the NAS income measure. In order to examine the aggregate impact of these changes, we use the CPS data for 1996 to produce inequality indices using both the NAS measure and the official money poverty measure.

Inequality Indices

The inequality indices that we use to examine the distribution of income and resources across the population include the standard Gini coefficient (*G*), and three generalized entropy (GE) measures with the index designation I_α. When α=0 the GE index corresponds to the mean logarithmic deviation (*D*), when α=1 to the Theil coefficient (*T*), and when α=2 to half of the coefficient of variation squared $\left(\frac{C^2}{2}\right)$; α is called the 'income share-distance' parameter.

The formulae for the different indices are given in equations (3a) through (4d) below. Here we refer to persons; however, the analyses could be done for families or other groups of persons as well. In each of the equations, y_i is the income of the i-th person, y is the mean income, and n = the number of observations or population size. The Gini index can be defined as in (3a) or (3b) below. For equation (3b) an ordered vector is needed:

$$G = \left[\frac{1}{2n^2\bar{y}}\right]\sum_{i=1}^{n}\sum_{j=1}^{n} | y_i - y_j | \tag{3a}$$

$$= 1 + \left(\frac{1}{n}\right) - \left[\frac{2}{n^2\bar{y}}\right]\sum_{i=1}^{n}(n-i+1)y_i \, . \tag{3b}$$

The GE inequality measures are given by the following formulas:

$$I_\alpha(y,n) = \frac{1}{n\alpha(\alpha-1)}\sum_{i=1}^{n}\left[\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right] \qquad \alpha \neq 0,1 \tag{4a}$$

$$I_0 = D = \left(\frac{1}{n}\right)\sum_{i=1}^{n}\log\left(\frac{\bar{y}}{y_i}\right) \tag{4b}$$

$$I_1 = T = \left(\frac{1}{n}\right)\sum_{i=1}^{n}\left(\frac{y_i}{\bar{y}}\right)\log\left(\frac{y_i}{\bar{y}}\right). \tag{4c}$$

$$\text{Thus } I_2 = \frac{C^2}{2} = \frac{1}{2n}\sum_{i=1}^{n}\left[\left(\frac{y_i}{\bar{y}}\right)^{2} - 1\right] \quad . \tag{4d}$$

The aversion parameter reflects different 'perceptions of inequality,' with lower values indicating a higher degree of inequality aversion. Changing this parameter alters the way income differences in different parts of the income distribution are aggregated. The more negative (positive) is the parameter, the more sensitive the index is to income differences at the bottom (top) of the income distribution rather than at the top (bottom).

Standard errors are produced for each measure using the methods specified by Kakwani (1990).[14] For all measures, we use population weights and account for the complex sample designs in the CPS and SIPP by using a sample design factor to adjust the standard errors.[15]

We produce this set of indices in order to examine how inequality is affected when the same information is being weighted differently in the aggregation process. The Gini coefficient is responsive to transfers based on the ranking of persons by their incomes, and for equi-distant transfers, is most sensitive to transfers at the mode of the distribution. The GE measures are developed by considering the relationships using an axiomatic approach in that a set of desirable

[14] The Kakwani approach assumes that the inequality indices are computed on the basis of independently drawn random samples of households. Since we compare inequality indices for the same families, for example, and examine whether the indices are statistically significantly different, we need to modify the t-test to account for this fact. However, using the formula for uncorrelated data for the correlated data that we have here results in our applying a more stringent test to the data than is actually necessary. Thus our statistical conclusions hold even more strongly.

[15] To estimate each standard error, we multiplied the simple random sampling standard error by 1.4.

properties for the measure itself is specified at the outset. These properties are then used to characterize the index. The GE measures can be interpreted as making assumptions about how distances between individuals' income shares are measured. The α parameter summarizes the sensitivity of I_α to income differences in different parts of the distribution. As the parameter α increases, the index becomes more sensitive to transfers at the top of the distribution. The Theil coefficient and one-half of the coefficient of variation squared are more sensitive to transfers at the top of the distribution, while the mean logarithmic deviation is relatively more responsive to transfers at the lower end (see Cowell and Kuga 1981, Jenkins 1991, and Coulter et al. 1992 for discussions of these measures and the principles which they satisfy). This is relative to other measures of the GT class with lower parameters.

Treatment of Zeroes and Negative Values

In conducting our analysis we found that, for 1996, about 0.9 percent of all persons were in families with zero or negative incomes. In contrast, 1.7 percent of all persons had zero or negative family resources. Negative values in the CPS data file can result for business, farm, and rental income. For the SIPP, negatives are possible for rental income. For resources, the cause of the negatives is most likely due to the imputations, particularly those for medical out-of-pocket expenditures, that we use to produce the measure. Because of the imputations, we wanted to give particular attention to the impact of the imputations for analyses that would involve the entire income distribution. In our study, the lowest value for income is -$2,513 while the lowest value for resources is -$25,860. Given that for part of our inequality analysis we use indices based on log incomes and resources, we had to make a decision concerning how to treat observations with zero and negative values. We produce results based on two different treatments of these values. First we set all negative and zero values to 0.01 and produce the inequality indices; then we conduct our analysis using only those observations with incomes or resources greater than 0. The first treatment is similar to that followed by the US Census Bureau when producing Gini indices for income based on detailed shares.[16] Jenkins (1995) and Cowell and Victoria-Feser (1996) have used the second method.[17] Truncating the zero and negative values to 0.01 is expected to increase the mean log deviation estimates because this measure is bottom-sensitive. To examine how the indices would be affected when the zeroes and negatives are included, we also produce Gini coefficients and estimates of half the coefficient of variation squared. Both of these allow for the inclusion of such values. This analysis is only conducted for income and resources per equivalent adult; equivalency is based on the scales implicit in the experimental thresholds.

Results of Inequality Analysis

Table 3 shows the results of the inequality analysis for income and NAS-defined resources using CPS data for calendar year 1996 and both assumptions concerning the treatment of zero and negative income and resource values. Indices are presented for persons, families and

[16] See Census (1995) for the Gini index calculation description. In creating a data set on transitional economies for use at the World Bank, researchers (Ackland et al. 1996) took steps to ensure that total disposable income was always positive, stating that, '…a practical reason for ensuring this is the fact that the existence of zero or negative TOTHHY [income] would complicate data manipulation and analysis (e.g., log transformations and the calculation of Gini coefficients).' In the World Bank data file, zero and negative values were made to be greater than 0 but less than the smallest positive amount in the full income distribution in order to preserve rankings.

[17] Both Jenkins (1995) and Cowell and Victoria-Feser (1996) have suggested that one may also want to drop unreasonably high values as well.

unrelated individuals, and families. Statistical significance[18] is noted in the table by an asterisk when the indices based on the official and experimental measures are compared. When zero and negative income and resources are set equal to 0.01, we find that the NAS measure is only slightly more equally distributed than the official income measure when the Gini coefficient, Theil coefficient, and half the coefficient of variation squared are used. This is true for persons, for families, and for families including unrelated individuals living alone. The mean log deviation, when produced for persons and the family groups, results in higher inequality for the NAS income measures. While the differences are statistically significant, they are very small.

In contrast, when we trim the data to include only observations with positive income or resource values, the NAS measure always results in greater equality in the distributions. For the person level analysis, the official based indices are statistically significantly greater for each of the incomes and resources upon which the Gini coefficient and mean log deviation are based, and for the family size and composition adjusted incomes and resources using the Theil coefficient. The family analyses reveal the same pattern with statistical significance between the official and NAS measures for the Gini and mean log deviation.

Using the full distributions (negatives, zeroes, and positive values) for income and resources per equivalent adult, we find that the Gini based on the official measure is statistically significantly greater than the NAS measure (results not presented in table).[19] This is consistent with our findings based on the truncated (when income or resources ≤ 0, the value is set = \$0.01) and trimmed (data are restricted to values > 0) distributions. In addition, we find that the Gini indices based on the full sample are statistically greater than the indices when trimmed data are used. This result holds for both income and NAS resources. Truncating the data has no affect. However we conclude from this analysis that the treatment of the zeroes and negative values matters in analyses of inequality when a measure such as the Gini coefficient is used.

In contrast, there is no statistical difference between the indices based on official income and NAS resources for the coefficient of variation index for either the truncated or trimmed distributions. When we compare the inequality indices for the full distributions to those based on the truncated distributions, we also find no statistically significant differences in the indices within income and resource measures and across measures.[20] Thus we conclude that using the entire distributions, truncating, or trimming the data makes little difference in inequality analyses based on the coefficient of variation index.

As might be expected, geographic price variations are likely to matter in assessing equality in distributions of economic well-being. Our Gini index analysis of NAS resources per equivalent adult, using the trimmed distributions, reveals that geographic adjustment in the thresholds result in statistically greater equality than when non-geographically adjusted thresholds are used.[21] There are no statistically significant differences between the GE indices when geographic adjustment is used and when it is not.

Income per equivalent adult results in the lowest index values, followed by those using unadjusted family income or resources and then the per capita adjusted income and resources. This result holds over both the official measure and the experimental measure for both treatments

[18] One-way t-tests are conducted. The 95 percent confidence interval is used; the critical value is 1.65.
[19] The Gini for the full distribution using official income is 0.441 and for NAS resources the Gini is 0.424. Standard errors are available from the authors upon request.
[20] Half the coefficient of variation squared is 0.686 for the official measure and 0.658 for the experimental measure when the full distribution is used.
[21] The Gini based on income per equivalent adult, using the trimmed NAS resource distribution, is 0.416 when no geographic adjustment is used as compared to 0.411 when geographic adjustment is used. The first is statistically significantly greater than the second using a one-tail t-test when $\alpha = 0.05$ and the critical value = 1.65.

of zeroes and negative values.

Poverty Analysis

In this section we use the above described NAS resource measure and the experimental threshold to examine resulting poverty statistics using CPS data from 1991 to 1996 and SIPP data from 1991. We expect there to be differences in poverty rates and in the composition of the poor when the two different measures are compared, given the additions and subtractions from income, as well as when the two different surveys are used. Throughout this analysis, we also produce results using standardized experimental poverty rates. For this, experimental rates are produced using thresholds adjusted to produce an overall poverty rate roughly equal to the official rate. The poverty rate of persons is used as our standard. For the 1991 analysis, the standardization was achieved by applying a factor of 0.845 to the experimental thresholds when using the CPS based measures and 1.025 when using the SIPP measure (Short et al. 1998b). For the 1996 analysis, the standardization was achieved by applying a factor of 0.856 to the experimental thresholds when using the CPS based measure. The standardized rates are an informative way to examine which groups have a differential probability to be classified as poor under the experimental measures. Before presenting our results, we describe the poverty statistics employed.

Poverty Statistics

Several poverty statistics are used to conduct our analysis. Statistics other than those used in this study could have been used (see Hagenaars 1986 and Ruggles 1990). Each measure involves comparing an income or resource measure to a poverty threshold. The simplest statistic is the head count ratio, which is simply the proportion of the population with incomes below the poverty threshold (in other words, $\frac{q}{n}$ where q = the number of poor families or persons and n = the total number of families or persons). However, this measure does not account for the depth of poverty in the population. Producing the average poverty gap (computed as $\frac{1}{q}\sum_{i=1}^{q}(z_i - y_i)$, where y_i is family income and z_i is the appropriate poverty threshold) can solve this problem. This measures the average shortfall of income (resources) below the poverty threshold. Here, deprivation depends on the distance between a poor family's income and the poverty threshold. A difficulty with this measure is that it is invariant to the distribution of incomes within the poor population. Foster et al. (1984) proposed a class of poverty measures, the Foster-Greer-Thorbecke (FGT) measures, which do not suffer from this problem. These measures take the form of:

$$P_\alpha(y,z,\alpha) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z_i - y_i}{z_i}\right)^{\alpha} \tag{5}$$

where

P is the poverty measure,

α is a measure of poverty aversion (a larger α gives greater emphasis to the poorest poor) and $\alpha \geq 0$,

$y_i = (y_1, y_{2,} ..., y_n)$ is a vector of incomes or resources in increasing order,

$z_i =$ is the poverty threshold for family *i* and z_i > 0,

$z_i - y_i$ is the income or resource shortfall of the *i*-th family,
$q = q(y; z)$ is the number of poor families or persons (having incomes or resources no greater than *z*), and
$n = n(y)$ is the total number of families or persons.

This class of measures has several attractive features. First it collapses to the head count ratio if $\alpha = 0$ and to the normalized poverty gap if $\alpha = 1$; when $\alpha = 2$, the index is sensitive to the distribution of incomes among the poor. As α increases, more weight is placed on those families or persons with the lowest incomes, until in the limit it measures only the condition of the family or person with the lowest income in the economy. Thus, the weights are based on a notion of relative deprivation experienced by the poor families or persons. In addition, the properties of the FGT family of measures satisfy three basic axioms. First, when $\alpha > 0$, the measures satisfy Sen's monotonicity axiom (see Sen 1976). This axiom can be stated as, 'given other things, a reduction in the income of a poor family must increase the poverty measure.' Second, when $\alpha > 1$ the measures satisfy Sen's transfer axiom (Sen 1979). The transfer axiom can be stated as, given other things, a pure transfer of income from a poor household to any other household that is richer must increase the poverty measure. Third, Kakwani's (1980) transfer sensitivity axiom is only met with the FGT class of measures when $\alpha > 2$ (Foster et al. 1984). For this axiom, if a transfer $t > 0$ of income takes place from a poor household with income y_i to a poor household with income $y_i + d(d > 0)$, then the magnitude of the increase in poverty must be smaller for larger y_i.

Standard errors are produced for the FGT measures using the specifications presented by Kakwani (1993).[22] Again, a sample design factor is used to adjust the sample standard errors to account for the complex sample design of the surveys.

Results of Poverty Analysis

In this section we present our poverty results. Included are head count ratios for selected demographic groups (in Tables 4 and 6), a comparison of the total population and the poor population according to demographic groups based on both the official and experimental measures (Table 5), average poverty gaps of families (Table 7), overall poverty rates and gaps for families and unrelated individuals and for families alone (Table 8), and overall poverty statistics for persons using the income to needs ratio and the FGT measures (Tables 9).

First, we begin by analyzing the poverty rates of persons to examine trends and the composition of the poverty population. In Table 4, we present the results for 1991 based on both the CPS and SIPP. Poverty rates using the official thresholds and income measure for different demographic groups are compared to the poverty rates based on our implementation of the panel's proposed method (labeled as NAS experimental and NAS standardized). As shown, poverty rates using the official definition with SIPP data are smaller than official CPS-based poverty rates. As noted earlier, in order to examine the effects on the composition of the poverty population, we adjust the experimental thresholds by a factor in order to obtain an

[22] The Kakwani approach assumes that the poverty indices are computed on the basis of two independently drawn random samples of households. However, as for the inequality indices, we compare indices for the same families, for example, and examine whether they are statistically significantly different. Thus, we need to modify the t-test to account for this fact. Again, use of the formula for uncorrelated data for the correlated data that we have here results in our applying a more stringent test to the data than is actually necessary; given this, our statistical conclusions hold even more strongly.

overall poverty rate equal to the official rate. The standardized rates in Table 4 show that children, Blacks, and people in female householder families are less likely to be classified as poor under the new measure while all other groups shown are more likely to be classified as poor.

Since the experimental standardized poverty rate is lower than the official rate for children, Blacks, and persons in female householder families, we would expect that their representation in the poverty population would be lower, and vice versa for those with higher rates. As seen in previous research (see Citro and Michael 1995; Garner et al. 1998; Short et al. 1998a, 1998b), using the new measure results in a poverty population that more closely resembles the total population. This is illustrated in Table 5, which shows the composition of the total population versus that of the poverty population under the different measures for 1991.

Table 6 shows that over the 1991-6 period, rates under the official and experimental methodologies behave similarly, increasing over the 1991-3 period and decreasing over the 1993-6 period. The table shows standardized experimental poverty rates controlled to the 1996 official rate. The official rate rises from 14.2 to 15.1 percent from 1991 to 1993 and falls to 13.7 percent by 1996. The standardized experimental rate rises from 14.5 to 15.7 percent from 1991 to 1993 and falls to 13.7 percent by 1996. However, over the 1993-96 period, poverty rates drop more under the experimental measure for some groups, such as children and Blacks. This drop appears to be due to the addition of the Earned Income Tax Credit[23] in the resource measure. This result highlights the ability of the new measure to capture the effects of many tax and transfer policies.

Poverty gaps give us some additional information about the difference between the official and the NAS measures. Average poverty gaps, computed on a family basis, are presented in Table 7. In this and the following tables, the NAS standardized measure is based on the 1996 official poverty rate for persons and is referred to in the tables as 'Std96.' For the poverty gap analysis, the data are restricted such that the gap cannot be greater than the threshold. This means that the gap for families with negative incomes or resources is set equal to the threshold. The same approach is used by the Census Bureau to produce poverty gaps for official publication. Based on this analysis, we find that the NAS measure (both standardized and non-standardized) results in lower poverty gaps on average than the official measure. The standardized NAS measure results in the lower of the two NAS gaps. This is not surprising since the thresholds are lower by definition. Overall, the results presented in Table 7 suggest that the intensity of poverty is softened considerably by the addition of in-kind transfers to the needy and the subtractions from current gross money income; however, it is important to remember that all negative values have been truncated for producing the gaps. The conclusion does not hold for all the demographic groups considered. The elderly experience greater average poverty gaps when both of the NAS experimental measures are used versus the official measure. This may not be surprising since the elderly are most likely to have larger expenses deducted from resources for medical care than are the non-elderly. The non-standardized NAS measure also results in higher poverty gaps for male headed households.

Table 8 includes poverty rates and gaps for families and unrelated individuals, and for families alone. As for Table 7, gaps are restricted such that they cannot be greater than the threshold. The rates are based on incomes and resources from the entire distribution. These results show that the rates based on the NAS experimental measure (not standardized) are statistically significantly greater than the official rates. The poverty gaps are statistically significantly smaller for the experimental measure (for both NAS96 and Std96) than for the

[23] This is a refundable tax credit for low-income working families.

official measure.

Table 9 lists additional poverty statistics for persons, including those based on the FGT class of measures; income and resources are based on CPS data for 1996. Here we see a similar pattern for persons emerge as for families and for families and unrelated individuals. First, the table shows the number of poor people under the three poverty measures, with the largest number of poor being counted under the NAS experimental measure. In contrast, the income to poverty ratio is lowest for the non-standardized experimental measure (2.71), and is highest for the official measure (3.78). The NAS standardized and non-standardized ratios are statistically significantly less than the ratio based on the official measure.

The FGT poverty measures that we show, computed only for persons, provide us with additional information about poverty. For this examination, we present results for (a) the entire distribution, including negative values, (b) distributions when negative values are truncated at greater than or equal to zero income or resources, and (c) distributions when the data are trimmed to be greater than zero. As noted previously, when $\alpha = 0$ the FGT equals the poverty rate. Before standardizing the experimental rate, we see that the overall poverty rate increases from 13.7 to 18.0 percent. The normalized poverty gap, FGT1, shows a different pattern than the non-normalized gap results. Based on the FGT1 and before standardization (and after standardization too when results are based on the entire distribution), the normalized gap increases with the new measure as compared to the official measure of poverty. The measure of intensity, FGT2, suggests a higher concentration of poor at the very bottom of the distribution when the experimental measure is used. However, when we standardize the experimental measure, the FGT statistics are more similar to those of the official poverty measure, yet they are statistically significantly different.

When data including negative values (all income or resource values) are used, the FGT1 and FGT2 measures reveal that poverty based on the experimental measure is more severe than when the official measure is used. This result holds for the standardized and non-standardized measures; here the differences are statistically significant.

As seen in Table 9, the negative values in the data affect the FGT results. When income and resources are restricted to values greater than or equal to zero (the truncation case), we find that the FGT1 and FGT2 indices are statistically significantly greater for the NAS96 measure but less for the Std96 measure when compared to the indices based on the official measure. When the data are restricted to income and resource values greater than zero and the non-standardized measure is used, only the poverty rates and normalized poverty gaps are greater with the NAS measure.[24] The FGT indices based on this trimming of the distributions and the standardization are all statistically significantly less than the indices based on the official measure.
Within the measures, the FGT results are compared across the treatments of the distributions (significance not shown in table). For this we find there to be no difference between the official based indices for the entire distribution and when the data are truncated to be greater than or equal to zero. However, when the data are restricted to values greater than zero, there are statistically significant differences for each of the three FGT indices. For the NAS measure (for both the NAS96 and Std96), the FGT1 and FGT2 indices are statistically significantly different when the indices with the negative values are compared to the indices based on distributions without negative values. In addition, the FGT0 indices are also statistically significantly different when the data are trimmed such that income or resources are greater than zero (using

[24] When the data are restricted to positive income or resource values only, the same thresholds as are used for the total distribution are applied. This is the reason why the standardized rate is not equal to the official rate for the analysis based on the trimmed data.

both the NAS96 and STD96 measures) as compared to the indices when all values are used for the analysis.

The effect of geographically adjusting the thresholds for price differences across areas is examined when incomes were trimmed to be greater than zero (results not shown). Based on this analysis we find that geographic adjustment results in statistically lower person poverty rates than when no geographic adjustments are applied.[25] There are no statistical differences between the FGT1 and FGT2 measures with and without price adjustments in the thresholds for either the standardized or non-standardized measures.

Concluding Remarks

The results presented here have shown, generally, that the alternative experimental poverty measures are not much different from the official measure in terms of general distributional properties, that is, inequality. By examining several inequality statistics, we have seen that the distribution of experimental resources is only slightly more equal than that of official money income, although some of the differences are statistically significant. Poverty rates are higher with the NAS measure than when the official measure is used. Our examination of family poverty gaps suggests that the experimental measure implies less severe poverty than the current measure. In contrast, when normalized poverty gaps are produced using the entire or the trimmed distributions for persons, and when more weight is attached to the lower end of the distribution (as for the severity index represented by the FGT2 index), poverty is a greater problem with the NAS experimental measure. Official poverty is significantly more of a problem when examined in terms of the FGT class of poverty measures and standardization is used. Whether the official or NAS experimental measure results in more severe poverty is likely to be related to the treatment of negative values and to whether one is talking about persons or families.

Based on our inequality analyses we conclude that scale adjustment matters, the treatment of zero and negative income and resource values matters, and the choice of inequality index matters in analyses of official income and the NAS experimental resource measure. The treatment of zeroes and negatives also matters for poverty measurement as does the use of standardization. Geographic adjustment may or may not matter, depending upon the inequality and poverty measures considered.

If the NAS resource measure were used as another measure of economic well-being, in addition to its use for poverty measurement, one might want to examine whether this measure produces higher economic well-being than does the official measure. For this, further analyses, including tests of stochastic dominance, are required. Preliminary analysis suggests that the official income distribution dominates that of the NAS measure within an interior range of incomes and resources based on a test of first degree stochastic dominance.[26] However, neither dominates the other throughout the distributions. Through analyses of higher order stochastic dominance, we would be able to make a statement about whether overall economic well-being is higher using the official measure or when the NAS measure is used.

Regardless of how the NAS measure is used, for poverty, inequality, or other analyses of economic well-being, the researcher and policy analyst need to understand how the distributions

[25] The poverty rate for persons is 0.169 when non-geographically adjusted and non-standardized thresholds are used, as compared to 0.165 with geographically adjusted, non-standardized thresholds. These rates refer to the trimmed data.

[26] We thank Stephen Howes of the World Bank, for sharing his 'SAS Dominance Module' (Howes 1995) for this part of our analysis.

are defined and what the indices of well-being are suggesting. Based on this study, we caution that if the NAS resource measure is used for such analyses, greater attention needs to be given to how zero and negative values are treated and to understanding what these values represent. Again, as noted before, the treatment of these values for both inequality and FGT poverty measure analyses matters. If we assume that current gross money incomes are correctly reported (with zeroes and negative values representing income losses for example), then are we adding appropriate amounts for in-kind transfers and are we subtracting appropriate amounts for the families? Is it reasonable to assume that the expenditures for child care expenses, work-related expenses, out-of-pocket medical expenses, and taxes and social security payments are being paid for out of current gross money income? Is it perhaps more reasonable to assume that some of these costs, particularly medical out-of-pocket costs, are being financed out of savings, borrowing, or a reduction in assets? As we have shown, the resource measure, as calculated here, results in a large number of persons in families with non-positive values. The presence of these values has consequences for our description and understanding of economic well-being in the United States. As our results of inequality and poverty here display, this *does* affect our ability to provide a complete picture of the relative conditions of persons below the poverty line. It is clear from this study that continued research is needed and public discussion desirable.

LESSONS FOR INDIA

In this paper we have described a systematic approach that we are using in the US to evaluate recommendations that have been made for revising poverty measurement. We are considering the impact on poverty measurement of using different equivalence scales, the treatment of owner-occupied housing in our measure of the basic bundle of threshold needs, geographic and updating adjustments for the thresholds, and different imputations for resource components. As we engage in this process, we regularly meet with other analysts and administrative persons within the federal government. For example, about once every six weeks we meet with the Office of Management and Budget Interagency Technical Group on Poverty and Income Measurement. This group has provided us with additional guidelines and suggestions for evaluation. In June 1999, we published a report of our latest findings under the auspices of the Bureau of the Census. We expected there to be substantial public discussion and further analyses. In preparation for these discussions, we made available to the public the data files and programs that we used to test our assumptions and produce the Census report. Forums for discussions were organized in which our work was presented and scrutinized. For example, in April 1999, the University of Wisconsin-Madison, Institute for Research on Poverty convened such a forum inviting academics, policy analysts, and other researchers to evaluate and comment on what we had done.

Whether an approach such as the one we are following in the US is applicable to India is a question only those in India can answer. However, as poverty measurement is most important to both our societies, we strongly believe that such systematic analyses are desirable and necessary. This belief is also reflected in the reports published by the Planning Commission and the Department of Statistics. Not only should the overall measure be considered in the analyses, but also assumptions concerning equivalence scale adjustment (as noted also by Lancaster, Ray, and Valenzuela 1998a, b), inter-area price and updating adjustments, the treatment of housing needs, and other issues.

Should India use an income based measure of poverty? The answer to this question is 'probably not.' Other alternative measures are likely to provide more appropriate information concerning poverty in India. The food energy requirements approach may not be the only measure one would want to use, as was recognized by researchers in India. This one has problems in that requirements vary across individuals and over time for a given individual. An assumption must also be made about activity levels which determine energy requirements beyond those needed to maintain the human body's metabolic rate at rest (see Datt and Ravallion 1998). As alternatives, one might want to consider other aspects of food adequacy and hunger. Other measures might also include those reflecting water quality, housing and energy adequacy, medical care access, health status, and resources available from others. Subjective assessments of economic well-being, based on the responses of the people in the society, may be a desirable complement to an absolute measure. By using a multi-dimensional approach to measure poverty, a clearer picture of who is poor in India should result. This can be then used to provide guidance in developing programs for poverty alleviation.

Table 1. Poverty Thresholds for Two Adults and Two Children: 1991 to 1996

Year	Official	Experimental CPI-U updated	Experimental CEX updated
1991	$13,812	$13,891	$13,891
1992	14,228	14,309	14,349
1993	14,654	14,738	14,936
1994	15,029	15,115	15,211
1995	15,455	15,543	15,561
1996	15,911	16,002	15,743

Table 2. Population Size and Summary Statistics of CPS-Based Family Income and Resource Measures: 1996

	Official	NAS96
Number of		
Families (000)	70,241	70,241
Families and unrelated individuals (000)	111,582	111,582
Persons (000)	266,218	266,218
Income and Resource Statistics		
For families and unrelated individuals		
Averaged across persons		
Mean	$50,569	$37,573
Median	37,992	27,868
Minimum	-2,513	-25,860
Maximum	1,404,998	1,008,454

Table 3. Inequality Statistics of CPS-Based Family Income and Resource Measures: 1996

	If income or resource ≤ 0, set value = 0.01		Restrict to income or resource > 0	
	Official	**NAS96**	**Official**	**NAS96**
Persons				
Number of persons (000)	266,218	266,218	263,822	261,692
Gini coefficient				
Income	0.448	0.440 *	0.442	0.430 *
Income per equivalent adult	0.441	0.421 *	0.435	0.411 *
Per capita	0.461	0.458	0.456	0.448
Mean log deviation ($I_{\alpha=0}$ **)**				
Income	0.524	0.597 *	0.393	0.356 *
Income per equivalent adult	0.414	0.552 *	0.374	0.316 *
Per capita	0.534	0.607 *	0.407	0.374 *
Theil coefficient ($I_{\alpha=1}$ **)**				
Income	0.379	0.371	0.370	0.353
Income per equivalent adult	0.370	0.347 *	0.361	0.329 *
Per capita	0.410	0.408	0.400	0.391 *
Half coefficient of variation^2 ($I_{\alpha=2}$ **)**				
Income	0.680	0.650	0.669	0.630
Income per equivalent adult	0.685	0.653	0.674	0.633
Per capita	0.837	0.834	0.825	0.811
Families and Unrelated Individuals (no scale adjustment)				
Number of families and unrelated individuals (000)	111,582	111,582	109,865	108,602
Gini coefficient	0.477	0.472	0.469	0.457 *
Theil coefficient	0.429	0.425	0.413	0.398
Mean log deviation	0.652	0.768 *	0.439	0.405 *
Half coefficient of variation^2	0.794	0.774	0.775	0.740
Families (no scale adjustment)				
Number of families (000)	70,241	70,241	68,840	69,278
Gini coefficient	0.425	0.420	0.422	0.412 *
Theil coefficient	0.345	0.340	0.339	0.327
Mean log deviation	0.432	0.510 *	0.351	0.320
Half coefficient of variation^2	0.620	0.600	0.613	0.585

*statistically significant difference between official and experimental value based on one-way t-test, α =0.05 level, critical value=1.65

Table 4. Poverty Rates of Persons (percentages): 1991

	Official Definition		NAS Experimental Measure			
					Standardized	
	CPS	**SIPP**	**CPS**	**SIPP**	**CPS**	**SIPP**
All Persons	14.2	12.1	18.9	13.6	14.2	14.2
Children	21.8	19.6	26.4	18.9	19.9	20.0
Elderly	12.4	9.0	20.3	14.5	14.9	15.3
	11.3	9.3	16.1	11.5	12.1	12.0
White						
Black	32.7	29.0	36.7	26.8	27.4	28.4
Hispanic	28.7	27.6	40.0	29.5	30.6	30.8
One or more workers	9.3	6.6	14.3	9.0	10.4	9.6
Persons in family of type						
Married couple	7.2	6.3	11.9	8.8	8.3	9.3
Female householder	39.7	35.5	45.0	33.6	35.7	35.2

Table 5. Distribution of the Total Population and Poor Population (percentages): 1991

	Total Population		Poverty Population			
					NAS Experimental	
			Official Measure		Standardized	
	CPS	**SIPP**	**CPS**	**SIPP**	**CPS**	**SIPP**
All persons	100.0	100.0	100.0	100.0	100.0	100.0
Children	26.0	27.0	40.0	44.0	37.0	38.0
Elderly	12.0	12.0	11.0	9.0	13.0	12.0
White	84.0	83.0	67.0	64.0	71.0	70.0
Black	13.0	13.0	29.0	30.0	24.0	25.0
Hispanic origin	9.0	9.0	18.0	21.0	19.0	20.0
One or more workers	85.0	82.0	55.0	45.0	62.0	55.0
Persons in family of type						
Married couple	80.0	80.0	45.0	45.0	51.0	54.0
Female householder	16.0	17.0	51.0	52.0	44.0	42.0

Table 6. Poverty Rates (percentages) of Persons Based on CPS Family Income and Resource Measures: 1991 to 1996

	Year					
	1991	**1992**	**1993**	**1994**	**1995**	**1996**
Official Measure						
All persons	14.2	14.8	15.1	14.6	13.8	13.7
Children	21.8	22.4	22.7	21.8	20.8	20.5
Nonelderly adults	11.0	12.0	12.4	12.0	11.0	11.0
Elderly	12.4	12.9	12.2	11.7	10.5	10.8
White	11.3	11.9	12.2	11.7	11.2	11.2
Black	32.7	33.4	33.1	30.6	29.3	28.4
Hispanic origin	28.7	29.6	30.6	30.7	30.3	29.4
One or more workers	9.3	9.7	9.9	9.6	9.5	9.5
Persons in family of type						
Married couple	7.2	7.7	8.0	7.4	6.8	6.9
Female householder	39.7	39.0	38.7	38.6	36.5	35.8
NAS Experimental - controlled to 1996 rate						
All persons	14.5	15.3	15.7	14.7	13.8	13.7
Children	20.0	21.0	21.0	20.0	18.0	18.0
Nonelderly adults	12.0	13.0	13.0	12.0	12.0	12.0
Elderly	15.0	17.0	17.0	16.0	15.0	16.0
White	12.0	13.0	13.0	13.0	12.0	12.0
Blacks	28.0	30.0	31.0	26.0	25.0	25.0
Hispanic origin	31.0	32.0	32.0	31.0	29.0	29.0
One or more workers	11.0	11.0	11.0	11.0	10.0	10.0
Persons in family of type						
Married couple	9.0	9.0	9.0	9.0	8.0	8.0
Female householder	36.0	36.0	36.0	35.0	32.0	32.0

Table 7. Average Poverty Gaps of Families, Based on CPS Family Income and Resource Measures, by Characteristics of Reference Person and Family: 1996
(restriction: gap cannot be > threshold)

	Official	NAS96	Std96
All Families	$6,252	$5,447	$4,815
Reference Person Characteristic			
Age			
< 18 years	5,769	4,652	3,720
18-64 years	6,468	5,500	4,812
65 years and older	4,000	5,223	4,859
Race			
White	5,907	5,406	4,866
Black	6,967	5,420	4,513
Other	6,628	6,127	5,535
Hispanic origin	6,366	5,700	4,835
Family Characteristic			
Workers present			
None	7,334	6,032	5,376
One or more	5,566	5,132	4,483
Family type			
Married couple	5,850	5,432	4,991
Male householder	5,347	5,473	4,696
Female Householder	6,657	5,461	4,656
Geographic region			
Northeast	6,473	5,738	5,068
Midwest	5,931	5,056	4,554
South	6,383	5,193	4,560
West	6,098	5,886	5,207
Metropolitan area			
Central city	6,676	5,783	5,001
Not central city	5,993	5,472	4,938
Non-metropolitan area	5,865	4,741	4,216

Table 8. Poverty Statistics for Families and Unrelated Individuals Based on CPS Family Income and Resource Measures: 1996
(restriction: gap cannot be > threshold)

	Official	NAS96	Std96
Families and Unrelated Individuals			
Number of (000)	111,582	109,865	108,602
Poverty rate	14.7	19.0 *	14.8
Poverty gap	$4,962	$4,668 *	$4,190 *
Families			
Number of (000)	70,241	68,840	69,278
Poverty rate	11.0	15.8 *	12.0 *
Poverty gap	$6,252	$5,448 *	$4,815 *

*statistically significant difference between official and experimental value based on one-way t-test,
α =0.05 level, critical value=1.65

Table 9. Poverty Statistics for Persons Based on CPS Family Income and Resource Measures: 1996

	Official	NAS96	Std96
Persons (000)	266,218	266,218	266,218
Poverty rate	13.7	18.0 *	13.7
Number poor (000)	36,529	47,812 *	36,529
Income/poverty ratio	3.78	2.71 *	3.18 *
FGT Poverty Measures			
Based on entire distribution			
Number of persons (000)	266,218	266,218	266,218
FGT0	0.137	0.180 *	0.137
FGT1	0.060	0.079 *	0.065 *
FGT2	0.039	0.063 *	0.060 *
Distribution with income or resources ≥ 0 (with negative values set =0)			
Number of persons (000)	266,218	266,218	266,218
FGT0	0.137	0.180	0.137
FGT1	0.060	0.073 *	0.059 *
FGT2	0.039	0.047 *	0.040 *
Distribution with income or resources > 0			
Number of persons (000)	263,822	261,692	261,692
FGT0	0.129	0.165 *	0.122 *
FGT1	0.052	0.057 *	0.042 *
FGT2	0.030	0.030	0.023 *

*statistically significant difference between official and experimental value based on one-way t-test,
α =0.05 level, critical value=1.65

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For related information on revising the US poverty measure see:

http://www.census.gov/www/hhes/povmeas.htm

Appendix: Data Sources

Consumer Expenditure Survey

The Consumer Expenditure (CEX) Interview Survey is the source of data used to compute poverty thresholds in this paper. Also as part of the CEX is a Diary survey; data from this survey are not used for producing the poverty thresholds (see USDL 1995 for a description of the Diary survey).   The CEX is a Bureau of Labor Statistics survey with data collected by the Census Bureau. The CEX Interview has been a continuing quarterly survey since 1980. The population covered by the survey is the total civilian non-institutional population of the United States as well as a portion of the institutional population in various group quarters. Excluded are military personnel living on military bases and nursing home residents. The unit of data collection is the consumer unit. A consumer unit comprises members of a household who are related or share at least two out of three major expenditures--housing, food, and other living expenses. A person living alone is a single consumer unit. About 5,000 consumer units participated in the Interview portion of the CEX each quarter during the period of this study. Data are collected from consumer units five times over a 13-month period. The first interview, based on a one-month recall, is used to 'bound' the interview or to reduce the likelihood that expenditures will be reported in the next interview. Data reported in the first interview are not released nor are they used in for any estimation. Expenditure data are collected in the second through fifth interviews for the previous three months. For example, a consumer unit that is visited in March reports expenditures for February, January, and December. The sample is a rotating panel in which 20 percent of the sample are interviewed for the first time each quarter while 20 percent are interviewed for the last time. The Interview survey covers about 95 percent of total expenditures (USDL 1995).

Current Population Survey

The Bureau of the Census conducts the Current Population Survey (CPS) for the Bureau of Labor Statistics. Each year the March Supplement or Annual Demographic Supplement is used to collect income data. At various other times during the survey cycle, supplementary questions are asked concerning various topics. The population covered includes the civilian non-institutional population of the United States and members of the Armed Forces in the United States living off post or with their families on post, but excludes all other members of the Armed Forces. The sample is about 60,000 households, including families and unrelated individuals; data are reported for more than 150,000 persons. Coverage does not include residents of US territories or other areas outside the 50 States and the District of Columbia. During the 1993-5 period, three changes were introduced in the CPS: (1) for the 1993 survey, 1990 Census population controls were introduced; (2) for the 1994 survey, interviewing was converted from paper and pencil to Computer Assisted Personal Interviewing (CAPI); and (3) for the 1995 survey, a new sample based on the 1990 Census design was introduced.

Survey of Income and Program Participation

The Survey of Income and Program Participation (SIPP) is a continuing panel survey, begun in 1983, which is sponsored and conducted by the Bureau of the Census. The current design introduces a new sample panel each February. Each sample of households is interviewed every 4 months for 32 months. (Most SIPP panels have eight interviews.) There are monthly rotation groups. The sample covers the US civilian noninstitutionalized population and members of the Armed Forces living off post or with their families on post. Sample size has varied from 12,500 to 23,500 households per panel; the 1996 panel is composed of 36,700 households.   The

reporting unit is the household with unrelated individuals and families also identified.

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The core of this paper reports the results of research and analysis undertaken by BLS and Census Bureau staff. It has undergone a more limited review than official publications. This paper is released to inform interested parties of research and to encourage discussion.

As applied to Garner, the views expressed are those of the author and do not reflect the policies of the Bureau of Labor Statistics (BLS) or the views of other BLS staff members.