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Experimental Poverty Thresholds for the United States 1990 to 1998

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[1] This paper reports the results of research and analysis undertaken by 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. Thanks to Thesia Garner and Charles Nelson for their useful comments and discussion.

I. Introduction[2]

Economic and social conditions have changed in the U.S. in fundamental ways in the last thirty years—there are more working mothers, health care costs are much greater, there are wider variations in commodity types, and expectations about what it takes to meet one's needs are higher. Certainly, patterns of consumption have changed. In addition, geographic variations in housing and the increasing importance of government programs have affected families' appraisals of the value of their disposable incomes. Fisher[3] refers to such developments as changes in social processes. As he notes, with technological advances new consumption items are introduced. With the introduction of new items and their general acceptance and use, notions about "necessities" change. Furthermore, changes in tax and transfer policies over time have important effects on the consumption patterns of families and individuals. With these and related changes come questions concerning whether the measures and data which are used to produce various economic statistics are still meaningful. Among these is the official measure of poverty.

Beginning in 1992 an important comprehensive examination of poverty measurement in the United States was conducted by the National Research Council (NRC) of the National Academy of Sciences (NAS) Panel on Poverty and Family Assistance. This Panel of scholars published their findings in a report titled *Measuring Poverty: A New Approach.*[4] Included in the report are recommendations for a new poverty measure, along with examples of how to implement the recommendations. The NAS Panel recommended that a new poverty measure should, "… reflect more nearly the circumstances of the nation's families and changes in them over time."[5] The Panel stated

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[2] Much of the general description of thresholds in this section of this paper draw from an earlier paper, Garner, Thesia I., Stephanie Shipp, Geoffrey Paulin, Kathleen Short, and Charles Nelson, "Poverty Measurement in the 1990s", *Monthly Labor Review*, March 1998, pp. 39-61.

[3] Gordon Fisher, "Relative or Absolute-A New Light on the Behavior of Poverty Lines Over Time," Newsletter ***of the Government Statistics Section and the Social Statistics Section of the American Statistical Association***, Summer 1996, pp. 10-12.

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

[5] Citro and Michael, 1995, p.4.

that a minimally adequate standard of living would include a basic needs commodity bundle, plus a small additional amount to allow for other needs (e.g., household supplies, personal care, and non-work-related transportation.) The NAS Panel defined the basic needs bundle to include food, clothing, shelter, and utilities. Family economic resources should be defined as the sum of money income from all sources and near money benefits from government transfer programs (e.g., food stamps, subsidized housing) that can be used to buy the commodities in the full needs bundle, less expenses that cannot be used to buy these commodities. These deductions would include income and payroll taxes, child care and other work-related expenses, child support to another household, and out-of-pocket medical care costs. [6] If a family cannot meet its needs for these basic commodities with its available family economic resources, then the family would be considered poor. In their work then, poverty is defined as economic deprivation.

II. Background

In order to produce poverty statistics, a poverty concept must be selected and resources defined. The most often used concepts for poverty measurement are identified as absolute, relative, and subjective.[7] An absolute measure reflects some standard below which, it is believed; basic needs cannot be met. Absolute measures often require a large number of judgments about an approved set of expenditures for the poor. The current U.S. official poverty threshold is assumed to reflect some absolute minimum. A relative poverty concept is based on the relative position of households or individuals within a

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[6] Citro and Michael, 1995, pp. 4-5.

[7] For more information concerning these measures see: Citro and Michael 1995; Aldi J.M. Hagenaars, ***Perception of Poverty***, Amsterdam: North Holland, 1986; and Patricia Ruggles, ***Drawing the Line: Alternative Poverty Measures and Their Implications for Public Policy***. Washington, D. C.: The Urban Institute Press, 1990. Examples of studies focusing on relative and subjective measures include: Thesia I. Garner and Klaas de Vos, "Income sufficiency v. poverty: Results from the United States and the Netherlands," ***Journal of Population Economics***, vol. 8, pp. 117-134, 1995; R. Morisette and Susan Poulin, ***Income Satisfaction Supplement. Summary of Four Survey Years***. Labour and Household Surveys Analysis Division Staff Report, Ottawa, Canada: Statistics Canada, 1991; and Van den Bosch, Karel, Tim Callan, J. Estivill, P. Hausman, B. Jeandidier, R. Muffels, and J. Yfantopoulos, "A Comparison of Poverty in Seven European Countries and Regions, Using Subjective and Relative Measures," ***Journal of Population Economics***, vol. 6, pp. 235-259.

distribution (e.g., of income or expenditures) as a crucial determination of poverty status. Such a measure explicitly sets the poverty threshold based on judgment. Subjective measures are based upon the notion that the opinions of people about their own situations (e.g., with respect to the income level minimally necessary to make ends meet) should ultimately be the decisive factor in defining poverty.[8]

A. History of U.S. Poverty Measurement

The poverty thresholds, originally developed in 1963-64, were based on an explicit concept of need. Mollie Orshansky, who worked at the Social Security Administration, derived what became known as the official poverty thresholds from the Economy Food Plan (developed in 1961 by the U.S. Department of Agriculture), and data from the 1955 U.S. Department of Agriculture Household Food Consumption Survey. The Plan was adapted to the food patterns of lower income families, and was developed to provide a nutritionally balanced diet. However, as noted by Fisher, the Economy Food Plan was to be for "temporary or emergency use when funds are low."[9] The dollar costs of the food plan were produced for families of different sizes and compositions. Minimum total living costs were computed by multiplying the dollar value of the minimum food plan by three since the average family of three or more persons spent about one-third of their average money income after taxes on food. This multiplier was based on the relationship between food expenditures and total after tax money income of the total population using data from the 1955 Household Food Consumption Survey. The thresholds for other size families were derived in a slightly different way.[10]

The Panel suggested that one of the reasons the Orshansky-based thresholds were adopted is because of their relationship to other related measures at the time: the original

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[8] These descriptions drawn from a broader discussion in Garner, Thesia I. and Klaas de Vos, "Income Sufficiency v. Poverty: Results from the United States and the Netherlands," *Journal of Population Economics*, vol. 8, pp. 117-134, 1995.
[9] Fisher, Gordon M., "The Development and History of the Poverty Thresholds," ***Social Security Bulletin***, Vol. 55, No. 4, Winter 1992.
[10] See Fisher 1992, and Citro and Michael 1995, p. 109.

1963 threshold for a two-adult/two-child family was very close to one-half the median after-tax four-person family income and to a subjective four-person family threshold derived from Gallup Poll data.

As noted above, the current U.S. poverty threshold is generally considered to be an absolute threshold (although not originally developed as such) and is based on the cost of a minimum food diet along with a multiplier for other expenses. Since the 1960s, when the U.S. officially began to produce poverty statistics, the same basic poverty concept has been used. However a few changes have been introduced over time. Until 1969, the original thresholds were updated annually based on changes in prices of only the items in the economy food plan. In 1969, a federal interagency committee changed that procedure. Since that time annual updates are made using the all-time CPI-U. Further, originally there were separate thresholds for families headed by women and men, and for families living in farm and nonfarm areas. The male-female and farm-nonfarm distinctions were dropped in 1981 and, at the same time, the matrix of thresholds was extended to nine persons or more rather than seven or more.[11]

The definition of poverty currently used in the U.S. is based on the price-updated thresholds in comparison to gross (pre-tax) annual money income. A family is identified as poor if its family's total annual gross money income is below its annual poverty threshold. The official definition of income for poverty measurement has not changed over time, however researchers at the Census Bureau have been experimenting with alternative measures of income for several years.[12] Such alternative income definitions have accounted for noncash benefits and the deduction of income taxes.

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[11] Fisher, Gordon, 1992, p.10.

[12] U.S. Bureau of the Census, ***Estimates of Poverty Including the Value of Noncash Benefits: 1984.*** Technical Paper 55, Washington, D. C.: U.S. Government Printing Office, 1985; U.S. Bureau of the Census, ***Measuring the Effect of Benefits and Taxes on Income and Poverty: 1992***. Current Population Reports, Series P-60, No. 186RD. Washington, D. C.: U. S. Government Printing Office, 1988; U.S. Bureau of the Census, ***Poverty in the United States 1998***. Washington, D. C.: U. S. Government Printing Office; 1999; Citro and Michael 1995; Ruggles 1990.

In addition to forming the basis of statistical poverty measurement, the Department of Health and Human Services uses the official poverty thresholds to produce annual poverty guidelines. These guidelines are obtained by smoothing the official thresholds for different size families. The poverty guidelines are often used to determine the eligibility of families to participate in government programs that are designed to help families whose resources fall below some standard of need.[13]

B. More Recent Examinations of Poverty Measurement in the U.S.

In ***Drawing the Line: Alternative Poverty Measures and Their Implications for Public Policy***, Patricia Ruggles focused mainly on alternative concepts of poverty and methods for measuring poverty; she also proposed methods to update and revise the poverty threshold and resource definitions.[14] The Joint Economic Committee held congressional hearings in the early 1990's[15] in response to Ruggles' book and her activities on the Committee staff. As a result of those hearings, the National Research Council (NRC) of the National Academy of Sciences (NAS) Panel on Poverty and Family Assistance, chaired by Robert T. Michael, was given the responsibility to conduct the review. In 1995, the Panel issued ***Measuring Poverty: A New Approach.*** [16]

The NAS Panel recommended, as did Ruggles, revising the current poverty measure to more accurately reflect trends in poverty over time and differences in poverty among different demographic groups. The new measure would retain the current notion of poverty as reflecting material deprivation; however, a revised set of thresholds and a revised definition of resources would be used to identify the poor. The NAS Panel intended that the revised thresholds and resource definitions would reflect social and economic changes. This is in contrast to the method currently followed for updating the

[13] Fisher, Gordon, "Poverty Guidelines for 1992," ***Social Security Bulletin***, vol. 55, no.1, Spring 1992.
[14] Ruggles, 1990.
[15] See ***The War on Poverty, Hearings Before the Joint Economic Committee, Congress of the United States, 102nd Congress, First Session, July 25, September 25, and November 19, 1991, S. HRG. 102-631***. Washington, D. C.: U.S. Government Printing Office, 1992.
[16] See Citro and Michael 1995.

official poverty thresholds that only allow for changes in prices, as noted earlier, not for changes in consumption patterns over time. With their report, the NAS Panel's aim was to propose a *procedure* to follow. Rather than recommending an absolute, relative, or subjective measure, the Panel proposed a *hybrid* poverty measure which includes aspects of both the absolute (budget based) and relative concepts.[17] Details concerning the hybrid approach and the new resource measure are presented below.

In general, the NAS Panel proposed eight broad sets of recommendations about:[18] (1) adopting a new poverty measure; (2) setting and updating the poverty threshold; (3) adjusting the threshold; (4) defining family resources; (5) identifying needed data; (6) highlighting other issues related to poverty measurement; (7) relating poverty measurement to assistance programs; and (8) linking states' needs to the Panel's proposed measure. The basic criteria for developing the poverty measure are that it should be:

- understandable and broadly acceptable to the public;
- statistically defensible (e.g., internally consistent); and
- operationally feasible.[19]

Since the NAS Panel's report was published, other studies have also examined these issues.[20] Working groups have met to share information about current work related to poverty measurement.[21]

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[17] One measure that Statistics Canada uses to determine the low income status of families, similar to family poverty, is the set of "low-income cut-offs" (LICOs). The LICOs are based on a hybrid approach in the sense that a specific set of commodities is assumed as necessary but the proportion and implicit allowance for other spending are determined in a relative manner (see Citro and Michael 1995, pp. 127-128).

[18] The entire report can be found on the Census Bureau Web site: hhttp://www.census.gov/hhes/www/povmeas.html

[19] Citro and Michael, 1995, p. xvii.

[20] For example see the following references. (1) U.S. General Accounting Office: (a) Controlled correspondence, GAO/GGD-96-183R (Washington DC: 1996); and (b) *Poverty Measurement: Issues in Revising and Updating the Official Definition*, GAO/HEHS-97-38, April 1997. (2) Brookings Institution and Institute for Research on Poverty: (a) "Summary of Meeting on Alternative Poverty Measure Strategy," Brookings Institution, April 8, 1997; (b) "Improving the Measurement of American Poverty," unpublished manuscript prepared by Gary Burtless, Tom Corbett, and Wendell Primus, April 8, 1997; and (c) "Implementing a New Measure of Poverty: State of Current Research and Analytical Work," unpublished manuscript by Wendell Primus, February 13, 1997.

III. NAS Panel Procedures and Findings

A. Defining the Thresholds

With reference to the poverty thresholds, the Panel stated generally that: [22]

- The poverty thresholds should represent a budget for food, clothing, shelter (including utilities), and a small additional amount to allow for other needs (e.g., household supplies, personal care, and non-work-related transportation).

- A threshold for a reference family type should be developed using actual consumer expenditure survey data and updated annually to reflect changes in expenditures in food, clothing, and shelter over the previous 3 years.

- The reference family threshold should be adjusted to reflect the needs of different family types and to reflect geographic differences in housing costs.

Weighted expenditure data from the 1989-91 Consumer Expenditure (CE) Interview Survey were used to produce the poverty thresholds presented in the Panel's report.[23] Expenditures for a basic bundle of commodities composed of food, clothing, shelter, and utilities[24] were obtained from the CE data for a reference family type. The reference family was defined as including two adults and two children.[25] Their criteria was for a reference family to "fall near the center of the family size distribution rather

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[21] Memorandum from Katherine Wallman (Office of Management and Budget), "Initial Meeting of Steering Group to Improve the Measurement of Income and Poverty," March 26, 1997; and Burtless, Gary, Tom Corbett, and Wendell Primus, "Improving the Measurement of American Poverty," paper prepared for the Alternative Poverty Measure Strategy Meeting, April 8, 1997, Brookings Institution, Washington, DC.

[22] Citro and Michael, 1995, pp. 4-5.

[23] There is also a diary portion to the CE. The diary and the interview samples are entirely independent so that expenditures from the two cannot be combined.

[24] The basic bundle is composed of food, apparel, shelter, and utilities, which are defined as follows:
Food includes food purchased for home use and away, and excludes alcohol and tobacco and other non-food items purchased at grocery stores.
Clothing includes expenditures for all types of clothing including uniforms and sewing materials.
Shelter includes rent, and for homeowners, mortgage interest (shelter does not include principal payment) taxes, maintenance and repairs.
Utilities include fuels, such as natural gas and electricity, telephone and public services, such as water and sewer.

[25] For the Panel's report, the reference family was specifically defined as including a married couple with two of their own children.

than at one of the extremes…also, it is preferable for the reference family to be one that accounts for a relatively large proportion of the population because its spending patterns observed in a sample survey will be the basis for the poverty threshold…"[26] The two-adult/two-child family met these criteria. Multipliers were applied to the basic bundle to add a small additional amount to allow for other needs, such as housekeeping supplies, personal care, and non work-related transportation. Thresholds for additional family types were derived by applying an equivalence scale to reflect differences in family composition and needs. These thresholds were then adjusted to account for differences in the cost of housing in metropolitan and non-metropolitan areas in the country using data from the 1990 Census. The Panel used a modified version of the Department of Housing and Urban Development (HUD) methodology for developing fair market rents to produce interarea housing price index values. Index values were produced for metropolitan areas in six population size categories within each of the nine Census regions and for non-metropolitan areas (not distinguished by size) in each of the regions.[27]

Expenditures were defined as the transaction costs, including excise and sales taxes, for these commodities acquired during the interview period. Expenditures include gifts, but exclude the value of purchases or portions of purchases directly attributable to business purposes. Also excluded were periodic credit or installment payments on commodities already acquired. Expenditures for vehicle purchases included the net outlays (purchase price minus trade-in value) on new and used cars and trucks, and expenditures for other vehicles. For owned housing, neither the purchase price of the housing nor the mortgage principal payment were included in expenditures; however, mortgage interest and related charges were included. The Panel noted that this definition of the shelter costs for homeowners was used for processing convenience.[28]

[26] Citro and Michael, 1995, p. 101.
[27] Citro and Michael, 1995, pp.194-199.
[28] Citro and Michael, 1995, p. 148.

The Panel stated that the "...food, clothing, and shelter [including utilities] component of the reference family poverty threshold under the proposed concept must be expressed as a percentage of median expenditures on these categories."[29] This requirement reflects the *relative* component of the hybrid poverty measure. The procedure for creating a time series of thresholds under the Panel's concept is to pick a percentage of median expenditures for food, clothing, and shelter (the basic bundle) and a multiplier. The multiplier would be applied to the food, clothing, and shelter (including utilities) component of the poverty threshold so as to allow a small fraction for other needed expenditures. With this information, a base year threshold would be established first, then the same percentage and multiplier would be used to produce the thresholds for all other years. The only requirement for each year would be the production of median expenditures for food, clothing, shelter, and utilities. The intent underlying this procedure was to drive the change in the thresholds by changes in median spending on food, clothing, shelter, and utilities and not by changes below the median.[30]

It should be noted that in the construction of the thresholds out-of-pocket expenditures were used. However, the mechanism to update the thresholds was to be based on changes in consumption. Out-of-pocket expenditures for food and utilities are likely to represent consumption. Such expenditures are less likely to represent the consumption of clothing. The consumption of rental housing also is likely to be fairly well represented by rental expenditures.

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[29] Citro and Michael, 1995, p. 148.
[30] If percentiles were used to define the thresholds, a situation could result in which a recession reduced median expenditures somewhat but more dramatically lowered the expenditure level at the 30th percentiles, for example. It would not be desirable for the poverty threshold or standard of need to reflect this greater reduction (Citro 1996).

Out-of-pocket expenditure for owner housing is not likely to be a good proxy for consumption. For example, if most housing were owner occupied and the owners had low or no mortgages, the expenditure approach would imply that these owners have no consumption of housing. If the Panel were attempting to provide a threshold based on the cost of the consumption, the out-of-pocket approach would not be a good model to follow. The Panel acknowledged this by stating that their approach was used for processing convenience only. The implicit cost of owned housing should be accounted for in the measure. If on the other hand, the purpose of the threshold were to provide an estimate of the expenditure that would be needed to meet the basic needs of the family, the out-of-pocket approach would be appropriate. In the Panel's report, expenditures, consumption, and needs are interchanged. However these are not the same. Until a decision is made concerning the focus of the thresholds (and corresponding resources) - expenditures, consumption, or needs - confusion will remain concerning the measure, especially with regard to the treatment of owner occupied housing.[31]

The Panel recommended that the thresholds be updated annually using an average of the most recent three years of CE data to produce the medians. The three-year average approach was recommended to increase the sample size and also to smooth out year-to-year changes in the thresholds; however this approach produces thresholds that lag behind changes in real consumption.[32] To conduct an analysis, the Panel used data from all consumer units participating in the CE in 1989-91. Each quarter approximately 5,000 consumer units[33] are interviewed using the CE Interview Survey. Based on the 1989-91

[31] See Short, Iceland, Bavier, Garner, Rozaklis, and Hernandez, "Report on Experimental Poverty Measures", in *Proceedings of the American Statistical Association,* (forthcoming).
[32] Citro and Michael, 1995, Table 2-7, p. 156.
[33] A consumer unit comprises either: (1) all members of a particular household who are related by blood, marriage, adoption, or other legal arrangements; (2) 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 independent; or (3) two or more persons living together who use their incomes

CE data, about 9 percent of all consumer units interviewed have the characteristics of the reference family, that is, the two-adult/two-child family.

First, median expenditures (adjusted to current dollars) for reference units are obtained using their FCSU expenditures. Second, percentages of the median are selected which reflect the reference households' expenditures between the 30th and 35th percentiles of the distribution of FCSU expenditures. These percentiles translate to 78 and 83 percent of the median. The Panel concluded in their study that these percentiles seem to represent a "reasonable range" for the FCSU component of the reference family's threshold.[34] Third, expenses for their other needs (e.g., household supplies, personal care, and non-work related expenses) are accounted for through the use of a small multiplier.

As noted earlier, multipliers were applied to the value of the designated basic bundle (reflected as some percentage of the median of the basic bundle) to account for the additional costs of other needed commodities. The two bundles considered by the Panel reflect expenditures for the: (1) basic bundle plus those for personal care and one-half of transportation;[35] and (2) basic bundle plus personal care, one-half transportation, education, and reading materials costs.[36] In the report, the Panel stated that "we arbitrarily chose to exclude one-half of transportation costs because the Interview Survey does not distinguish between work expenses, which we propose to deduct from resources,

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to make joint expenditure decisions. Financial independence is determined by the three major expenses 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.

[34] Citro and Michael, 1995, p. 149.

[35] ***Transportation*** expenditures were defined by the Panel to include vehicle finance charges, expenses for gasoline and motor oil, maintenance and repairs, vehicle insurance, public transportation (including air fares), and vehicle rentals, licenses and other charges. In addition, transportation included the total purchase price (minus the trade-in value) on new and used vehicles.

Personal care includes products for hair, oral hygiene, and shaving, cosmetics and bath products, electric personal care appliances, other personal care products, and personal care services.

[36] ***Education*** includes tuition, fees, textbooks, supplies and equipment for public and private nursery schools, elementary, and high schools, colleges, and universities, and others schools

Reading materials includes subscriptions for newspapers, magazines, and books through book clubs, purchase of single copy newspapers, and magazines, newsletters, books, encyclopedias, and other reference books.

and personal transportation for errands, vacations, etc."[37] This allocation is consistent with other studies.[38]

The Panel's determination of what to include in the additional amount was constrained by what was available in the Interview Survey (e.g., some personal care items and household supplies, which would seem natural candidates to include in the multiplier bundle, are only available from the Diary). However, a bigger point is that the Panel did not intend to engage in a detailed budget-building exercise; it simply wanted to try out a couple of reasonable multipliers to get a feel for a reasonable range for a small multiplier applied to a basic bundle.[39] Other commodity bundles could have been assumed.

The Panel concluded from a review of their tabulations that a reasonable range for the multiplier was 1.15 to 1.25, which allowed for a poverty threshold that ranged from $13,700 to $15,900 (in 1992 dollars rounded). The value is 78 percent of median expenditures for the basic bundle (corresponding to the 30th percentile) times 1.15 and the upper value is 83 percent of the median for the basic bundle (corresponding to the 35th percentile) times 1.25. The Panel chose their multipliers as corresponding to those at or below the median level of expenditures for the basic bundle. The general formula for deriving the proposed reference family threshold is shown in **Chart 1**.

Chart 1: Calculation of Threshold for Reference Family

$$T = \left[\frac{(M1 * \%m) + (M2 * \%m)}{2} \right] * \textit{housing index} \qquad (1)$$

where

T = the reference family poverty threshold,

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[37] Citro and Michael, 1995, p. 151.

[38] In constructing the cost of raising a child, the Department of Agriculture used data from a 1990 study by the Department of Transportation which found that employment-related transportation activities account for about 40 percent of travel costs for families with children. See *Expenditures on Children by Families, 1995 Annual Report*, Center for Nutrition Policy and Promotion, USDA, page 5, and U.S. Department of Transportation, Federal Highway Administration, 1994, *1990 Nationwide Personal Transportation Study*.

[39] Citro 1996.

M1 = the multiplier for a smaller additional amount, (1.15 for the Panel's estimate)
M2 = the multiplier for a larger additional amount, (1.25 for the Panel's estimate)
% = some percentage, (0.78 & 0.83 for the Panel's estimate), and
m = median expenditures for the basic bundle of food, clothing, shelter, and utilities.

Once the value for the basic bundle was determined the thresholds were adjusted to reflect geographic differences in the price of housing. Inter-area housing price indexes, calculated from the 1990 Census data on gross rent for apartments with specified characteristics, adjusted to reflect the share of housing in the proposed poverty budget, were used.[40]

Equivalence scale adjustments were next made to the reference family's threshold to account for the differing needs of adults and children and the economies of scale of living in larger families. After evaluating the equivalence scale implicit in the poverty thresholds and several forms of the thresholds, the Panel recommended a scale of the type shown in **Chart 2**.

Chart 2: Two-Parameter Equivalence Scale

$$\text{Scale value} = (A + PK)^F \qquad (2)$$

where A = the number of adults in the family,
K = the number of children, each of whom is treated as a proportion (P) of an adult, and
F = the scale economy factor.

Specifically, the Panel recommended that P be set at 0.70 such that the needs of children are treated as 70 percent of those of an adult, and the scale economy factor, F, be set in the range of 0.65 to 0.75. The values of the resulting scale are consistent with the Rothbarth scales reported by Betson, and Betson and Michael.[41]

[40] For a description of the housing adjustment, see Citro and Michael, 1995, pp. 194-199, 249, 252-253.
[41] See citations in Citro and Michael, page 177.

B. Updating the thresholds over time

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)). This is one of the most controversial of the Panel's recommendations. Specifically, their recommendations were:

> **Recommendation 2.2** The new poverty thresholds should be updated each year to reflect changes in consumption of the basic goods and services contained in the poverty budget: determine the dollar value that represents the designated percentage of the median level of expenditures on the sum of food, clothing, and shelter for two-adult-two-child families and apply the designated multiplier. To smooth out year-to-year fluctuations and to lag the adjustment to some extent, perform the calculations for each year by averaging the most recent 3 years' worth of data from the Consumer Expenditure Survey, with the data for each of those years brought forward to the current period by using the change in the Consumer price Index.
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> **Recommendation 2.3** When the new poverty threshold concept is first implemented and for several years thereafter, the Census Bureau should produce a second set of poverty rats for evaluation purposes by using the new thresholds updated only for price changes (rather than for changes in consumption of the basic goods and services in the poverty budget).
>
> **Recommendation 2.4** As part of implementing a new official U.S. poverty measure, the current threshold level for the reference family of two adults and two children ($14,228 in 1992 dollars) would be reevaluated and a new threshold level established with which to initiate a new series of poverty statistics. That re-evalutation should take account of both the new threshold concept and the real growth in consumption that has occurred since the official threshold was first set 30 years ago.

In their work the NAS panel examined historical data. Citing the work of Vaughan[42] they examined time series from 1947 to 1989 of relative thresholds over time. Looking at one-half median before-tax four-person family income they found an increase of 115 percent over this long period of time. After-tax income, however, increased only 86 percent over the same period. Compared with the official threshold, adjusted for price changes only, both before-tax and after-tax series were lower through the year 1955, at the same level through 1965, and then well above the threshold thereafter. This series suggested why, in 1963, when the original thresholds were devised, they were widely regarded at the right level for that time, while they are now often criticized for being too low.

The NAS Panel also examined subjective poverty thresholds over this same period using Gallup Poll data assembled by Vaughan (1993). These thresholds were derived from a get-along question and a "poverty line" question. These series show a similar relationship when compared to the official thresholds as the median income measures, suggesting that subjective thresholds respond to changes in real income or consumption. They suggest that if the elasticity of subjective thresholds with respect to changes in median income or consumption is very close to 1.0 that one could argue for a strictly relative approach to updating poverty thresholds. The NAS Panel cited research suggesting an elasticity between 0.65 (Vaughan, 1993) and 1.0 (Rainwater, 1992)[43].

Based on this and other evidence the NAS Panel notes that "in developing a poverty standard, some reference is invariably made to the living conditions of the particular time and place. Given the evidence of relativity in the way in which poverty thresholds are commonly derived we conclude that the key point for consideration is not whether to treat poverty thresholds as absolute or relative, but rather, how often to update them for real changes in living standards."[44]

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[42] Vaughan, Denton R. "Exploring the use of the public's view to set income poverty thresholds and adjust the over time", in *Social Security Bulletin* 56(2), Summer 1992, pp. 22-46.
[43] Rainwater, Lee, "Poverty in American Eyes", Luxembourg Income Study, Working Paper No. 80. Harvard University. 1992.
[44] Citro and Michael, pp. 131- 144.

The Panel intended to use an adjustment factor would be a "quasi relative" updating mechanism. The Panel expected that the median basic bundle FCSU expenditures by the reference family would change at a different rate than inflation but by less than the change in consumption as measured by per capita Personal Consumption Expenditures (PCE).[45]

Chart 3
Updating the Thresholds:
The Intuition Behind the Panel's Proposal

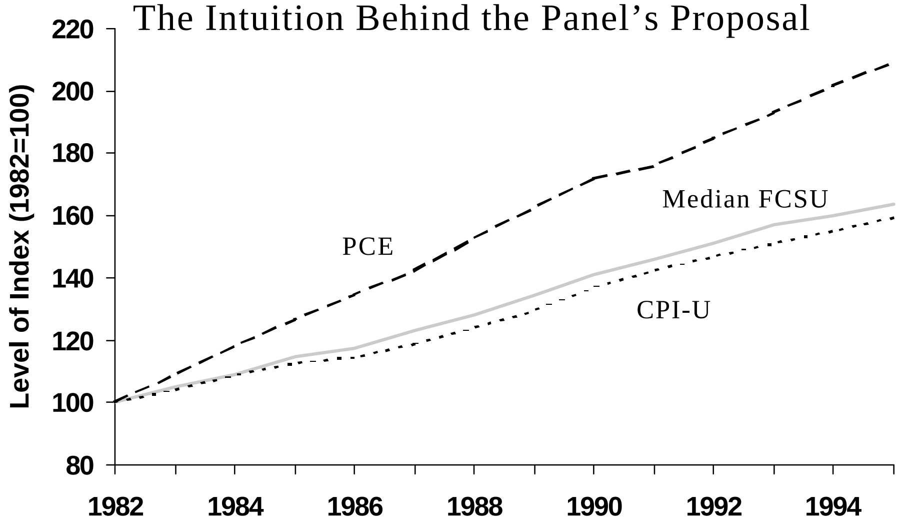


Chart 3 compares changes in median FCSU expenditures for the reference two-adult/two-child household, the all item CPI-U[46], and the PCE. As shown PCE increase faster than median FCSU expenditures, which increase faster than the CPI-U. These results seem to confirm the Panel's expectations regarding the use of the median FCSU as an updating mechanism. These results, however, may not hold for each year, because the

[45] For more discussion see Johnson, David, Stephanie Shipp, and Thesia Garner, "Developing Poverty Thresholds Using Expenditure Data," in *Proceedings of the Government and Social Statistics Sections* of the American Statistical Association, Alexandria, VA, August 1997, pp. 28-37.
[46] 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.

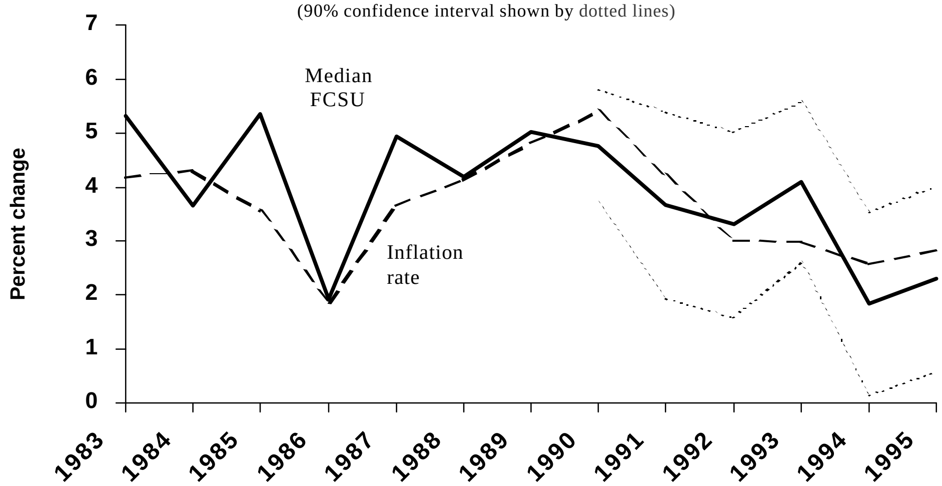
change in the median is volatile. For example, using the inflation rate to adjust the 1990 threshold to 1995 yields a higher threshold than using the Panel's proposed method.

Chart 4 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.[47]

After the Panel published their report, concern was raised that the Panel's

Chart 4
Percent Changes in Median FCSU and inflation rate: 1983-95

(90% confidence interval shown by dotted lines)



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 4** shows, the standard errors for the changes in the median are fairly large (e.g., 2.3 percent in

[47] 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 (USDL2) for an explanation of how to use the replicate weights to produce variances.

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.

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. These latter two methods also decrease the percentage change in the median for the 1990-95 years. This is because the median expenditures increase the most for the reference household.

Table 1. Various Methods to Update the Threshold

Year	**Change in median FCSU expenditures for reference household**	**Inflation rate**	**Average change in median for nine household types**	**Change in median equivalent FCSU for all households (using P=0.70 and F=0.65)**
1990	4.8	5.4	4.8	4.7
1991	3.7	4.2	3.9	3.7
1992	3.3	3.0	1.9	1.9
1993	4.1	3.0	2.3	2.5
1994	1.8	2.6	2.3	2.4
1995	2.3	2.8	2.3	2.3
Average standard error	0.95	0.15	0.51	0.53
Percent change From 1990-95	21.7	22.9	18.9	18.7

IV. Income or Resources

In addition to the poverty thresholds, the resource measure in the NAS recommendations takes account of changes in consumption over time. As the NAS Panel specified, three important expenditure items are subtracted from family income before poverty status is determined. These are work-related expenses, childcare expenses while parents are at work, and medical out-of-pocket expenses. While not explicitly included in the thresholds, these were considered to be necessary expenses by the NAS Panel. Insofar, as these expenses are updated in a timely way to capture changes in consumption patterns of these commodities, this measure of poverty is more responsive to changes in consumption patterns than is observable from examining only the thresholds.

V. Poverty Estimates 1990 to 1998

In this paper, as in our report[48], we have followed the NAS Panel's recommendation to produce time-series of poverty rates using two sets of experimental thresholds. One set is adjusted from year to year by the change in median expenditures on the basic bundle of goods, which include food, clothing, shelter, and utilities (FCSU). These FCSU estimates are based on three-year moving averages of the median expenditures of the two-adult two-child family as estimated from the CE. The second set changes from year to year by changes in the Consumer Price Index (CPI-U) (see **Table 2).** This set is based on the FCSU threshold for 1997, while thresholds for other years are based only on changes in the CPI-U from 1997.

[48] Short, Kathleen, Thesia Garner, David Johnson, and Patricia Doyle, *Experimental Poverty Measures: 1990 to 1997,* U.S. Census Bureau, Current Population Reports, Consumer Income, P60-205, U.S. Government printing office, Washington, D.C., 1999.

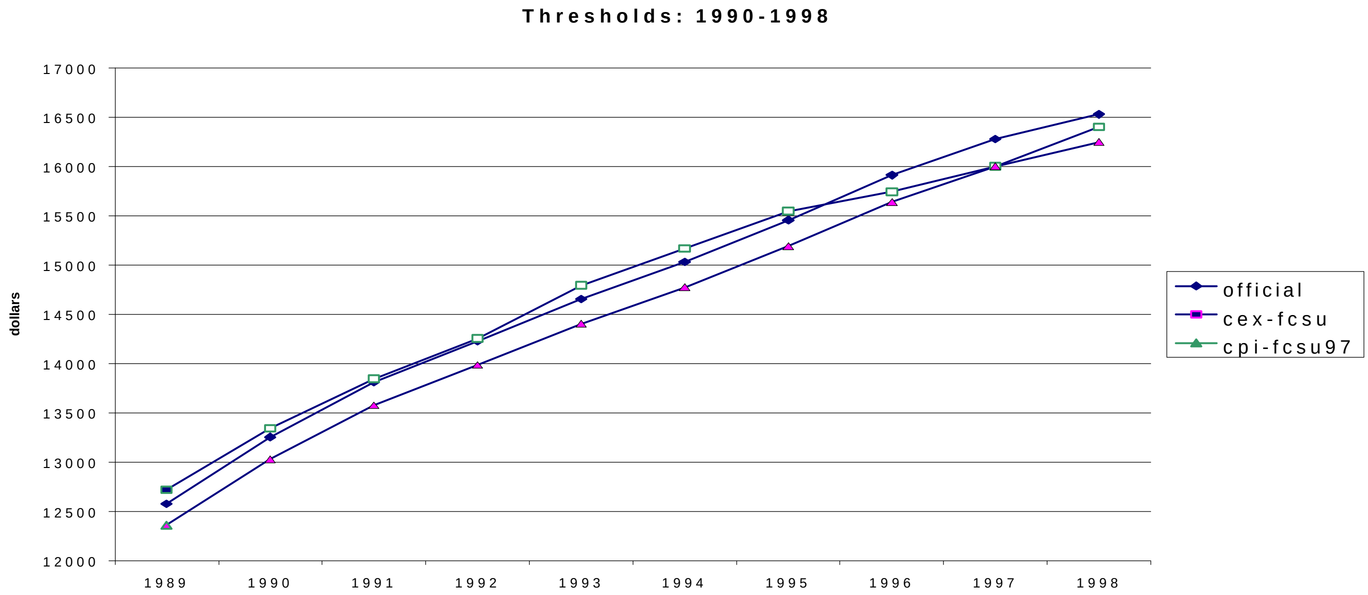
Table 2: Experimental Thresholds Using Alternative Updating Methods: 1990-1998
(1997 as base year)

Year	Current Official Threshold	FCSU Change in median FCSU	FCSU 1998 Backdated with CPI-U
1990	$13,254	$13,342	$13,028
1991	$13,812	$13,843	$13,576
1992	$14,228	$14,253	$13,985
1993	$14,654	$14,791	$14,403
1994	$15,029	$15,166	$14,772
1995	$15,455	$15,545	$15,191
1996	$15,911	$15,744	$15,639
1997	$16,276	$15,998	$15,998
1998	$16,530	$16,401	$16,248

Source: Short, Iceland and Garner, 1999.[49]

As can be seen in the table, the 1997 experimental thresholds are the same, by design, and slightly lower than the official thresholds. Also, the 1998 experimental threshold based on FCSU estimates from the CE is slightly higher than that based only on the CPI-U, suggesting that spending for the basic bundle rose more from 1997 to 1998 than price changes. However, this is not always the case, as can be seen in **Chart 5**.

[49] Short, Kathleen, John Iceland, and Thesia Garner, "Experimental Poverty Measures: 1998", unpublished paper available at http://www.census.gov/poverty/povmeas/exppov/exppov.html.



The chart shows the general increased variability in the thresholds that are based on the CE relative to those based on the CPI-U changes. While the trends are similar, generally the FCSU thresholds increased more slowly from 1994 to 1997 increased a bit faster from 1992 to 1993 and from 1997 to 1998. While the differences are slight and very probably not statistically significant, they can have an important effect on our estimates of trends in poverty rates over time.

We construct two separate time series of poverty rates using the above thresholds. The first one uses three–year averages from the CE to estimate thresholds for each year from 1990 to 1998. The second series uses the same threshold as the first for the year 1997, but then generates a new set of thresholds based only on changes in the CPI-U between years. Both sets of thresholds are shown in **Table 2** for the reference two-adult two-child family**.**

In our report we constructed six basic experimental measures. We show only three of those here. We refer to these three measures as the NAS, DES-DCM2, and the NAS-NGA measures, respectively. The first measure we refer to as the NAS measure. We calculated it by closely following the methods outlined in the NAS panel's report. While there are a few minor differences from the measure the panel recommended, they are computational rather than conceptual in nature. In both the panel's report and here this measure is constructed in the following way[50]:

Thresholds:

- Thresholds are set at the midpoints of the ranges recommended by the NAS panel – averaged over the three most recent years – i.e., data for 1995, 1996, and 1997 are averaged for the 1997 threshold
- The equivalence scale is a two-parameter version
- Geographic indexes are those listed in the panel report (normalized)

Resources:

- Include the value of food assistance programs
- Include the value of housing subsidies
- Include the value of energy assistance (only heating assistance in this implementation)
- Subtract work-related and childcare expenses using the panel's childcare model
- Take account of taxes as modeled in the CPS
- Subtract medical out-of-pocket expenses (MOOP), modeled and calibrated to spending totals

[50] All measures shown here use the family as the unit of analysis. See Short et al. (1999) for more details on the construction of these measures.

We refer to the second experimental measure as DES-DCM2. This measure is constructed like the NAS measure, but we use a Different Equivalence Scale. We use a three-parameter equivalence scale here that is arguably a more refined equivalence scale than the two-parameter one the panel used. DCM2 refers to Different Childcare Method. This measure uses amounts based on deductions for necessary childcare in the former Aid to Families with Dependent Children (AFDC) and Food Stamp programs. DCM2 is similar to the panel's method in its effect on poverty estimates but is easier to implement.

Finally we show the NAS measure without a geographic adjustment. This measure is referred to as NAS-NGA. This measure is calculated exactly as the NAS measure but the thresholds are not adjusted for differences in the cost of housing in different parts of the country. The geographic adjustment is excluded because, as the panel noted, this element requires more research and better data sources. These measures, then, adopt the assumption that the cost of meeting basic needs does not vary by geographic area.

Here we examine only "standardized" poverty rates. For these standardized measures, as in our report, the experimental poverty thresholds are adjusted to produce the same rate as the official rate for 1997 for each experimental measure. Thresholds for each of the measures for the other years in the series are adjusted by that same factor. Thus, they do not necessarily match the official rate in the other years. Each measure is adjusted separately and the factors vary depending upon the difference between the experimental measure and the official measure in 1997. This approach allows us to examine trends in the rates while essentially holding the level of all measures constant in 1997.[51] These standardized rates for 1990 through 1998 are shown in **Table 3**.

[51] We base the analysis in 1997 to maintain consistency with the results in the Census Bureau report.

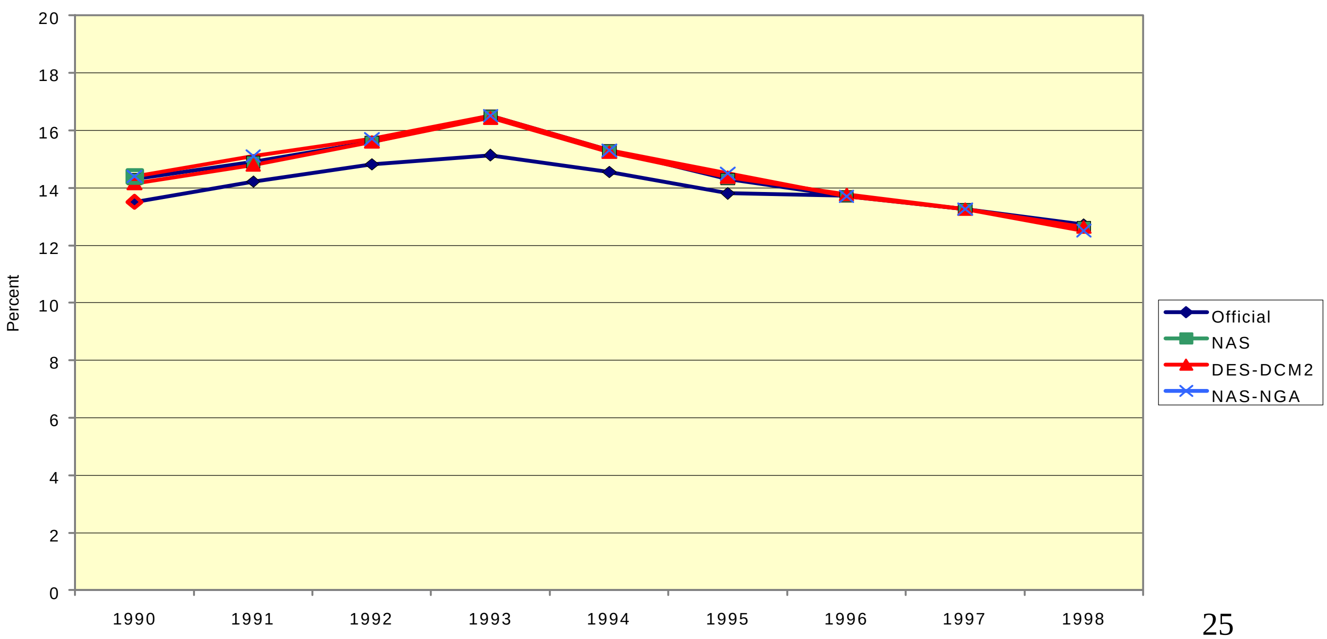
Table 3: Poverty Rates Standardized to 1997 Official Rate (CE Based Thresholds): 1990 to 1998

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Official	13.5	14.2	14.8	15.1	14.6	13.8	13.7	13.3	12.7
NAS	14.3	14.9	15.6	16.5	15.3	14.3	13.7	13.3	12.6
DES-DCM2	14.2	14.8	15.6	16.4	15.2	14.4	13.8	13.3	12.6
NAS-NGA	14.4	15.1	15.7	16.5	15.3	14.5	13.7	13.3	12.5

Source: U.S. Census Bureau, Current Population Survey, March 1991-1999.

Figure 1 shows poverty rates for 1998 using the official measure and three of the standardized experimental poverty measures using thresholds updated with CE data. The figure shows that, over the 1990-98 period, rates under the official and experimental measures behave similarly: increasing over the 1990-93 period and decreasing over the 1993-98 period. The official rate rose from 13.5 percent to 15.1 percent from 1990 to 1993 and fell to 12.7 percent by 1998. All of the standardized experimental rates show similar patterns with only some slight differences.

Figure 1: Standardized Poverty Rates with CE-Based Thresholds
1990 - 1998



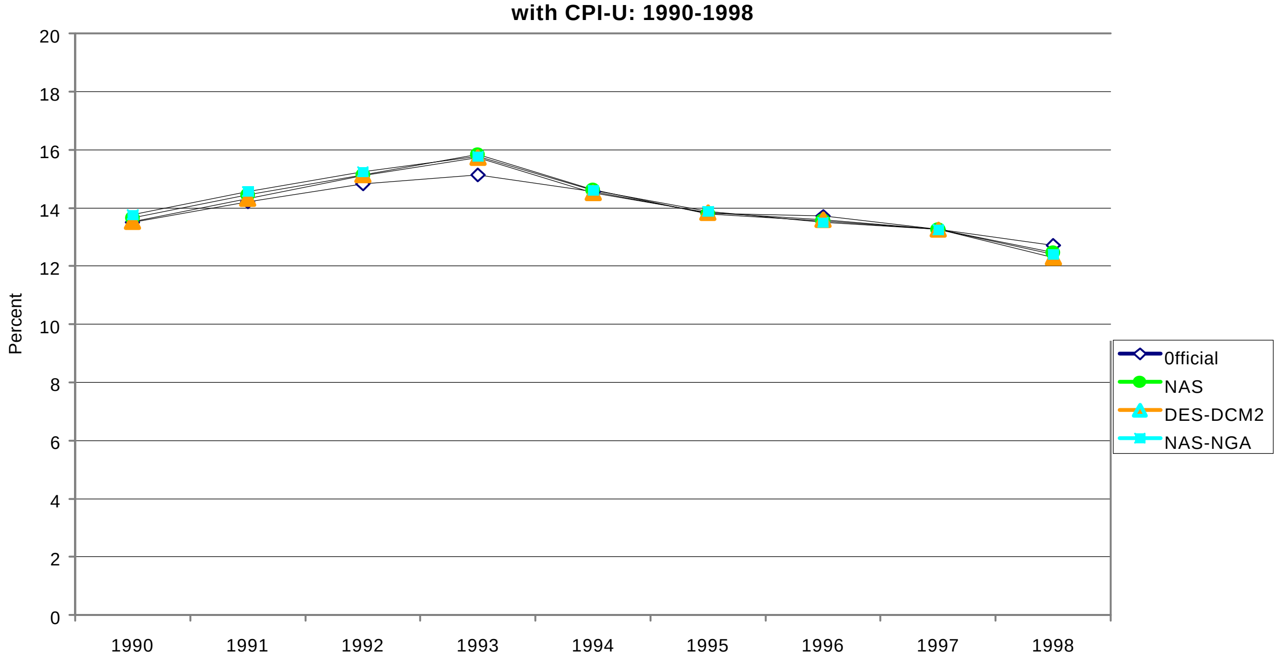
Source: Table B

NAS--National Academy of Sciences

In 1990, all of the poverty rates under the experimental measures are higher than that of the official measure. The increase in poverty rates from 1990 to 1993, however, is similar across all the measures, including the official one. All of the experimental rates, while constrained to be equal in 1997 are higher than the official rate in 1993, suggesting that these measures declined at a faster rate over this period than the official measure. One important reason for the accelerated decline in the experimental poverty rates in this later period was the effect of an expanded Earned Income Credit (EIC), a tax program that is not accounted for in the official poverty measure.

Figure 2 shows trends based on varying the thresholds from year to year with changes in the CPI-U only. Here we see again that the trends of the experimental measures are similar to the official measure from 1990 to 1993 with a greater decline from 1993 to 1998 than the official measure. Even though the figure shows that most of the 1998 standardized experimental estimates are slightly below the official rate, the

Figure 2: Standardized Poverty Rates with Thresholds Adjusted from 1997 with CPI-U: 1990-1998



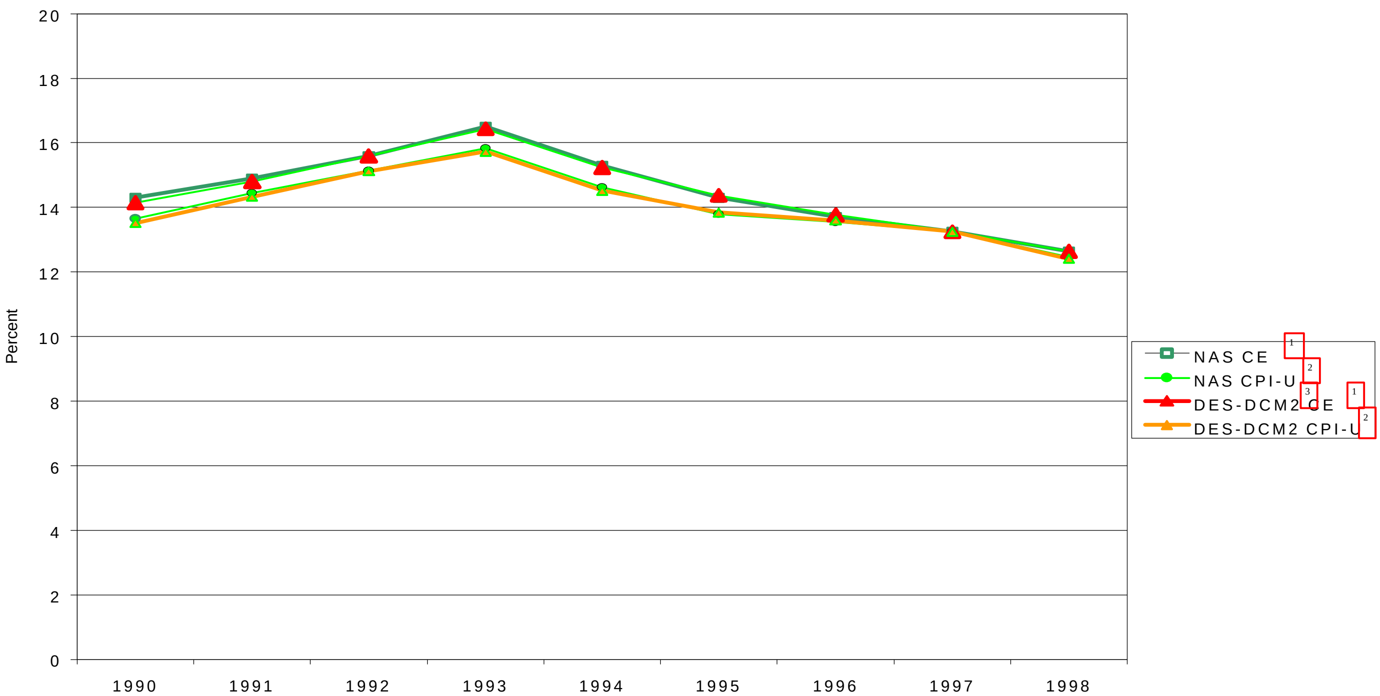
Source: Table D

NAS--National Academy of Sciences
DES-DCM2--Childcare method based on AFDC program allowances and three-parameter equivalence scale

decline from 1997 to 1998 is not statistically different among the various measures.

Figure 3 shows the difference between the two updating methods more clearly. Looking only at the NAS measure using the two updating methods shows that both measures follow a similar trend over the period. While the measure updated with the CE appear to be above the measure updated for price changes over this time period, increases from 1990 to 1993 and overall decreases in poverty rates across the period from 1993 to 1998 are not statistically different using the two measures.

Figure 3: Standardized Poverty Rates with Year-to-Year Changes in Thresholds based on CE and CPI-U: 1990 - 1998



Source: Tables B and D

1. Threshold in all years based on Consumer Expenditure Survey (CE) data.
2. Thresholds in 1997 based on CE, other years adjusted from 1997 by change in Consumer Price Index (CPI-U).
3. NAS measure with different childcare valuation and different equivalence scale.

V. Summary and Conclusions

In this paper we have described experimental poverty measures that have been computed for the United States. These measures have been based on recommendations from our National Academy of Sciences and have been presented in a recent Census Bureau report released in July of this year.

This paper describes the recommendations that the NAS Panel had relating to updating poverty thresholds over time. That group recommended a different method from that currently used to update the official poverty threshold in the U.S. The current method increases poverty thresholds originally designed in the 1960s by changes in prices as measured by the Consumer Price Index for all items (CPI-U).

The NAS Panel recommended what they referred to as a “hybrid” or “quasi relative” approach, that incorporates changes in spending on a basic bundle of goods rather than changes in prices, in total consumption of all goods, or in income.

The paper then presented poverty thresholds calculated over the period from 1990 to 1998 in this recommended way, as well as, an additional set of thresholds that change from year to year based on the CPI-U. We then calculate experimental poverty rates based on these two sets of thresholds and compare trends over this short time period in the two measures. We show that, at least over these nine years of data, there are no statistically significant differences in the two experimental measures, while the experimental measures do differ slightly from the official measure in showing a greater decline from 1993 to 1998.