

Building a Consumption Poverty Measure: Initial Results Following Recommendations of a Federal Interagency Working Group

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March 1, 2022

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JEL Codes D12, I32

Key Words: consumption, poverty measurement, U.S. Consumer Expenditure Surveys

Abstract

Consumption is a well-being measure that is determined by a combination of resources (e.g., income, in-kind benefits, assets, debt, time) available households, their circumstances, and their preferences. In this study, we derive consumption poverty statistics using a consumption measure that includes the flow of services from owner occupied housing and vehicles and in-kind transfers. The base data are from the U.S. Consumer Expenditure Survey Interview from 2015 through 2020. The consumption poverty rate (using an absolute threshold anchored to the 2015 relative consumption poverty rate) declines from 16.8 percent in 2015 to 11.5 percent in 2020.

Note: Public access to the computer code used to produce the results presented in this paper is available at: <https://github.com/tigarner/Consumption-Measurement-and-Poverty>

Acknowledgements: This research was presented during a session at the ASSA-AEA Annual Meetings; the paper is forthcoming in the *American Economics Association (AEA) Papers and Proceedings 2022* volume. We would like to thank Dominic Smith, who provided guidance in the production of the vehicle flow of services; Josh Klick for his assistance with the Chain-CPI-U; Bob Martin, who provided assistance in developing the rent imputation modeling; Adam Safir, Scott Curtin, and Brett Creech, who provided support throughout the project; and Leslie Hodges, Courtney Paolicelli, and Saied Toossi from USDA, who provided amazing guidance regarding the NSLP and WIC. Discussions with Liana Fox (Census Bureau), Kevin Corinth (University of Chicago), Jim Sullivan (University of Notre Dame), and Richard Burkhauser (Cornell, emeritus) have greatly improved this research. We also appreciate the discussion and comments from those who attended the BLS Consumption Symposium in September 2021 and FESAC meeting in December 2021.

In this study, we derive consumption-based poverty statistics, and for comparison, also poverty statistics for expenditures and income. This research builds on the Bureau of Labor Statistics (BLS) initiative to produce a consumption measure of well-being at the consumer unit level, and recommendations from the Interagency Technical Working Group (ITWG) on Evaluating Alternative Measures of Poverty.¹ We begin to implement the ITWG recommendations by producing a consumption measure that includes the flow of services from owner occupied housing and the stock of vehicles owned, as well as public in-kind transfers.² Poverty statistics for 2015-2020 are presented. The primary data are from the U.S. Consumer Expenditure Survey, Interview component.

Consumption is a well-being measure that is determined by a combination of resources (e.g., income, assets, debt, time) available to individuals, their circumstances, and their preferences (see, Jappelli and Pistaferri 2017). It can be viewed as a variable reflecting *what has been achieved*. In the standard economic model, individual utility is a function of consumption. Given this direct tie to utility, some consider consumption to be a better unidimensional measure of wellbeing as compared to income. Various consumption measures are in use for the study of poverty (e.g., Meyer and Sullivan 2012) and inequality (e.g., Fisher, Johnson, and Smeeding 2015).

Estimates of consumption can be derived from expenditures for most categories of goods and services; however, expenditures alone are not sufficient. The value of the in-kind

¹ Additional results and updates for this research project will be posted at <https://www.bls.gov/cex/consumption-research.htm>.

² See the Appendix A for the list of recommendations from the ITWG related to creating a comprehensive measure of consumption and a discussion of how the measures in this paper begin to implement these recommendations.

benefits from the government and private sector (e.g., employers), the flow of services from owner-occupied housing and owned vehicles, and the value of home production for own consumption should be counted as well. Finally, some types of expenditures like education and healthcare may be better thought of as investments rather than providing current consumption. In our preliminary measure of consumption, home production, education, and healthcare are not included but the other components of consumption are.

When using our most comprehensive consumption measure and relative poverty thresholds, consumption poverty is 16.8 percent in 2015 and falls to 14.2 percent in 2020. This contrasts with relative income poverty which is 22.5 percent in 2015 and remains at 22.5 percent in 2020. We also consider absolute poverty measures. For these measures, we anchor the thresholds for each measure so that the poverty rates in 2015 are equal to the relative consumption poverty rate in 2015, and update the thresholds using the Chained CPI-U. When using this method, income poverty falls from the anchor rate of 16.8 percent to 13.6 percent, while consumption poverty falls to 11.5 percent. Relative to the entire U.S. population, a person is more likely to be at risk of consumption poverty (below 60 percent of the median of adult equivalized consumption) if they are living in consumer units where the reference person is Black non-Hispanic, Hispanic, has a lower level of education, or has children.

I. Data and Methods

In this section we provide a brief description of the data and the construction of our consumption measure.³ The primary data source for the measure is the U. S. Consumer

³ For additional details regarding the CE Survey, the measures, and thresholds, see Appendix B.

Expenditure Survey (CE) Interview component. Using the restricted-use microdata, we construct total quarterly expenditures (denoted `tot_exp`) at the consumer unit level.⁴ We construct several consumption measures, but for this paper we only present the most comprehensive measure which includes the flow of services from owner occupied housing and the stock of vehicles owned, and public in-kind benefits. Public in-kind benefits include those for rental assistance, Low Income Home Energy Assistance Program (LIHEAP), the National School Lunch Program (NSLP), and the Supplementary Nutrition Program for Women, Infants, and Children (WIC). Supplemental Nutritional Assistance Program (SNAP) benefits are implicitly already counted in food expenditures as the assumption is that SNAP benefits are used first before income or credit. Excluded are expenditures for the following: those associated with owning a primary residence or vacation home; the purchase and financing of vehicles; cash contributions; life, endowment, annuities, and other personal insurance; retirement, pensions, and Social Security; healthcare; and education. For comparison, we also construct an income measure defined as after tax and transfer income plus the value of the same public in-kind benefit programs that enter the consumption measure.

Our initial measures exclude the value of home production. While home production would ideally be included in a comprehensive measure of consumption, we are still conducting

⁴ 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 income to make joint expenditure decisions. Financial independence is determined by the three major expense categories: Housing, food, and other living expenses. To be considered financially independent, at least two of the three major expense categories have to be provided entirely, or in part, by the respondent. (<https://stats.bls.gov/cex/csxgloss.htm>)

research on the best way to incorporate home production into the measure.⁵ Estimating the value of home production requires data on time use. Time use data is not collected in the CE, so the CE must be linked with a different data source to impute a value for home production.⁶

In the Figures we limit our results to those based on the purely relative thresholds, and absolute thresholds that results when poverty rates for all our measures (consumption, expenditures, and income) are anchored to the same initial poverty rate.⁷ The relative poverty thresholds are defined as 60 percent of the national population weighted equivalized median measure value. The poverty rate is defined as the percentage of people who are this threshold. The absolute thresholds are based on anchoring the threshold for each measure so that each of the resulting poverty rates is equal to the relative consumption poverty rate for 2015 (16.8 percent). Each of consumption, expenditures, and income thresholds, associated with this initial 16.8 percent rate in 2015, are updated for later years using the all items chained CPI-U.

For this analysis, adult equivalized consumption, expenditures, and income are produced for each consumer unit. Consumer unit level values are converted to equivalized values using a three-parameter equivalence scale.⁸ It is these adult equivalence values, when weighted by the

⁵ In September 2021, the BLS contracted with an outside vendor to investigate options to use available data to produce a consumption measure that can be incorporated with CE expenditures data at the consumer unit level. Results of this study are expected by the end of September 2022.

⁶ A similar challenge arises in incorporating home production into measures of household income (Frazis and Stewart 2011).

⁷ While anchoring to the initial consumption poverty rate is useful for showing changes over time between different measures, the preferred approach in much of the literature for constructing absolute thresholds is to anchor to an initial poverty threshold (rather than an initial rate). This approach is used so “that different measures do not diverge simply because of differing changes at different points in the distribution of resources (Meyer and Sullivan 2012, p. 143).”

⁸ This scale was developed by Betson (1996) and used in several BLS and Census Bureau studies (e.g., Fox and Burns 2021, Garner et al. 2016).

population and ranked from lowest to highest allow us to derive each of the relative thresholds and the absolute thresholds anchored to the 2015 consumption poverty rate.

II. Results

In this section, we present the poverty results for the different measures discussed in the previous section. For exposition purposes, we have converted quarterly adult equivalized consumption, expenditures, and income for all consumer units to annualized values for consumer units with two adults and two children.

Figure 1 shows the median annualized real consumption, expenditures, and after-tax income with in-kind benefits at the equivalized consumer unit level for 2015 to 2020. Median expenditures are less than median after-tax income. Median expenditures and consumption have similar trends over this period and show less of an increase than median after-tax income. Annualized real median after-tax income increases by 13.0 percent from 2015 to 2020, while median consumption increased by 6.7 percent over the same period. The year 2020 is notable as it reflects the impacts of the COVID-19 pandemic and the associated recession. In 2020, median after-tax income increased while median expenditures and consumption fell. It is notable that after-tax income plus the value of in-kind benefits rose during the recession.⁹ The 2020 CE annual report notes that the decline in expenditures is due to the decline in certain type of expenditures during the pandemic such as transportation, food away from home, and

⁹ Real post-tax median (non-equivalized) household income also increased in the CPS-ASEC in 2020 (Shrider, et al 2021).

apparel and services (BLS 2021). These declines were only partially offset by increases in other categories such as food at home and housing.¹⁰

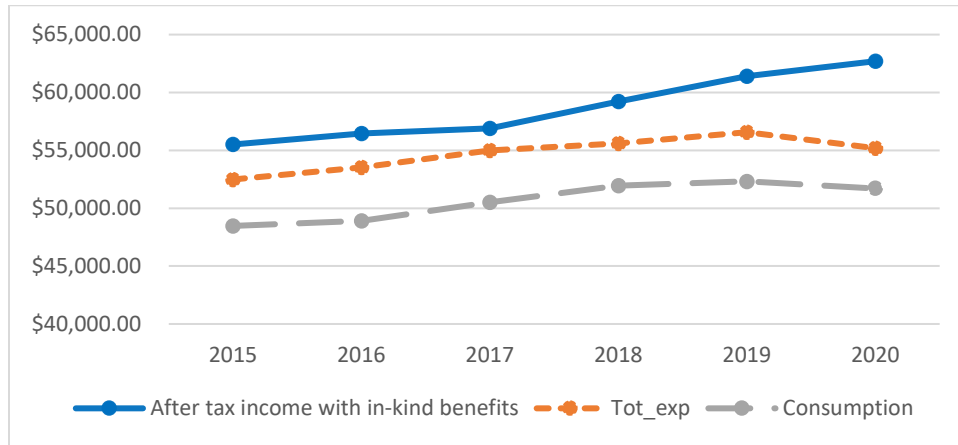


Figure 1: Annualized Medians in Real 2015 Dollars for All Consumers Units Equivalized to 2 Adults+2 Children CUs
 Note: The Chained CPI-U is used to calculate real 2015 dollars.

Table 1 shows, for 2015, the demographic characteristics of the entire U.S. population compared to those in poverty, defined using after tax income with in-kind benefits and consumption. The demographic characteristics for the U.S. population are based on the full CE sample; the CE sample, when weighted, is designed to be nationally representative. All statistics are for people as opposed to consumer units. Both black non-Hispanics and Hispanics constitute a much larger percentage of those in poverty compared to their representation in the U.S. population.¹¹ People living in consumer units in which the reference person has at most a high school education are more likely to be poor than as represented in the U.S. population. Those living in consumer units with children are more likely to be consumption

¹⁰ Incorporating home production, which we plan to do in future versions of the consumption measure, is likely to be important for understanding consumption dynamics during COVID-19 as households substituted to home production for food and childcare.

¹¹ It should be noted, standard errors for the demographic characteristics have not yet been produced. Thus, no claims can be made about the statistical significance of the difference between the U.S. population and those in poverty, or between income and consumption poverty.

poor compared to the U.S. population; and those living in consumer units with children are more likely to be consumption poor as opposed to income poor. The income poor are most likely to live in consumer units with no earners, while those who are consumption poor are most likely to live in consumer units with a combination of earners (reference person, spouse, others). People who live in single mother consumer units are more likely to be income poor as opposed to consumption poor.

Table 1. Characteristics of All People Compared to Those Living in Consumer Units Who are Poor with Poverty Rate Anchored to 2015 Consumption Rate: 2015Q2-2016Q1

Characteristic	U.S. Population	Below Consumption Threshold	Below After-Tax Income with In-kind Benefits Threshold	Below Both Consumption and Income Thresholds
<i>Race/Ethnicity of Reference Person</i>				
White Non-Hispanic	64.7%	47.9%	49.6%	45.9%
Black Non-Hispanic	12.5%	20.9%	19.4%	21.7%
Hispanic	16.3%	25.5%	24.2%	26.8%
Other	6.5%	5.7%	6.9%	5.6%
<i>Education of Reference Person</i>				
Less than High School Graduate	13.0%	31.6%	28.4%	37.2%
High School Graduate	23.4%	32.2%	29.3%	30.8%
Some College	21.6%	21.7%	23.2%	20.9%
Associate Degree or Higher	42.0%	14.5%	19.1%	11.0%
<i>Consumer Unit Composition based on Marital Status</i>				
Single Mother Consumer Units	5.8%	11.4%	13.4%	14.6%
Married Couple Consumer Units with Others	44.0%	42.4%	30.0%	32.5%
Single Person Consumer Units	11.8%	11.6%	20.3%	16.5%
Married Couple Consumers Units with No Others	17.8%	4.7%	8.8%	4.3%
Other Consumer Units	20.6%	30.0%	27.5%	32.1%
<i>Whether Consumer Unit Has Members in Age Group</i>				
0-17 Years	51.2%	64.6%	53.5%	62.3%
18-64 Years	89.3%	94.4%	90.2%	94.5%
Greater than 64	21.7%	16.9%	21.0%	15.2%
<i>Consumer Unit Earner Composition</i>				
Reference Person Only	20.9%	24.4%	28.9%	28.3%
Reference Person and Spouse Only	26.2%	10.4%	5.7%	4.2%
Spouse Only	7.1%	6.9%	8.1%	8.1%
Consumer Units with Other Earners	31.2%	37.8%	22.8%	26.1%
No Earners	14.7%	20.6%	34.5%	33.3%

Notes: All results are person weighted (family size times CU weight). Full Sample N=25,797 unweighted consumer units.

Figure 2 shows the relative poverty rates based on consumption, expenditures, and after-tax income including in-kind benefits from 2015 to 2020. In 2015, the after-tax income poverty rate (22.5 percent) is substantially higher than the expenditure and the consumption poverty rates. From 2015 to 2020, the poverty rates for expenditures and consumption declined (2.3 and 2.6 percentage points, respectively) while the after-tax income poverty rate was unchanged.

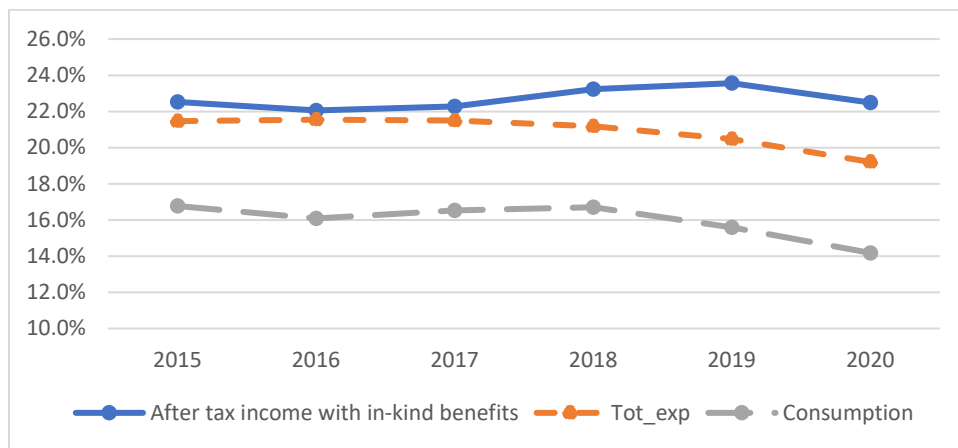


Figure 2: Relative Poverty Rates by Measure: 2015-2020
 Note: Relative poverty thresholds are calculated at 60% of the median value for each measure.

Figure 3 shows the poverty rates based on consumption, expenditures, and after-tax income with in-kind benefits from 2015 to 2020 based on the absolute thresholds that result from anchoring the expenditures and income poverty rates to the 2015 poverty rate for consumption (16.8 percent in 2015). All the poverty rates show a substantial decline over this period. The consumption poverty rate has the largest decline over this period, 5.3 percentage points, and reaches 11.5 percent in 2020. The after-tax income with in-kind benefits poverty rate declines by less over the period, falling to 13.6 percent in 2020 for a drop of 3.2 percentage points.

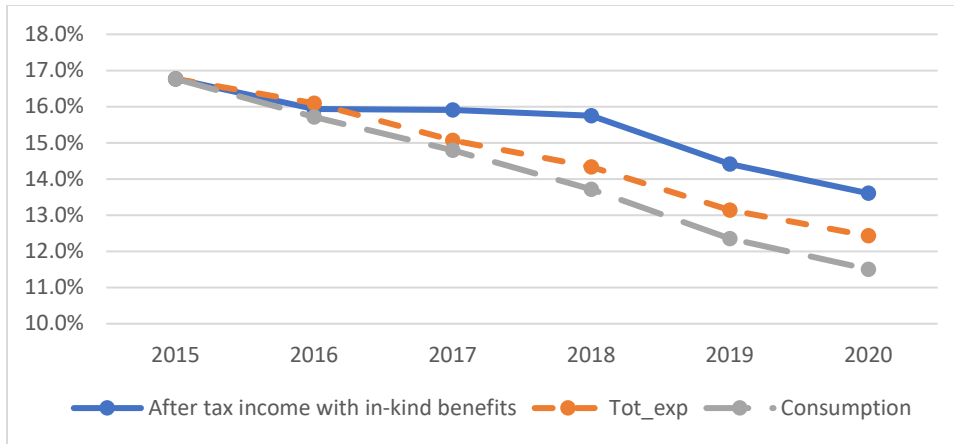


Figure 3: Absolute Poverty Rates by Measure: 2015-2020
 Note: All thresholds are anchored to 2015 relative consumption poverty rate.

III. Summary and Conclusions

In this paper, we present results from a preliminary measure of total consumption. Although broader and more in line with the theoretical measurement objectives than consumption measures based only on less comprehensive measures, there are other areas that still need to be added but require additional research before they can be incorporated into the measure. One area that will be included in future versions is the value of home production. Another area of consideration is the treatment of medical care and health insurance (often referred to together as healthcare). Whether healthcare should be included in a measure of consumption is controversial, and in the future, we plan to have versions with and without healthcare.¹² Finally, there are some categories of expenditure that are not covered by the CE Interview Survey. So, in future versions, we plan to integrate data from the CE Diary to capture expenditures missing from the Interview.

¹² The ITWG recommended creating versions with and without healthcare, where the version with healthcare could reflect something less than the full value for some households.

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Appendix A. ITWG Recommendations

The ITWG, in their final report, made specific recommendations regarding the development of a measure of consumption to be used for poverty statistics.¹³ While the working group referred to consumption as a resource measure, it is our position that consumption is an outcome, or well-being, measure as opposed to a resource measure. That aside, in this section we summarize the primary recommendations regarding the development of a consumption measure, equivalence scales in developing a poverty threshold, and the role of the BLS in particular.

The recommendations can be divided into those that are broader in scope and those that focus on the specifics of consumption poverty measurement. Broader recommendations include that the BLS be the federal government agency to develop a measure of consumption, which will be used to produce poverty statistics, and that the BLS engage with stakeholders and experts throughout the development of the measure. Specific recommendations regarding the construction of the measure include the following: (1) two new sets of research measures of consumption-based resources be produced, one that includes a value of health insurance and one that does not; (2) education not be considered part of consumption because education is generally considered an investment in human capital; (3) service flows from owner-occupied shelter and the value of the service flows from owned vehicles be included in consumption; (4) administrative data be used to supplement or replace survey collected data, but when such data are not available, regression-based modeling should be used to improve the quality of estimates of expenditures and in-kind program participation; (5) in the development of a poverty threshold, an equivalence scale be applied that accounts for the potentially differing needs of adults and children and economies of scale; and (6) that the CE Interview be used as the source of data for this work. See below for a list of the recommendations related to consumption and the BLS.

In our study, we implement several of these recommendations. First, with the presentation of results from this study, we begin our engagement with stakeholders and experts on poverty measurement. Second, we use the CE Interview as the primary data set to produce our consumption measure and poverty statistics. Third, we include in consumption the flow of services from owner-occupied housing and the flow of services from vehicles. Fourth, we exclude health and education as components of consumption, which partially implements the recommendation of producing versions with and without values for health insurance. Fifth, we use regression-based modeling in combination with administrative in-kind benefits data. And finally, we applied an equivalence scale that accounts for the differing needs of adults and children and economies of scale in consumption.

¹³ For the full report, published on January 14, 2021, see ITWG (2021).

Recommendations of the Interagency Technical Working Group (ITWG) on Evaluating Alternative Measures of Poverty¹⁴ Focused on Consumption or the Bureau of Labor Statistics
(identified by recommendation number in the report)

1. The Working Group recommends that the Census Bureau and the Bureau of Labor Statistics engage with stakeholders and other experts throughout the development of the recommended measures, including soliciting additional public comment as needed. In particular, the Working Group recommends expert input through a National Academy of Sciences panel.

5. The Working Group recommends that the Bureau of Labor Statistics develop and publish two new sets of research measures of consumption-based resources, one that includes a value of health insurance and one that does not.

6. The Working Group recommends that the Census Bureau and the Bureau of Labor Statistics use, where available and when appropriate, administrative data to supplement or replace the use of survey data for developing the recommended measures.

14. The value of health insurance should not depend on the disability or health status of individuals.

17. The Working Group recommends that expenditures on education be excluded from the recommended extended income-based and consumption-based resource measures because education is generally considered an investment in human capital.

19. The Working Group recommends continued research and additional stakeholder and expert engagement on whether and how to treat education within resource measures.

22. The Working Group recommends, taking into consideration the advantages and disadvantages for each of the above approaches for correcting for missing or misreported data, the application of all three approaches, where appropriate, in the following order: Methods that combine administrative data with survey data are the preferred approach for adjusting survey data to correct for misreporting and missing data. These methods may involve direct replacement of survey responses with administrative reports when research supports the quality of the administrative records relative to survey reports. The administrative data need to be available for use in production and the administrative data must also be available in a timely fashion. When survey reports conflict with administrative records for particular individuals, research should examine criteria to determine which source to use for the poverty estimates. Consistent with Foundations for the Evidence-based Policymaking Act of 2018, efforts to

¹⁴ From *Final Report of the Interagency Technical Working Group on Evaluating Alternative Measures of Poverty*, January 14, 2021. Available at <https://www.bls.gov/evaluation/final-report-of-the-interagency-technical-working-group-on-evaluating-alternative-measures-of-poverty.pdf>

encourage and facilitate data sharing across government agencies should be strengthened. Research to assess ways in which survey data might be made more comparable to administrative data (e.g., changing the reference period for income from the previous 12 months to the previous calendar year) should be encouraged. Regression-based modeling (with or without individual-level or aggregate administrative data) can also improve the quality of estimates of income, expenditures, and program participation. These regression-based techniques can be used, for example, when sharing agreements do not allow for direct substitution, there are significant lags in the availability of administrative data, or administrative data are not available for all geographies or years. Regression-based modeling such as Sequential Regression Multiple Imputation (SRMI) should replace hot deck imputations where feasible and continued research should be conducted to improve these methods as new tools and techniques become available. Some rules-based adjustment may be necessary for some programs and income sources. For example, if program rules assign automatic eligibility for Medicaid to all TANF and SSI recipients, it could be logical to assign program receipt to all survey respondents who are known to participate in either of these two programs. In a similar vein, if there are school districts in which all students are deemed eligible for free school lunch, they should be assigned participation in free school lunch if they report that their children regularly eat school meals.

24. The Working Group recommends that the Census Bureau and the Bureau of Labor Statistics continue to research, and possibly implement, ways to reduce survey burden and improve the quality of resulting data through increased access and use of administrative data in surveys, including the ... CE.

25. The Working Group recommends funding support of the work to develop the new recommended measures, including funding to support BLS to research the nature and construction of a potential consumption-based poverty measure and improve the CE program in support of improved poverty measurement. A proposal requesting \$7.1 million was included in the fiscal year 2021 President's Budget.

26. The Working Group recommends that the Bureau of Labor Statistics use the CE Interview Survey data to research and develop a consumption-based resource measure.

27. The Working Group recommends that the value of service flows from owner-occupied shelter and the value of the service flows from owned vehicles be included in the consumption resource measures.

28. The Working Group recommends that the CE Interview serve as the primary data source for the production of the consumption resource measures, with estimates produced at the state level.

29. The Working Group recommends that the current CE Interview Survey serve as the interim data source for the production of the consumption resource measures, with estimates

produced at the Census Division level.

32. The Working Group recommends that by the time the proposed resource measures are ready to be published, BLS and the Census Bureau should work to identify an interim solution for each set of the measures for applying thresholds to produce a full poverty measure. BLS and the Census Bureau should consider input from experts (per the previous recommendation) as available to inform the applied methodology. The interim methodology applied need not be the final methodology chosen for application to the resource measures. The intention of this recommendation is to ensure the ability to publish poverty measures using the proposed resource measure recommendations.

33. The Working Group recommends that the BLS conduct a study of price indexes appropriate for use in updating thresholds that would be used in combination with consumption and income as defined in this report.

34. The Working Group recommends that an expert panel conduct a study of and make a recommendation regarding the application of equivalence scales that would be most appropriate for the income and consumption resource measures recommended in this report. In the interim, the Working Group recommends that for any resource measures produced an equivalence scale be applied that accounts for the potentially differing needs of adults and children and economies of scale.

Appendix B. Data and Methods

CE Interview Survey

The U. S. Consumer Expenditure Survey (CE) Interview component is the base data set upon which the consumption measure and poverty statistics are derived. The CE is a household survey sponsored by the BLS and is designed to measure expenditures at the consumer unit level.¹⁵ The survey has two components, an Interview and a Diary; each instrument has its own sample, and thus, Diary and Interview responses cannot be combined at the consumer unit level. The Interview is designed to be administered, by personal interview, four times to each consumer unit (CU) at three-month intervals. The reference period for expenditures for almost all goods and services is the three months prior to the interview. The Diary component is a record keeping instrument designed to collect expenditures on frequently purchased categories of goods and services during two consecutive weeks. For each instrument, demographic information and income are collected; the reference period for income is the previous 12 months.¹⁶ Consumer units can enter the Interview and Diary samples anytime during a calendar year; thus, reported expenditures and income can reflect those in overlapping calendar years. The BLS estimates that less than one quarter of all CUs participating in the Interview provide data for a calendar year (Erhard 2021). For this study, we use data from the Interview only; approximately 97 percent of total expenditures, when defined as those reflected in the integration of Diary and Interview data, are collected in the Interview.¹⁷ Items such as postage and nonprescription drugs are not collected in the Interview Survey. Also not collected are detailed food and beverage expenses, but these are collected with global questions in the Interview.¹⁸

One challenge with using the CE Interview data is that it is difficult to generate representative annual expenditures at the consumer unit level since not all consumer units participate in all four interviews, and when they do, the expenditures do not necessarily reflect those made in a calendar year. Thus, for this study, we use quarterly data from 2015Q2 through 2021Q1 to produce the spending and consumption measures and resulting poverty statistics. We refer to each year in our series by year, for example 2015 with quarterly data collected in 2015Q2-

¹⁵ 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 income to make joint expenditure decisions. Financial independence is determined by the three major expense categories: housing, food, and other living expenses. To be considered financially independent, at least two of the three major expense categories are to be provided entirely, or in part, by the respondent. (<https://stats.bls.gov/cex/csxgloss.htm>)

¹⁶ For additional information in the CE, see: <https://stats.bls.gov/cex/home.htm> .

¹⁷ This percentage is calculated using 2020 internal Interview only data (Interview only tabular data released by request) and Integrated Diary and Interview published data (from <https://stats.bls.gov/cex/tables/calendar-year/mean/cu-all-multi-year-2013-2020.pdf>) . Mean Interview only total expenditures equal to \$59,384 and mean Integrated total expenditures equal to \$61,334.

¹⁸ See BLS Handbook of Methods (2021). <https://stats.bls.gov/opub/hom/cex/pdf/cex.pdf>

2016Q1. With this approach we assume that each quarter represents an independent sample that is representative of the U.S. population.¹⁹

Different measures of expenditures and consumption are produced. We start with the CE publication definition of total expenditures,²⁰ but subtract miscellaneous expenditures since they are not collected each quarter. Our most comprehensive measure of consumption includes the flow of services from owner occupied housing and the stock of vehicles owned, and public in-kind benefits. Excluded are expenditures for the following: those associated with owning a primary residence or vacation home; the purchase and financing of vehicles; cash contributions; life, endowment, annuities, and other personal insurance; retirement, pensions, and Social Security; healthcare; and education.

For comparison, we also produce an income measure using after tax income in the CE with the value of public in-kind benefits added. CE income also includes the cash value of Supplemental Nutrition Assistance Program (SNAP) benefits and the value of compensation in the form of meals and housing. After tax income is calculated using imputed federal and state income taxes based on TAXSIM.

Public In-kind Benefits

Public in-kind benefits include those for rental assistance, Low Income Home Energy Assistance Program (LIHEAP), the National School Lunch Program (NSLP), and the Supplementary Nutrition Program for Women, Infants, and Children (WIC). SNAP benefits are not imputed to the consumption measure as they are assumed to be accounted for implicitly in reports of food expenditures; it is expected that consumer units use SNAP benefits before other sources of income or credit to pay for food. Public in-kind transfers of rental assistance are derived from regression models using CE Interview collected rental unit characteristics and rent paid. Included in consumption is the difference in imputed and reported rents for renters receiving

¹⁹ This is in contrast to the approach taken by others who produce annual consumption measures (e.g., to study inequality or poverty) by restricting the data to consumer units with four complete interviews with population weights adjusted to reflect specific consumer unit characteristics (e.g., Fisher et al. 2015), multiplying each quarterly interview consumption values by four to approximate annual values (e.g., Meyer and Sullivan 2012), or adjusting the weights to reflect the number of quarterly interviews in which consumer units participated (e.g., Brouillette et al., 2021).

²⁰ Total expenditures consist of the transaction costs, including excise and sales taxes, of goods and services acquired during the interview or recordkeeping period. Expenditure estimates include expenditures for gifts but exclude purchases or portions of purchases directly assignable to business purposes. Periodic credit or installment payments on goods or services already acquired are also excluded. The full cost of each purchase is recorded, even though full payment may not have been made at the date of purchase. The order of the expenditures listed here follows the order of presentation in published CE tables. The major categories of expenditures include the following: food, housing, apparel and services, transportation, healthcare, entertainment, and other expenditures. *Other expenditures include the following: personal care products and service; reading; education; tobacco products and smoking supplies; miscellaneous; cash contributions; life, endowment, annuities, and other personal insurance; retirement, pensions, and Social Security.*

government assistance with rents, those living in public housing, and those living in rent-controlled units.

No information is collected in the Interview regarding LIHEAP, NSLP, or WIC. Data from the Current Population Annual Social and Economic Supplement (CPS-ASEC) were combined with CE data to impute LIHEAP benefits to consumer units and receipt of benefits from the NSLP and WIC. NSLP benefits from the USDA were assigned to consumer units by imputing NSLP receipt and using the same number of school days for all states for 2015 through 2019. Benefit levels for 2020 were assigned using a similar procedure, but the amount of the benefit varies based on the number of school days in session and assumptions regarding the number of days not in school, but with the possibility of receiving benefits via SNAP Electronic Benefit Transfers (EBT).²¹ WIC benefits from USDA were assigned to consumer units with imputed WIC receipt and varied by the number of infants, children, and mothers in the WIC sample. In addition to the average WIC food benefit being assigned to each member in a WIC consumer unit, benefits reflecting the value the infant formula rebates are also added. Over the last several years states have begun to distribute WIC benefits using EBT. For those states having fully implemented EBTs, only the infant formula rebates were assigned to WIC consumer units.²² As with SNAP EBT, food expenditures are assumed to implicitly account for WIC benefits distributed via EBT.

Rental Equivalence of Owned Homes and Rent for Renters

The flow of services from owner occupied housing are based on respondents' answers to the following question: *If someone were to rent this "dwelling" how much do you think it would rent for monthly, unfurnished, and without utilities?* This question is asked regarding one's primary residence, as well as for vacation homes, and is based on when the interview takes place. In order to include a value of rent for renters that is most comparable to current owners' rental equivalence, we used the last month of rent paid rather than the sum of the rents reported for the past three months (the reference period). The quarterly value of all rents paid are included in CE publications.

The rental equivalence of owners' primary residences (where they live at the time of the interview), and the rental equivalence for vacation homes and time shares are available in the CE Interview data files. Included in the most comprehensive consumption measure are the rental equivalences for primary residences and vacation homes for own use as well as those available for rent to others for part of the year. Not included in consumption are the rental equivalence for time shares.

²¹ See Shrider (2021).

²² See the following link to the USDA WIC EBT Status Report (January 2022) <https://www.fns.usda.gov/wic/wic-ebt-activities>.

Vehicle Flow of Services: Depreciation and Opportunity Costs

The value of the flow of services from owned vehicles is a function of vehicle depreciation and the opportunity cost of owning their stock of vehicles versus another asset. Depreciation and opportunity costs depend on the current market value of the stock of vehicles owned. Depreciation rates are first estimated using vehicle characteristics (original purchase price, make, model and year, and whether used or new). Then current market values are also estimated. Service flows from the stock of vehicles owned are produced only for cars and trucks since the characteristic information for the other vehicles (e.g., motorcycles, RVs, private airplanes) is not sufficient to estimate the current market values. Pooled quarterly data from CE Interview periods 1996Q1 through 2021Q1 are used to estimate age specific vehicle depreciation rates and current market values. There are unique age specific depreciation rates across all interview years. The opportunity costs are estimated using the current market value and long-term security rates. The ones that we use are the “Treasury Long-Term Average (Over 10 Years), Inflation-Indexed, Percent, Annual, Not Seasonally Adjusted.” The annual rates are derived from the monthly rates published on the FRED website: <https://fred.stlouisfed.org/series/DLTIIT>.

Relative Poverty Thresholds and Equivalence Scales

The relative poverty thresholds are derived based on the ranking of population weighted equivalized income, expenditures, and consumption. Consumer unit level values of income, expenditures, and consumption are converted to equivalized values by dividing by the number of equivalent adults in the consumer unit. The number of equivalent adults is based on applying the three-parameter scale to the adults and children in the consumer unit. The equivalence adjustment reflects that (1) on average, children need or consume less than adults; (2) as consumer unit size increases, expenditure and consumption needs do not increase at the same rate; and (3) the increase in need is larger for a first child of a single-parent family than the first child of a two-adult family. The three-parameter scale is calculated in the following way:

- One and two adults: scale = (number of adults)^{0.5}
- Single parents: scale = (number of adults + 0.8*first child + 0.5*other children)^{0.7}
- All other families: scale = (number of adults + 0.5*number of children)^{0.7}

In the calculation used to convert consumer unit income, expenditures, and consumption for two adults, the scale is set to 1.41. The economy of scale factor is set at 0.70 for other family types, which is within the 0.65 to 0.75 range recommended by the NAS panel that released a report on a new approach to measuring poverty in the U.S. (NRC 1995).

Absolute Poverty Thresholds

The absolute poverty thresholds are either anchored in 2015 or the thresholds are those that result when the poverty rate is anchored to 2015. Absolute anchored thresholds are based on

the anchor being the 2015 relative consumption_4 threshold. The Absolute thresholds based on anchoring the poverty rates are based on the poverty rate for the 2015 relative consumption_4 threshold. Both absolute thresholds are updated to 2016 through 2020 using the Chained CPI-U.²³

Appendix B References

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²³ The C-CPI-U employs a formula that reflects the effect of substitution that consumers make across item categories in response to changes in relative prices. The C-CPI-U designed to account for consumer substitution between item categories, any remaining substitution bias (as compared to the CPI-U) would be quite small. See <https://www.bls.gov/cpi/additional-resources/chained-cpi.htm>