

**DEVELOPING POVERTY THRESHOLDS USING EXPENDITURE DATA**

**David Johnson, Stephanie Shipp, and Thesia I. Garner, Bureau of Labor Statistics  
David Johnson, BLS, 2 Massachusetts Avenue, NE, Room 3105, Washington, DC 20212**

Key words: Poverty measurement, Consumer Expenditure Survey

In its 1995 report, *Measuring Poverty: A New Approach*, the National Research Council of the National Academy of Sciences (NAS) Panel on Poverty and Family Assistance suggested developing a poverty measure that is understandable and broadly accepted by the public, statistically defensible and operationally feasible (see Citro and Michael (1995)). The Panel suggested ways to define the reference threshold using data from the Consumer Expenditure (CE) Survey, to update the threshold over time, to account for households with varying compositions, and to adjust for inter-area price differences. The Panel also suggested ways to revise the resource measure; however, we focus on their recommendations pertaining to the poverty thresholds.

A recent study by researchers at the Bureau of Labor Statistics and Bureau of the Census (Garner et al. (1997), referred to as BLS/Census study) replicated the Panel’s work, estimated experimental thresholds using CE data and revised the resource measure. The study found that changes in the Panel’s proposed thresholds and their experimental thresholds (based on various definitions of a minimum expenditure bundle) appear to be similar over the time period covered. The study also found that poverty rates based on these thresholds followed trends over time that are similar to trends in the current official poverty measure. The study also found, however, that the poverty rates based on these alternative thresholds and resource measures were always higher, both over time and across thresholds and subgroups, than were rates based on the official measure.

Since the initial BLS/Census study was conducted, two additional government and non-government groups<sup>1</sup> have identified areas requiring further research. Those areas related to the construction of poverty thresholds are:

- *Setting the initial poverty thresholds.* Should the initial poverty threshold remain unchanged?
- *The treatment of housing.* Should out-of-pocket housing expenditures be used or should such costs be estimated using a flow of services from home ownership, e.g., reported rental equivalence or imputed rent?
- *Updating the thresholds over time.* Should the thresholds be updated based on the change in median expenditures for a basic bundle of goods and services or by a price index?
- *Determining the geographical index.* How should the thresholds be adjusted for differences in prices across geographical areas?
- *Choosing an equivalence scale.* How should the thresholds be adjusted for differences in household sizes and types?

In this paper, we examine each of these five issues, focusing on the data and methodological issues related to the estimation of thresholds using CE data.<sup>2</sup> We find that alternative definitions of the reference threshold do not significantly change the thresholds, with the treatment of homeownership having the largest effect. Thresholds based on imputed rents for owners result in lower thresholds than when the thresholds are based on out-of-pocket shelter costs, while higher thresholds result when shelter costs for owners are defined as reported rental equivalence. We find that updating the threshold using the change in median expenditures (the Panel’s proposed method) rather than the change in the all-items Consumer Price Index (CPI-U) leads to a slightly larger increase in the thresholds between 1982 and 1995, but the change in median expenditures has a higher variance than the change in the CPI-U. We also find that the geographic adjustment recommended by the Panel (a cost-of-living housing index based on a Housing and Urban Development (HUD) approach) yields similar results to those using BLS inter-area price indexes for 11 major expenditure categories. In addition, we find that the equivalence scale recommended by the Panel yields similar thresholds (using a two-adult, two-child reference household) to those resulting if other household types are chosen as the reference unit.

---

<sup>1</sup> These groups are the Office of Management and Budget Steering Group to Improve the Measurement of Income and Poverty and a team of researchers from the Brookings Institution and the Institute for Research on Poverty (see Burtless, Corbett and Primus (1997)).

---

<sup>2</sup> For more details on the analysis presented here, see Johnson, Shipp and Garner (1997).

**Joint Statistical Meetings, Anaheim, CA, Invited Session 6: “Redefining Poverty in the United States,” Anaheim, CA, August 1997. ASA Proceedings.**

To assist in examining the effects of these methodological issues, we use thresholds derived in this study along with cash incomes from the Current Population Survey (CPS) to produce poverty rates for selected population groups in the U.S. in 1995. Replacing the Panel’s cost-of-living housing index with one that accounts for more expenditure items has a minimal effect on the overall poverty rate, yet this replacement changes the poverty rates by region—rising in the Northeast and metropolitan areas and falling in the South and non-metropolitan areas. The percentage of poor children is not as sensitive to the equivalence scale used as are the percentage of elderly, married couples, and unrelated households.

In section I, we review the Panel’s proposed formula for computing the thresholds and defining the reference unit and examine alternative methods for computing the thresholds. Section II examines the treatment of shelter expenditures in the thresholds. Section III deals with the Panel’s recommendation to update the thresholds over time. Section IV compares the geographic adjustment made by the Panel to BLS experimental inter-area price indexes. Section V evaluates the adequacy of the proposed two-parameter equivalence scale used to produce the Panel’s thresholds. Section VI compares the thresholds to CPS income data to show the impact of changing the threshold definition on poverty rates and the distribution of the poverty population.

**I. Determining the level of the threshold**

The NAS Panel recommended that CE Survey data be used to calculate the thresholds for a particular year. Median expenditures for the reference household unit (adjusted to current dollars) are calculated using expenditures for food, clothing, shelter, and utilities (FCSU) for the three-year period previous to the current year. The resulting thresholds are based on a percentage of the median level of expenditures for FCSU and a small multiplier to account for other expenditures. The threshold for the reference unit is adjusted to reflect differences in costs associated with geographic location and household type. The Panel recommended the following formula for deriving the proposed poverty threshold for the reference unit:

$$T = \left[ \frac{(M1 * P1 * median) + (M2 * P2 * median)}{2} \right]$$
$$= \left[ \frac{(1.15 * .78) + (1.25 * .83)}{2} \right] * median$$

(where  $T$  = the reference family poverty threshold,  $M1$ ,  $M2$  = multipliers for a small additional amount,  $P1$ ,  $P2$  = some percentage level,  $median$  = median

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

The Panel recommended that the percentage of median expenditures should lie between 78 percent and 83 percent, corresponding to the 30<sup>th</sup> and 35<sup>th</sup> percentiles of the distribution of FCSU expenditures for a family composed of a married couple and two children. The Panel recommended a lower and upper value for the multiplier of 1.15 and 1.25, respectively. The threshold is computed by taking the average of these upper and lower values for both the percentages and multipliers (as in the above equation), with the result being that the threshold equals 0.96725\*median expenditures for the basic bundle.

The level of the basic threshold, before adjusting for differences in costs and in household composition, depends upon the definition of the basic bundle, the percentage values used to adjust the medians and the multipliers. In this paper, we use the multipliers and percentage values suggested by the Panel, which were also used in the BLS/Census study, to examine different methods for obtaining the median expenditures upon which the thresholds are based. (See Table 1.) The thresholds might change more dramatically if the percentages and multipliers were also calculated using the different methods.

To obtain the median expenditures on FCSU for the reference unit, the Panel pooled the prior three years of data. Because current year data may not be available in time to produce the thresholds, the Panel used data from prior years; however, the Panel did recommend that the most recent three years of data be used when available. For this study, we calculate the thresholds using data from the most recent three-year period. Specifically, the median FCSU for 1995 is calculated for the reference household using data from 1993 to 1995 updated to 1995 dollars with the CPI-U.

While the Panel recommended using a household with two adults (married or unmarried) and two children as the reference household, the Panel’s calculations (and those of the BLS/Census study) were based on the expenditures of a consumer unit<sup>3</sup> composed of a married couple with two children. Column 2 of Table 1 shows the basic threshold using the reference two-adult/two-child household.

---

<sup>3</sup> The terms family, household, and consumer unit are used interchangeably throughout this paper. See USDL1 for definition of consumer unit.

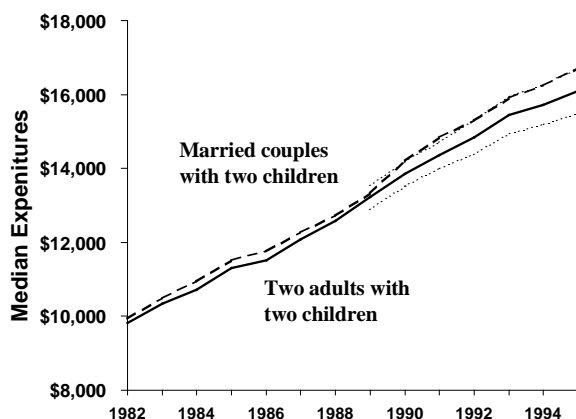
**Joint Statistical Meetings, Anaheim, CA, Invited Session 6: “Redefining Poverty in the United States,” Anaheim, CA, August 1997. ASA Proceedings.**

**Table 1: Official Census thresholds, basic threshold and alternative thresholds for the reference two-adult/two-child household**

Year	(1) Official Census thresholds	(2) Basic Threshold using FCSU	(3) Using FCSU and Only four-quarter Consumer units	(4) Using FCSU Adjusted by component CPI-U
1989	\$12,576	\$12,790	\$13,015	\$12,768
1990	\$13,255	\$13,398	\$13,609	\$13,361
1991	\$13,812	\$13,891	\$14,133	\$13,832
1992	\$14,228	\$14,349	\$14,413	\$14,269
1993	\$14,654	\$14,936	\$14,938	\$14,960
1994	\$15,029	\$15,211	\$15,402	\$15,101
1995	\$15,455	\$15,561	\$15,762	\$15,536
Percent change 1989-95	22.9%	21.7%	21.1%	21.7%

Chart 1 shows that the level of median expenditures for married couples with two children is slightly higher than those for a household with two adults and two children. The error bounds for median expenditures of the reference household show that the median expenditures are not significantly different from each other.<sup>4</sup> In fact, the thresholds for the reference household are not significantly different from the official Census thresholds for a four-person family with two children (see column 1 of Table 1).

**Chart 1: Median Expenditures on FCSU for two alternative reference household types (90% confidence interval shown by dotted lines)**



*Alternative methods*

In constructing the Panel’s poverty thresholds, and those used in the BLS/Census study, each quarter of data was treated independently. The Panel, however,

recommended using only those consumer units who reported a complete year of expenditures.

We consider this recommendation by using two-adult/two-child consumer units who participated in the CE Interview Survey for the full four quarters.<sup>5</sup> The quarterly expenditures for each of the four quarters are aggregated to obtain an annual measure of expenditures for each consumer unit. Since young renters are under-represented in the sample of consumer units who remain in the CE Survey for all interviews, we adjust the weights for consumer units by age of the reference person and housing tenure (homeowner or renter). The thresholds using four-quarter consumer units yield thresholds that are less than 2 percent different from the thresholds obtained by treating each quarter of data independently. (See columns two and three of Table 1.)

Another way to calculate the thresholds is to change the method used to convert the expenditures to current year dollars. For example, to calculate the 1992 thresholds, the Panel used 1989-91 data adjusted to 1992 dollars with the all-items CPI-U. Increases in the all-items CPI-U represent the combined effect of changes in all prices but the prices of the components of FCSU may not rise at the same rate.

To examine whether differences in price changes among commodities affect the threshold calculations, we convert expenditures in each component of the basic bundle (i.e., food, apparel, shelter and utilities) into current dollars by the respective component CPI-U. The median expenditure is calculated using the sum of the component price adjusted expenditures. Our results reveal that the thresholds adjusted by component-specific CPI-U indexes are less than 1 percent lower than the all-items CPI-U adjusted threshold in all years except 1993, when it is slightly higher. (See column

<sup>4</sup> For this paper, medians represent the weighted medians, while the BLS/Census study used the mean of the middle quintile.

<sup>5</sup> Since 1980, these consumer units represent about 75-80 percent of all consumer units interviewed.

## Joint Statistical Meetings, Anaheim, CA, Invited Session 6: “Redefining Poverty in the United States,” Anaheim, CA, August 1997. ASA Proceedings.

four of Table 1.) Table 1 shows that there is not much difference in the change in the threshold levels between 1989 and 1995.

### II. The treatment of shelter expenditures for homeowners

To estimate shelter costs for homeowners, the Panel used the actual out-of-pocket expenditures as reported in the CE Survey.<sup>6</sup> The BLS/Census research team also used out-of-pocket expenditures in their work but tested the use of a rental equivalence value collected in the CE Survey.<sup>7</sup> Another way to estimate shelter costs for homeowners is to use hedonic regression-pricing models that relate observed market prices for housing to the implicit expenditures for specific characteristics of the housing unit. An hedonic model is used in this study to produce imputed rents for homeowners using rents paid by renters. We only produce thresholds for 1995 because we are still in the development stage for the hedonic specification; once the model has been refined, thresholds for the other years will be produced.

Following the procedure used to compute the 1995 thresholds in Table 1, we pool quarterly data from quarter one 1993 through quarter four 1995 for use in the regression estimation. Each quarterly interview is treated independently, resulting in data for 61,169 consumer units during this period. For this study, 21,810 consumer units are classified as renters and 38,293 as owners. The remaining units are either people living in college housing or renters who did not report a positive rental expenditure value.

The housing unit characteristics selected for the sample are in part based on the set of characteristics used by Kokoski, Cardiff and Moulton (1994) in their research on inter-area indexes of the cost of shelter using hedonic quality adjustment. The hedonic regression is modeled using the following equation:

*natural logarithm of rent paid by renters =*  
*f [age of the dwelling, age of the dwelling squared, type of dwelling, age of housing unit, housing type, number of bedrooms, number of bedrooms squared, number of rooms other than bedrooms and baths, whether the consumer unit has more than one complete bathroom, whether the government pays part of the housing costs, whether the unit is public housing, type of heating,*

<sup>6</sup> For homeowners, shelter expenditures include those for mortgage interest, property taxes, maintenance, repairs, and homeowner's insurance. Mortgage principal payments are not included.

<sup>7</sup> Homeowners are asked, "If someone were to rent your home today, how much do you think it would rent for monthly, unfurnished and without utilities?"

*other amenities, geographic sampling areas (PSUs)].*

Imputed rents for owners are estimated using the characteristics of owner housing and the coefficients that are obtained from the estimation of the above equation. The adjusted R-square value is 0.38 for the three-year sample.

Homeowners' shelter costs (imputed rents plus homeowners' expenditures for maintenance, repairs and insurance<sup>8</sup>) based on the imputed rents model are compared to shelter costs based on out-of-pocket expenditures and shelter cost based on rental equivalence. We then compare the thresholds that result from using these three different methods of measuring shelter costs. Using imputed rent in the shelter definition (along with other homeowner costs) yields a threshold of \$15,403 for 1995, which is quite similar to the basic threshold using out-of-pocket shelter costs (\$15,561), yet lower than the threshold using only the rental equivalence value collected in the CE Survey (\$17,011).

In discussing the treatment of homeownership on the resource side, Betson (1995) states that assigning an imputed rental value to homeowners may understate a homeowner's needs if the homeowner has a mortgage and overstate the homeowner's needs if the homeowner does not have a mortgage. Our results, on the threshold side, suggest that this may indeed be the case. A basic question that still needs to be addressed is whether the poverty threshold should allow for ownership of housing or just for a flow of services for comparable housing.

### III. Updating the thresholds

The NAS Panel recommended that the poverty thresholds, once determined, should be updated over time using the change in median expenditures for the basic bundle of goods (composed of FCSU) of the reference households (see Citro and Michael (1995)). According to Primus (1997), this is the most controversial of the Panel's recommendations. The Panel intended to use an adjustment factor that increases more than inflation and that would be a more "relative" updating mechanism. The Panel expected that the median FCSU expenditures by the reference household would increase by more than the inflation rate but by less than the change in per capita Personal Consumption Expenditures (PCE).<sup>9</sup>

<sup>8</sup> Including all homeowner expenditures for these commodities may result in an overstatement of maintenance, repairs and insurance expenditures that are comparable to the expenditures paid by renters.

<sup>9</sup> U.S. Department of Commerce, *Statistical Abstract of the United States, 1996*, Table No. 685.

**Joint Statistical Meetings, Anaheim, CA, Invited Session 6: “Redefining Poverty in the United States,” Anaheim, CA, August 1997. ASA Proceedings.**

Chart 2 compares changes in median FCSU expenditures for the reference two-adult/two-child household, the all item CPI-U<sup>10</sup>, and the PCE. PCE increase faster than median FCSU expenditures, which increase faster than the CPI-U. These results seem to confirm the Panel’s expectations regarding the use of the median FCSU as an updating mechanism. These results, however, may not hold for each year, because the change in the median is volatile. For example, using the inflation rate to adjust the 1990 threshold to 1995 yields a higher threshold than using the Panel’s proposed method.

**Chart 2: Comparison of growth in PCE, CPI-U and median expenditures on FCSU**

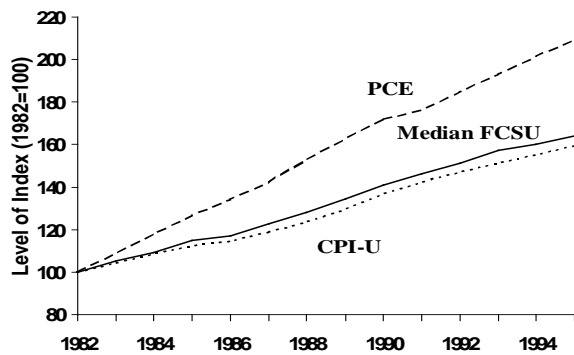
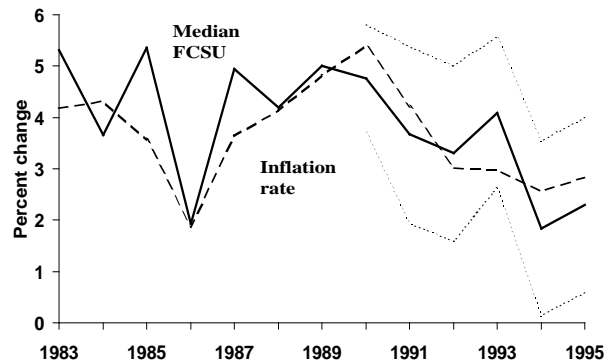


Chart 3 compares the annual changes between the percent changes in the median expenditures on FCSU for the two-adult/two-child reference unit and the inflation rate (using the CPI-U-X1). The changes in FCSU median expenditures track the inflation rate fairly closely; however, there are a few outliers (e.g., 1985, 1993, and 1994). The standard errors are also calculated for the change in the median expenditures for each year beginning with 1990 and ending with 1995.<sup>11</sup>

After the Panel published their report, concern was raised that the Panel’s proposed updating method would be highly volatile and would have a large variance, especially when compared to the variance of the change in the CPI-U. As Chart 3 shows, the standard errors for the changes in the median are fairly large (e.g., 2.3 percent in 1995) compared to the standard error for inflation (0.15 percent). The 90 percent confidence

interval for the change in the median expenditures for 1995 is from 0.6 to 4.0 percent.

**Chart 3: Percent changes in median FCSU and inflation rate (90% confidence interval shown by dotted lines)**



To reduce the variance in the rates of change, the rates of change for various household types can be calculated and the average of these rates used. Another way to reduce the variance would be to calculate the change in the median equivalent expenditures (i.e., household expenditures adjusted by an equivalence scale). Assuming that the changes for the different household types are not correlated, we find that the standard error falls by almost 50 percent for both alternative methods. These standard errors, however, are still larger than the standard errors of the inflation rate.

**IV. Geographic indexes: Adjusting for inter-area price differences**

The Panel noted that it is widely agreed that it is desirable to adjust poverty thresholds for differences in prices across geographic area, but that there are no generally accepted inter-area cost-of-living indexes that correspond to the CPI. Various approaches have been proposed to estimate inter-area price differences.

The Panel developed an inter-area price index for shelter using a modified version of a method developed by HUD for administering rental housing subsidies. Using a combination of data from the American Housing Survey, the 1990 decennial census, and a random-digit dialing survey, HUD developed a set of fair market rents that vary by geographic location. The Panel used a modified approach (using only the decennial census) and computed index values for each of the 341 metropolitan areas (setting the U.S. average equal to 1.0). The index values were based on the cost

<sup>10</sup> U.S. Bureau of Labor Statistics, *CPI Detailed Report*, January 1996. We also use the CPI-U-X1 for 1982. The new CPI-U definition, based on rental equivalency, was introduced in 1983.

<sup>11</sup> These errors are produced using the replicate weights found in the CE Survey data file and half-samples for each of the three-year periods in our study. See interview microdata documentation (USD2) for an explanation of how to use the replicate weights to produce variances.

**Joint Statistical Meetings, Anaheim, CA, Invited Session 6: “Redefining Poverty in the United States,” Anaheim, CA, August 1997. ASA Proceedings.**

of rent<sup>12</sup> at the 45<sup>th</sup> percentile of the distribution for each area. The data were then grouped into six population size categories within each of the nine census regions. The non-metropolitan and small metropolitan areas were aggregated by region, and new index values recomputed, which produced a final set of 41 index values.

The index values were further adjusted for the estimated fraction of the poverty budget accounted for by housing (including utilities), which was set at 44 percent. This effectively created a fixed-weighted inter-area price index with two components, housing and all other goods and services; the price of other goods and services was assumed not to vary.

For this paper, adjustments in expenditures for inter-area price differences are based on research performed at BLS by Kokoski, Cardiff, and Moulton (1994).<sup>13</sup> These researchers used an hedonic methodology and monthly CPI-U price data for July 1988 through June 1989 to produce experimental inter-area price indexes; indexes were computed for the 44 CPI publication geographic areas. These experimental inter-area price indexes were created at the lowest commodity level for which CPI price data are available and then were aggregated to form index factors for 11 major expenditure categories. This was accomplished by weighting lower level indexes using expenditure shares from CE Survey data. The resulting 11 expenditure categories comprise about 85 percent of total consumer spending.

Following Weber (1997), a residual category vector is calculated for the remaining 15 percent of expenditures by taking the average of the 11 existing factors for each area. The indexes were then updated to 1995 using the ratios between the 1995 and 1989 component-specific CPI-U for each of the 44 geographic areas. Inter-area price indexes for each area are obtained by taking the weighted average of the 12 commodity-specific indexes using the area-specific expenditure shares as weights.

To obtain the price indexes for each of the 41 region/size areas used in the Panel’s report, we use the 12 region/size averages from the procedure in Kokoski et al. (1994) for each of the three smaller areas in each of the nine census regions. For example, the indexes for the small, medium and large size metro areas in the Western region are used for areas with fewer than

250,000 persons, 250,000-500,000 persons and 500,000-1,000,000 persons, respectively, in both the Mountain and Pacific divisions. Indexes for the larger areas (with 1,000,000-2,500,000 persons and over 2,500,000 persons) are obtained by taking the weighted average of the metropolitan areas located in each region that are represented in the inter-area indices.

To compare the method used by the Panel and the one used in this study, both sets of indexes are normalized so that the weighted average (using the population distribution for the 41 region/size areas as weights) is 1.000. Although the BLS inter-area price indexes include more expenditure categories than the Panel’s Housing index, both methods produce similar indexes and the correlation coefficient is 0.78.

**Table 2: Comparison of 1995 thresholds for two-adult/two-child household using the BLS and Panel geographic adjustments**

Geographic area	Thresholds	
	BLS	Panel
National average, Reference threshold	\$15,561	\$15,561
Greater Los Angeles	18,984	18,782
San Diego	17,973	18,782
Mid Atlantic Medium size metro area	16,355	15,748
New England Medium size metro area	16,355	17,724
East South Central Non-metro area	12,791	12,776
West South Central Non-metro area	12,791	13,242

Table 2 illustrates the main differences between the BLS inter-area approach and the Panel’s housing index approach. Because the BLS approach is based on the CPI publication geographic areas, some larger metropolitan areas within the same region (e.g., Greater Los Angeles and San Diego) have different thresholds, while the housing index assigns the same threshold. In addition, because there are only four regions in the BLS approach, different regions of similar size (e.g., medium sized cities in the Mid-Atlantic and New England regions) obtain similar thresholds, while obtaining different thresholds under the Panel’s approach. Finally, both adjustments cause the thresholds in non-metropolitan areas to be less than the national average.

**V. The two-parameter equivalence scale**

An equivalence scale is used to adjust the thresholds for differences in household size and composition. The Panel reported that standard methods for using expenditure data to estimate various types of

<sup>12</sup> These are rents for two-bedroom apartments that had complete plumbing facilities, kitchen facilities, and electricity and into which the occupant had moved within the last five years.

<sup>13</sup> The BLS inter-area price research is still in progress and the current indexes are of experimental status. They do not reflect official BLS published data.

**Joint Statistical Meetings, Anaheim, CA, Invited Session 6: “Redefining Poverty in the United States,” Anaheim, CA, August 1997. ASA Proceedings.**

equivalence scales yield many different scales depending on the assumptions made about the measure of well-being, the estimation method, the types of households and data used in the analysis.

The Panel and others have suggested that some issues remain, which must be addressed in determining “reasonable” equivalence scales. These issues include the smoothness of the scales, differences in the cost of children, differences between one and two adult households, and differences between single parent and two-parent households.

The Panel recommended that the thresholds for household types other than the reference type be determined using an equivalence scale that would adjust for the number of adults and children in the household. This two-parameter scale is given by  $(A + PK)^F$ , where  $A$  represents the number of adults and  $K$  represents the number of children. The Panel recommended that the scale economy factor,  $F$ , be set at either 0.65 or 0.75 and that the parameter  $P$  be set at 0.7.

To examine whether household-type specific thresholds would be different from those recommended by the Panel, we consider the expenditures on FCSU for various household types and calculate the median for each household type and their respective threshold using the 0.96725 factor. This would then provide a benchmark of using a different reference household to compute the thresholds.

Table 3 shows that the 1995 thresholds for the two-adult/two-child household is \$15,561 in 1995 dollars, while it is \$7,237 for single adults. Dividing the median value for singles by the median value for a two-adult/two-child household produces a ratio of 0.47. Similarly, the ratio for two adults without children is 0.71 and the ratio for one adult with one child is 0.63.

The two-parameter scale with parameters of  $F=0.65$  and  $P=0.7$  implies that the scales for a single person, two adults and one adult/one child are 0.45, 0.71 and 0.64, respectively (see the last column of Table 3). For several of the household types, this two-parameter scale is a rough approximation of the ratios between the medians. The similarity, however, does not hold for larger households, e.g., couples with three children or single parents with two children.

To further examine this similarity, we find the parameters that minimize the squared differences between the two-parameter scales and the implied scales using five household types: singles, two adults, two adults with one child, two adults with two children, and one adult with one child.<sup>14</sup> Using the natural logarithms of the scales and weighting the data by the percent of

households in each household type yields an estimate of  $F=0.61$  and  $P=0.72$ .

**Table 3: 1995 Thresholds using alternative households as the reference household (and the ratio of these thresholds to the two-adult/two-child household)**

	Threshold	Ratio	$F=.65;$ $P=.7$
Single adults	\$7,237	0.465	0.451
Two adults	\$11,012	0.708	0.707
Two adults, one child	\$13,321	0.856	0.861
<b>Two adults, two children</b>	<b>\$15,561</b>	<b>1.000</b>	<b>1.000</b>
Two adults, three or more children	\$16,065	1.032	1.129
One adult, one child	\$9,732	0.625	0.637
One adult, two or more children	\$10,182	0.654	0.797

**VI. Impact of the proposed thresholds on poverty rates and the composition of the poor**

Once a threshold is chosen, we need to examine the impact on both poverty rates and the composition of the poor population. Although the Panel recommended many changes to the resource side of poverty measurement, we use the current resource measure (before-tax cash income) to compare the effects of the different thresholds.<sup>15</sup> This differs from the BLS/Census study, which examined poverty rates using both experimental thresholds and an alternative resource measure.

Table 4 summarizes the results of how changing various equivalence scale parameters and adjusting the 1995 reference thresholds (\$15,561) for inter-area price differences affects the poverty rate. The use of either the BLS experimental inter-area index or the Panel’s housing index yields a lower poverty rate than when no geographic adjustment is made. The use of either of the two recommended economies of scale factors ( $F$ ) also lowers the poverty rates. The poverty rate is lowest when  $F = 0.75$  and the BLS geographic index is used. This result, that the Panel’s equivalence scale lowers the poverty rate, is also shown in the Panel’s report and in Betson (1996).

Table 4 also shows that increasing the threshold leads to higher poverty rates. The effect of changing the threshold definition, whether by changing the

<sup>14</sup> These five household types account for 77.9% of consumer units and 61.5% of the population of persons.

<sup>15</sup> We used person-weighted data from the 1996 CPS March Supplement for families and unrelated individuals. In order to make the geographic indices comparable, the indices were adjusted so that the weighted mean over the sample was equal to 1.0.

**Joint Statistical Meetings, Anaheim, CA, Invited Session 6: “Redefining Poverty in the United States,” Anaheim, CA, August 1997. ASA Proceedings.**

measurement of shelter costs (e.g., using imputed rent or rental equivalence) or by changing the adjustments for different household types and sizes, is to increase or decrease the poverty rate. For example, each change in the threshold of one percentage point (e.g., \$156 for the reference household) causes the poverty rate to increase by 0.18 percentage points (e.g., from 13.4 percent to 13.58 percent).

**Table 4: 1995 Poverty rates for all persons using different thresholds, geographic adjustments and equivalence scales**<sup>16</sup>

Threshold	Equivalence scale	Inter-area factor	Poverty rate
<b>Official</b>			
\$15,455	Census	None	13.8
15,455	Census	Panel	13.7
15,455	Census	BLS	13.7
<b>Basic FCSU</b>			
15,561	$P=.7; F=.65$	None	13.7
15,561	$P=.7; F=.65$	Panel	13.5
15,561	$P=.7; F=.65$	BLS	13.4
15,561	$P=.7; F=.75$	None	13.0
15,561	$P=.7; F=.75$	Panel	12.9
15,561	$P=.7; F=.75$	BLS	12.8
<b>Imputed rent</b>			
15,403	$P=.7; F=.65$	BLS	13.3
<b>Rental equivalence</b>			
17,011	$P=.7; F=.65$	BLS	15.2

To examine the effect of the geographic adjustments, we calculate poverty rates for four geographic regions and for metropolitan and non-metropolitan areas. (See table 5.) Table 5 shows that both geographic inter-area price adjustment methods lower the poverty rate in the non-metropolitan areas while raising the poverty rate in the metropolitan areas.

The BLS inter-area adjustment has a larger effect than the Panel’s housing index in the Northeast, mainly because of the large indexes in the Mid-Atlantic division. The Panel report shows that the geographic price adjustment increases poverty in the Northeast and West. While these indexes do not affect the overall poverty rates, they could have a large impact on state and local area poverty rate estimates.

<sup>16</sup> While the confidence interval for the thresholds would imply larger changes in the poverty rates, the confidence interval for the CPS poverty rate is about 0.3%

**Table 5: 1995 Poverty rates by region and metropolitan area, using no geographic adjustment, the Panel and BLS inter-area adjustment**<sup>17</sup>

Region or Area	Geographic adjustment		
	None	Panel	BLS
Northeast	12.5	13.8	15.0
Midwest	10.8	9.9	9.9
South	15.9	14.2	13.4
West	14.6	15.8	15.8
Metropolitan area	13.3	13.9	13.9
Non-metro area	15.3	12.2	11.7

Next, we consider various parameterizations of the two-parameter scale and examine the effects on the poverty rates. Similar to Johnson (1996), we find that using almost any parameter,  $P$ , reflecting a child’s needs to be less than an adult’s to adjust the poverty threshold, lowers the poverty rate for children. In addition, we find that increasing the elasticity ( $F$ ) causes the poverty rate for all persons to fall. Johnson (1996) shows that this is mainly due to the relative decrease in the threshold for one and two-adult families, which falls as the elasticity parameter increases.

Finally, we examine the effect of the choice of equivalence scales on the composition of the poor. (See Table 6.) We use the scales implicit in the poverty thresholds, two parameterizations of the two-parameter scale and scales recommended by Ruggles (1990) and Betson (1996). Betson’s scale allows for the first child in a single-adult household to increase the scale more than the first child in a two-adult household. Betson’s scale also restricts the scale for the two-adult household to be 41 percent more than the scale for the single adult household.<sup>18</sup>

<sup>17</sup> Using the two-parameter equivalence scale, with  $P=0.7$  and  $F=0.65$ .

<sup>18</sup> Betson’s scale is given by  $1.41$  for two-adult households,  $(A + c + P*(K-I))^F$  for single parent households ( $c$  is the parameter for the first child in a single-parent household) and  $(A + PK)^F$  for other households, where  $P=.5$ ,  $F=.7$  and  $c=.8$ .



**Joint Statistical Meetings, Anaheim, CA, Invited Session 6: “Redefining Poverty in the United States,” Anaheim, CA, August 1997. ASA Proceedings.**

**Table 6: Composition of the poor for certain demographic groups by equivalence scale using BLS inter-area price adjustment**

Demographic group	Percent of the Population	Percent of the poor population represented				
		Implicit in Official Threshold	Panel-1 <i>F</i> =.65; <i>P</i> =.7	Panel-2 <i>F</i> =.75; <i>P</i> =.7	Ruggles <i>F</i> =.5; <i>P</i> =1	Betson Scale
Children	26.7	39.8	39.0	41.2	38.5	39.0
Elderly	12.0	8.9	9.7	7.7	10.7	9.4
People in female headed household	15.4	40.1	40.5	41.5	40.3	40.5
People in married couple household	66.3	34.0	35.4	37.4	32.9	34.6
Unrelated individuals	15.0	22.6	20.5	17.3	23.1	21.0
Blacks	11.0	22.8	22.9	23.8	22.4	23.1
Northeast	19.5	21.5	21.8	21.9	21.8	21.8
Midwest	23.4	17.3	17.3	16.9	17.5	17.3
South	34.9	34.9	34.9	34.9	34.8	34.9
West	22.2	26.2	26.1	26.3	25.8	26.1
Non-metropolitan area	22.5	19.6	19.6	19.4	19.8	19.3

Using the BLS inter-area price indexes and the \$15,561 threshold for the reference household, Table 6 compares the composition of poor persons among demographic groups when the equivalence scale changes. For example, the percent of poor who are children varies slightly (but stays at about 40 percent) depending on the equivalence scale. The same is true for the proportion of persons in female-headed households. The percent of the poor who are elderly varies with a change in the equivalence scale used. The elderly-share of the poor increases (relative to the proportion using the Census thresholds) for each of the alternative equivalence scale specifications except for Panel-2,  $(A + 0.7K)^{0.75}$ , for which the elderly-share or the poor falls. The Panel-2 scale also causes the percent of the poor living in married-couple households and the black-share of the poor to increase. The choice of the scale has little impact on the distribution by region.

**VII. Conclusions**

In this paper, we addressed many of the recommendations of the National Academy of Sciences (NAS) Panel on Poverty and Family Assistance in an attempt to develop an improved poverty measure. Selecting the initial threshold, i.e., choosing among specific data related methods, is an empirical question. If variations in the methods yield only small differences, then the simpler method should be used. Although it is appealing conceptually to use consumer units who participate in the CE survey for four quarters and to use CPI-component indexes, the resulting alternative definitions of a median bundle produce similar thresholds and are therefore not necessary.

We found that thresholds that used out-of-pocket expenditures for shelter in defining the FCSU bundle lie between the estimates that use a flow of service

approach to measure homeowners’ shelter expenditures. The treatment of homeowner shelter costs requires more research, especially if the flow of housing services for homeowners is to be included in the resource measure.

We also found that the adjustments for geographic differences in prices and household size affect the composition of the poor and not the overall poverty rate. The geographic adjustment using the BLS indexes produces results similar to the Panel’s geographic adjustment that relies only on housing. In addition, the ratio of median expenditures on the basic bundle for some of the household types was found to be similar to the Panel’s recommendation for the equivalence scale (using  $F=0.65$ ). Although these two scales are similar, small changes in the parameters in the two-parameter scale affect the poverty rates of singles and the elderly.

Finally, updating the threshold by using the change in the median basic bundle produces a relative threshold and one that is more volatile than using the inflation rate. Over the 1990-95 period, using changes in the median expenditures for the reference household leads to smaller changes in the thresholds than when the inflation rates are used (although historically adjusting by the inflation rate would have caused a larger change). Perhaps the least controversial way to update the threshold would be to update the threshold definition every five or ten years with the change in the median value and to update the threshold level with the inflation rate in the intervening years.

**References**

Betson, David (1995a) “The Effect of Homeownership on Poverty Measurement,” Office of Assistant Secretary

of Planning and Evaluation, Department of Health and Human Services manuscript.

Betson, David (1995b), "Poor Old Folks: Have Out Methods of Poverty Measurement Blinded us to who is Poor?" Office of Assistant Secretary of Planning and Evaluation, Department of Health and Human Services manuscript.

Betson, David (1996) "Is Everything Relative? The Role of Equivalence Scales in Poverty Measurement," University of Notre Dame, March 1996.

Burtless, Gary, Tom Corbett, and Wendell Primus, "Improving the Measurement of American Poverty," paper prepared for the Alternative Poverty Measure Strategy Meeting, Brookings Institution, Washington, D.C., April 1997.

Citro, Connie F. and Robert T. Michael (eds.), *Measuring Poverty: A New Approach*, Washington, D. C.: National Academy Press, 1995.

Garner, Thesia I., Geoffrey Paulin, Stephanie Shipp, Kathleen Short, and Charles Nelson, "Experimental Poverty Measurement for the 1990s," *Monthly Labor Review*, forthcoming 1997.

Gillingham, R.F., "Place to Place Rent Comparisons," *Annals of Economics and Social Measurement* 4, 153-173, 1975.

Johnson, David, "The Two-Parameter Equivalence Scale and Inequality Between and Within Households," paper presented at the 1996 General Conference of the International Association for Research in Income and Wealth, August 1996.

Johnson, David S., Stephanie Shipp and Thesia I. Garner, "Developing Poverty Thresholds Using Expenditure Data," BLS manuscript 1997.

Kokoski, Mary F., Patrick Cardiff, and Brent Moulton, *Interarea Price Indices for Consumer Goods and Services: An Hedonic Approach Using CPI Data*, BLS Working Paper 256, July, BLS Working Papers, Office of Prices and Living Conditions, U.S. Department of Labor, Washington, D. C., 1994.

Moulton, Brent, "Interarea Indexes of the Cost of Shelter Using Hedonic Quality Adjustment Techniques," *Journal of Econometrics*, 68, 181-204, 1995.

Primus, Wendell, "Implementing a New Measure of Poverty: State of Current Research and Analytical Work," paper prepared for the Alternative Poverty Measure Strategy Meeting, Brookings Institution, Washington, D.C., April 1997.

Ruggles, Patricia, *Drawing the Line: Alternative Poverty Measures and Their Implications for Public Policy*, Washington, DC, Urban Institute, 1990.

Weinberg, Daniel, H., "Changing the Way the United States Measures Income and Poverty," paper prepared for the first meeting of the United Nations Expert Group on Household Income Statistics. Canberra, Australia, December 2-4, 1996.

U.S. Department of Commerce, *Statistical Abstract of the United States, 1996*.

U.S. Department of Labor (USDL1), Bureau of Labor Statistics, *Consumer Expenditure Survey, 1992-93*, Bulletin 2462, September 1995.

U.S. Department of Labor (USDL2), Bureau of Labor Statistics, Consumer Expenditure Survey Internal tapes and Interview documentation, 1996.

Weber, Wolf, "A Regional Analysis of Consumer Expenditures: Do Unemployment Rates Affect Spending?" paper presented at the Eastern Economic Association meetings, April 1997.