Supplemental Poverty Measure Thresholds and Noncash Benefits

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Abstract

The Supplemental Poverty Measure (SPM) statistics, released by the U.S. Census Bureau since 2011, use resources that account for federal in-kind (noncash) benefits for food, rent, and utilities; however, the SPM thresholds are based on food, clothing, shelter, and utilities (FCSU) spending (with Supplemental Nutrition Assistance Program, SNAP, benefits implicitly included in reported food spending). Resources are based on internal Census Bureau Current Population Survey Annual Social and Economic Supplement (CPS ASEC) data. Thresholds are based on internal Bureau of Labor Statistics Consumer Expenditure Survey Interview (CE) data. Values for in-kind benefits are included in resources but no in-kind benefits other than SNAP are accounted for in the thresholds. Thus, thresholds and resources are inconsistently defined; consistency in the thresholds and resources was listed as necessary in the March 2010 Interagency Technical Working Group (ITWG) guidelines on developing a SPM. Accounting for noncash benefits in the thresholds is a challenge as the Consumer Expenditure Interview Survey (CE), the source upon which the thresholds are based, collects limited or no information on these other benefits. The CE does collect information regarding whether consumer units living in public housing or receive a assistance from the government with rents.

Various approaches can be used to impute in-kind benefits to the CE. For all but rent subsidies, the approach followed in this study is to apply a regression based approach to impute participation (binary yes or no) from the CPS ASEC public use (PU) to consumer units in the internal to BLS CE. Participation in the following in-kind benefit programs are imputed using CPS data: National School Lunch Program (NSLP), Women, Infants, and Children Program (WIC), and Low Income Housing Energy Assistance Program (LIHEAP). These imputed participations are used in combination with benefit levels from the U.S. Department of Agriculture (for NSLP and WIC) and U.S. Department of Health and Human Services (for LIHEAP). The market value of subsidized rental units is needed to account for the full value of rental shelter. Market values can be assumed to the same as HUD Fair Market Rents or they can be based on the market rents of unsubsidized renters in the CE.

Thresholds based on the CPS_PU Program Participation approach, with binary assignment of benefits to consumer units, along with market rents, are produced for 2012. These are compared to thresholds based on earlier tested methods including one using program eligibility guidelines and participation from administrative and other household survey data. No poverty rates using these thresholds are produced. Results reveal that the 2012 SPM thresholds do not differ statistically with the two imputation approaches.

Key Words: U.S. Consumer Expenditure Survey, U.S. Current Population Survey Annual Social and Economic Supplement (CPS ASEC) Poverty Measurement, Regression–based Imputation, In-Kind Government Benefits

1. **Introduction**

The Supplemental Poverty Measure (SPM) is designed to account for taxes and transfers aimed at alleviating the hardship of people living in low-income families, households, and consumer units. This is in contrast to the official measure of poverty that does not account for government spending for these programs. The SPM is designed neither to replace the U.S. official poverty measure nor to be used for government program assistance eligibility. The SPM is designed to provide information on aggregate levels of economic need at a national level or within large subpopulations or areas. Since 2011, the Bureau of Labor Statistics (BLS) and Census Bureau have been working together to produce SPM thresholds, resources, and poverty statistics.[1] This work is based on observations (guidelines) published by an Interagency Technical Working Group (ITWG 2010) in March 2010, and research conducted since the guidelines were published. As stated in the report,

> The Working Group was charged with developing a set of initial starting points to permit the U.S. Census Bureau, in cooperation with the Bureau of Labor Statistics (BLS), to produce a Supplemental Poverty Measure (SPM).
>
> In deciding on these observations, the Working Group placed value on *consistency between threshold and resource definitions* (italics added), data availability, simplicity in estimation, stability of the measure over time, and ease in explaining the methodology.

The inconsistency in SPM thresholds and resources (2011-2015) results from the inclusion of the values of in-kind benefits for food, rents, and energy in SPM resources, while SPM thresholds only account for Supplemental Nutrition Assistance Program (SNAP) in-kind benefits. This is because the U.S. Consumer Expenditure Interview Survey, the data source for the thresholds, collects limited or no data on these programs. Such an inconsistency can result in an overestimate of the economic well-being of people in the U.S. when defined in terms of SPM resources, and thus an underestimate of SPM poverty. A goal of the current research is to impute values to SPM thresholds for four of the federal in-kind benefit programs that are represented in SPM resources: National School Lunch Program (NSLP), Women, Infants, and Children Program (WIC), and Low Income Housing Energy Assistance Program (LIHEAP), and public and voucher rental subsidies. Such an improvement will move us forward in producing in a consistently defined SPM, with thresholds and resources reflecting the same underlying concept of needs and resources available to meet those needs.

Since the SPM was first produced, the value of in-kind benefits have been included in resources, but not thresholds.[2] Included in resources are benefits such as Supplemental Nutrition and

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[1] See http://www.census.gov/hhes/povmeas/methodology/supplemental/index.html and https://www.bls.gov/pir/spmhome.htmfor ongoing SPM research.

[2] For resources, see http://www.census.gov/hhes/povmeas/methodology/supplemental/index.html, and for thresholds, see https://www.bls.gov/pir/spmhome.htm

Assistance Program (SNAP), National School Lunch Program (NSLP), Women, Infants, and Children Program (WIC), rent subsidies, and energy assistance (e.g., Short 2015; Renwick 2015).

Over the past few years, and during this past year most intensively, research has been conducted to include in-kind benefits in SPM thresholds. Including in-kind benefits in thresholds has posed a particular challenge since only limited in-kind benefit information is available in the CE. For example, the CE collects information on whether rental housing is subsidized and the rent paid for the unit, but not the market value of the unit; it is this value that is needed to account for the cost of rental housing in the thresholds. In past research the indicator rental assistance variables were used in combination with Fair Market Rents from the U.S. Department of Housing and Urban Development (HUD) to impute market rents for subsidized units. With regard to food benefit programs, the BLS assumes that cash value of benefits from SNAP (previously known as food stamps) are included in reported food expenditure. However, no information is collected regarding the other food benefit programs, specifically the National School Lunch Program (NSLP) and Women, Infants and Children Program (WIC). Also no information is collected in the CE regarding the Low Income Housing Energy Assistance Program (LIHEAP).

In earlier research, Garner (e.g., 2010) used program eligibility guidelines and consumer unit characteristics to impute NSLP and WIC benefits. But eligibility rates do not equal participation rates, since not all eligible individuals or households participate in these programs. In more recent research, Garner, Gudrais, and Short (2015) have produced eligibility rates, adjusted by participation in the NSLP, WIC and LIHEAP using data from administrative sources. Garner and Hokayem (2012) used internal to the Census Bureau CPI ASEC data to impute NSLP and WIC participation probabilities. This same approach is used in this study, but with public use CPS ASCE data; LIHEAP imputations are produced for the first time to the CE using this approach. The CPS Program Participation approach is based on logit regression models using data from the CPS ASEC to impute NSLP, WIC, and LIHEAP participation probabilities for consumer units in the CE before assigning program benefits.

It is assumed that in-kind benefits reflect consumption needs and are time-specific. Thus, when in-kind benefits are imputed, they reflect the value of benefits that were in effect around the interview period. For example, for consumer units who participated in a CE Interview anytime within the 2008 quarter two to 2009 quarter one time period, in-kind benefits reflect 2008 program participation or eligibility, and benefits. Interviews that took place anytime within the 2012 quarter two to 2013 quarter one period reflect 2012 eligibility and benefit levels.
In-kind benefit program participation probabilities are used in combination with benefit levels form the U.S. Department of Agriculture (for NSLP and WIC) U.S. Department of Health and Human Services (for LIHEAP). Thresholds based on the CPS_PU Program Participation approach are produced for 2012 and compared to thresholds based on the CE Eligibility/Participation approach. No poverty rates using these thresholds are produced.

However, thus far, these thresholds have not been used by the Census Bureau for the regular publication of SPM poverty statistics. The purpose of this paper is to produce SPM thresholds,

testing different approaches that include the value of in-kind benefits. Implementing one of these approaches for SPM thresholds would result in a much improved SPM, and would thereby result in a poverty measure that is *consistently defined in terms of thresholds and resources*.

Conclusions from this study are:

1. Results reveal that the 2012 SPM thresholds do not differ statistically with the two imputation approaches.
2. Results are similar for the CPS_PU and CE when the CPS_PU regression coefficients are used to produce predicted probabilities of participation.
3. However, these results suggest that more attention needs to be paid to identifying differences in the und erly CPS_PU and CE samples before moving to the next step to impute 0,1 outcomes using multiple imputation methods.

The remainder of this paper is organized as follows. Section 2 presents a brief literature review of the literature related to participation in the NSLP, WIC, and LIHEAP. Section 3 presents an overview of the data and methods used in this study to produce the program participation probabilities and SPM thresholds. Section 4 presents our results regarding the predicted probabilities and SPM thresholds. Section 5 concludes.

2. Literature Review
a. Factors Associated with National Lunch Program (NSLP) Participation

Prior research identifies several factors associated with participation in the NSLP, including socioeconomic characteristics, participation in other food assistance programs, program features, alternative food choices, region and degree of urbanization. All children who eat a lunch at school participate in the NSLP, and all lunches in NLSP are subsidized. Children qualifying for a free or reduced price lunch receive a larger subsidy. Children from families with income below 130 percent of the federal poverty guidelines are eligible for a free lunch, and children from families with income between 130 percent and 185 percent of the poverty guidelines are eligible for reduced price lunch. Children from families with income over 185 percent of the poverty guidelines pay full price, although their lunches are still subsidized to a small extent (USDA 2011).

Most studies rely on either student or parent reports of participation or on administrative data. The definition of participation also varies. Some studies define participation as eating a lunch at school while other studies, unlike the USDA, define participation by whether a child qualifies for a free or reduced price. Dunifon and Kowaleski-Jones (2003) define participation by whether a child receives a free or reduced price meal. Using data from the 1997 Panel Study of Income Dynamics, Dunifon and Kowaleski-Jones (2003) find that black children or those having more siblings in the household were more likely to participate in the NSLP than white children or those with fewer siblings, respectively. Family income and paternal education were negatively associated with participation. Dunifon and Kowaleski-Jones also found a positive association

between the percentage of time the child received food stamps and NSLP participation. Using data from the 2001 Survey of income and Program Participation (SIPP) and the 1999-2002 National Health and Nutrition Examination Survey (NHANES), Newman and Ralston (2006) report NSLP participation is highest for children ages 8 to 13 for free, reduced price, and paid meals. Nearly two-thirds of participants for free meals come from female-headed households.

Similarly, Gordon et al. (2007), who examine eating lunch at school as well as receiving a free or reduced price meal, also find differential effects by race, income and the age composition of the children in the family, as well as by gender. Specifically, Hispanic and black children participate in the NSLP at higher rates than non-Hispanic white children and children of other races. Low income children are more likely to participate in the program than their more affluent counterparts. NSLP participation is also higher among boys than girls.

A few studies address the effects of maternal labor supply on NSLP participation, defined as eating a school lunch, with mixed results. Akin et al. (1983) find mother's work hours increase NSLP participation, but only for older children in the age group 12-18 years. Although Gleason (1995) suggests children of mothers who work are less likely to participate in the NSLP, this effect is statistically insignificant. Using data from the Early Childhood Longitudinal Study – Kindergarten Class (ECLS-K) and employing an instrumental variable approach to address the endogeneity of the maternal labor supply decision, Datar and Nicosia (2009) conclude that maternal employment significantly increased participation with larger effects for mothers working full-time than for those working part-time.

Program features also influence program participation, although the results of these studies are mixed. For example, Akin et al.(1983), Maurer (1984), and Gleason (1995) find negative price effects on participation rates while Barnes' (1988) analysis of all meal price types finds students are fairly nonresponsive to the price of meals. In their analysis of data from the NSLP Access, Participation, Eligibility and Certification Study, Moore et al. (2009) report that school type (i.e., elementary, middle, or high school) is the factor most strongly associated with participation among students certified for free and reduced price meals. Moore et al. (2009) analyze participation by number of school lunches served and by free or reduced price category.

b. Factors Associated with Women, Infants, and Children (WIC) Participation

Prior research reveals that factors influencing participation in the USDA's Special Supplemental Nutritional Program for Women, Infants and Children (WIC) are similar to those associated with NSLP participation. For example, socioeconomic characteristics, participation in other public assistance programs, and program features are associated with WIC participation.

Using data from the 1996 SIPP panel and the 1998-2001 CPS ASEC, Bitler, Currie and Scholz (2003) examine the determinants of postnatal WIC participation. Overall, their findings suggest that individual characteristics play a larger role in participation than state-level factors. For example, black and Hispanic mothers are more likely to participate than their non-Hispanic white counterparts; however, Asian mothers are less likely to participate. Having low-income

and being married are positively associated with postnatal WIC participation, whereas having attended college and suburban residences are negatively associated with postnatal WIC participation. Other studies find similar factors are associated with prenatal WIC participation (Tiehen and Jacknowitz 2008; Swann 2007). Again, non-Hispanic black and Hispanic mothers are more likely to access WIC prenatally than their non-Hispanic white counterparts (Swann 2007). Prenatal WIC participation is negatively associated with education attainment and age (Tiehen and Jacknowitz 2008; Swann 2007). Swann (2007) also finds that not having health insurance and being a single mother increases the likelihood of prenatal WIC participation. In addition, state policies also affect prenatal WIC participation. Studies including WIC program characteristics find prenatal participation is lower in states requiring income documentation to establish eligibility and is higher in states that allow TANF receipt or Medicaid eligibility to confer automatic WIC eligibility (Oliveira and Frazao 2009; Swann 2010).

A few studies examine the timing and dynamics of WIC participation. For example, Swann (2007) uses the 1988 National Maternal and Infant Health Survey (NMHS) and finds a strong association between previous WIC participation and prenatal WIC participation. Using data from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), Jacknowitz and Tiehen (2009) examine transitions into and out of the WIC program from pregnancy until the child is age one. They conclude that prenatal WIC coverage is strongly correlated with postnatal receipt of WIC and that economic advantage plays an important role in determining exit from WIC. In a similar study, Jacknowitz and Tiehen (2010) find that mothers with a college degree and employed mothers tend to delay WIC participation. Using data from the 2001 SIPP panel, Castner et al. (2009) find that mothers in households participating in other public assistance programs, in combination with declining earnings, have an increased likelihood of entering WIC. Bitler and Currie (2004) also use SIPP data to demonstrate that state Medicaid policies that influence infant take-up rates had long-term effects on WIC participation.

c. Factors Associated with Low-Income Energy Assistance Program (LIHEAP Participation

LIHEAP participation is modeled includes variables that are used in determining eligibility for LIHEAP by states administering the program for HHS. In addition, additional variables are included based on the research of Renwick (2015). In that study, Renwich developed a LIHEAP regression model to impute participation and benefit levels from the internal CPS ASEC to the American Community Survey.

3.   Methods to Impute In Kind Benefits to CE Data

a. Program Participation to CE Data from CPS_PU Data

This section describes two methods to impute NSLP and WIC participation rates to consumer units in the CE: (1) The CPS Program Participation Method first proposed by Garner and Hokayem (2012); and (2) The CE Eligibility/Participation approach of Garner, Gudrais, and Short (2015).

Both approaches results in predicted probabilities of participation, not 0,1 outcomes—our ultimate desired result. Both approaches use the same benefit levels to assign benefits to consumer units. The key difference in the two methods rests on the assumption of participation rates of consumer units in the programs. The first method estimates the probability of program take-up and assigns benefits based on this probability (CPS Program Participation Method). In contrast, the second method first imputed eligibility based on program benefits then then adjusts these using participation rates available from federal agencies (USDA and HHS) or published in the literature. Both use consumer unit characteristics. The CPS_PU Program Participation Method is described first. Since the focus of this study is the CPS-PU approach, we refer interested readers to Garner, Gudrais, and Short (2015) for a detailed description of the CE Eligibility/Participation approach.

The CPS Program Participation Method estimates a model predicting program participation using data from the CPS_PU ASEC. Results from this model are used to impute participation rates for consumer units in the CE before assigning program benefits. The CPS_PU model specifications draw on the findings from the previous literature on NSLP, WIC, and LIHEAP participation, mainly that program participation is a function of demographic characteristics, socioeconomic characteristics, and participation in other public assistance programs. A multinomial logit model is used to estimate NSLP participation, and a logit model is used to predict WIC and LIHEAP participations.

The motivation for a multinomial logit model for the NSLP comes from the method of adding this benefit to measures of resources. All children who eat a lunch at school participate in the NSLP, and all lunches in the NSLP are subsidized. Children qualifying for a free or reduced price school lunch receive a larger subsidy than those buying a school lunch that is not free or reduced price. An estimated cash value is added to resources for children reported as usually eating lunch at school. In the CPS, the reference person identifies the number of children who "usually" ate a hot lunch.[3] In a separate question, the reference person identifies the number of children who received a free or reduced price lunch.[4] The CPS instrument does not distinguish between children receiving a free lunch and children receiving a reduced price lunch. The answers to these questions are used to identify the three mutually exclusive alternatives for the multinomial logit model:

1. At least one child in the household ate a subsidized school lunch **and** the child qualified for a free or reduced price (referred to "Subsidized Lunch with a Free or Reduced Price").

2. At least one child in the household ate a subsidized school lunch but no child or children in the household qualified for a free or reduced price (referred to "Subsidized Lunch").

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[3] The CPS question asks, "During 20XX, how many of the children in this household usually ate a complete hot lunch offered at school?"

[4] The CPS question asks, "During 20XX, how many of the children in this household received free or reduced price lunches because they qualified for the federal school lunch program?"

3. No child in the household eats a subsidized school lunch or qualified for a free or reduced price (referred to "No Subsidized Lunch"). This means that the child does not eat a school-provided lunch of any type.

Underlying the multinomial logit model is an additive random utility model where a household chooses the option yielding the highest utility. We do not observe the utility of each alternative, just the alternative chosen. The multinomial logit model is specified in the following way with a normalization for estimation:

$$\Pr(y = 1) = \frac{e^{X_i\beta^1}}{1+e^{X_i\beta^1}+e^{X_i\beta^2}} \quad \text{(Subsidized Lunch with a Free or Reduced Price)}$$

$$\Pr(y = 2) = \frac{e^{X_i\beta^2}}{1+e^{X_i\beta^1}+e^{X_i\beta^2}} \quad \text{(Subsidized Lunch)}$$

$$\Pr(y = 3) = \frac{1}{1+e^{X_i\beta^1}+e^{X_i\beta^2}} \quad \text{(No Subsidized Lunch)} \quad (1)$$

where y represents the three outcomes regarding school lunches. A probability for each outcome is estimated for each household i. The errors underlying the model are assumed to be independently and identically distributed with a Type-I extreme value distribution. The model produces coefficient estimates for each alternative (β^1, β^2, β^3) that represent the attractiveness of that alternative relative to a base alternative (Cameron and Trivedi 2005). Alternative 3, "No Subsidized Lunch," is the base alternative.

The motivation for the WIC and LIHEAP logit models for WIC and LIHEAP participations also comes from the method of adding WIC and LIHEAP benefits to measures of resources. This method adds the value of WIC and LIHEAP benefits based on program information from the U.S. Department of Agriculture and U.S. Department of Health and Human Services, respectively. It relies on CPS questions asking about anyone in the household who participated in WIC and if the household received energy assistance in the last year.[5] Theses questions are used to determine the outcomes of the logit models.

The logit models are specified in the following way:

$$\Pr(y = 1) = \frac{1}{1+e^{X_i\beta}} \quad (2)$$

where y is a dichotomous variable equal to 1 for WIC program participation and zero otherwise, and equal to 1 for LIHEAP program participation and zero otherwise. The error for the logit model follows a Type-I extreme value distribution.[6]

In all three models, X_i is a vector of demographic characteristics for the head of household, household characteristics, and variables representing public assistance and geography of

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[5] The CPS question asks, "At any time last year, (were you/was anyone in this household) on WIC, The Women, Infants, and Children Nutrition Program?" and "Since last October, did the household receive energy assistance?" [need to edit LIHEAP question]

[6] See Cameron and Trivedi (2005) and Greene (1993) for a further discussion of multinomial logit and logit models.

residence. Five years of data are used to produce the thresholds thus five years of CPS_PU data are used in model estimation. All data are pooled for the regressions. Thus, dummy variables for 2008-2012, omitting the year 2008, are included. Since programs can be administered differently across states, state fixed effects are also included; Alabama is the omitted state variable in the estimation.

Each model specification is estimated via maximum likelihood. X_i differs for each specification only in the age composition of children variables. Since the NSLP program is focused on school-age children, the NSLP specification only includes a count of the number of children in the household for the age groups corresponding to elementary school (ages 5-10), middle school (ages 11-13), and high school (ages 14-18). Similarly, the WIC program is focused on infants and young children below the age of 5; the WIC specification only includes a count of the number of children in the household between ages 0 and 5. The LIHEAP program is focused on the elderly, disabled, and household units with children. The LIHEAP model, in addition the other variables noted, also include dummy variables for single parent, whether a disabled member is present in the household or consumer unit, and renter versus owner.

Table 1 lists the CPS_PU explanatory variables and their definitions used in the multinomial and logit model specifications.

b. Assigning Benefits

(1) National School Lunch Program (NSLP)
The second largest food and nutrition program in terms of expenditures (after the Supplemental Nutrition Assistance Program, SNAP) is the National School Lunch Program (NSLP). The NSLP offers free, reduced-price, and subsidized meals for school-aged children. Children qualifying for a free or reduced price lunch receive a larger subsidy. Parents or guardians apply in the beginning of the school year for their children to receive school meals during the year. The school administers the program and records which children receive which type of subsidy. The majority of students participating in the program are in public schools; however, students in private schools can also participate when the program is administered by the school.

The imputed NSLP values are based on payment rates per meal and commodity school lunch program values. Payment rates and commodity values are available online via the U.S. Department of Agriculture (USDA) web site (http://www.fns.usda.gov/nslp/national-school-lunch-program-nslp). For this study (and for Census Bureau estimates), the average (over the 48 contiguous states) reported school lunch payment rates, for schools in which less than 60 percent of the lunches served during the second preceding school year were served free or at a reduced price, are assigned to each student. The appropriate per-meal value (for either free, reduced, or paid meals, depending on the level of eligibility) is multiplied by the participation-adjusted number of children between the ages of 5 and 18, and then by 167, the number of

days students are assumed to be in school. This is the same number of days used for estimating NSLP benefits in SPM resources by the Census Bureau.

(2) Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) is designed to provide food assistance and nutritional screening to nutritionally at risk, low-income women, infants, and children ages one to four. Assistance is provided in the form of food, nutrition education, and referrals to health care and other social services. Like SNAP, WIC is funded by the USDA; it is the third largest program based on aggregate benefits, after SNAP and the NSLP. CE does not collect information on WIC. Unlike for SNAP, we assume WIC benefit values are not included in food expenditures and thus are not currently accounted for in SPM thresholds. WIC benefits are not associated with specific dollar amounts like SNAP benefits, but rather are provided in the form of prescribed food packages in which participants may only purchase specific food items, package sizes, and quantities.

CE characteristics data are used in combination with average monthly WIC benefits to produce quarterly values for the CE sample. Average WIC benefit data are available on the USDA web site (http://www.fns.usda.gov/wic/women-infants-and-children-wic).

(3) Low Income Home Energy Assistance Program (LIHEAP)

The Low Income Home Energy Assistance Program (LIHEAP) provides three types of energy assistance to low income residents. This program is administered by the U.S. Department of Health and Human Services (HHS). Under LIHEAP, states may help to pay heating or cooling bills, provide allotments for low-cost weatherization, or provide assistance during energy-related emergencies. States determine eligibility and can provide assistance in various ways including cash payments, vendor payments, two-party checks, vouchers/coupons, and payments directly to landlords. In some states, LIHEAP benefits are not restricted to paying for heating and cooling when received as additional money income to the consumer unit; this additional income can be used by the consumer unit for expenses other than utilities. In these cases, LIHEAP benefits would be included in resources but not in SPM thresholds. No information regarding LIHEAP benefits is collected in the CE. However, the CE Interview does collect information regarding types of fuels and expenditures, and if utilities are included in rents. Whether the fuel is used for heating and cooling versus for cooking is not known.
The value of LIHEAP benefits is a weighted average of average cooling and heating benefit values and participation rates obtained from HHS (2014). Because of limited availability of data, 2009[7] values are used for all years (but updated with the All-Items CPI).

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[7] After the thresholds were produced using the 2009 LIHEAP, 2010 data (HHS 2015) became available. However, as a full five years of LIHEAP data are needed for the SPM thresholds, we made a decision to just use the 2009 data and adjust them by the CPI to reflect changes in prices. Changes in LIHEAP and utilities by consumers and heating and cooling days can only be accounted for using the yearly data to which we do not have access.

c. SPM thresholds

The estimation sample is composed of consumer units with exactly two children. Since the number of people in a consumer unit can differ from one case to the next (i.e., the number of adults can vary although the number of children is fixed at two), an equivalence scale is needed to equalize expenditures across all consumer units. The number of equivalent adults is determined by the number of adults and children in the household. For each consumer unit, FCSU expenditures are divided by the number of adult equivalent units. Each person in the consumer unit is assigned the adult equivalent value of FCSU expenditures for his or her consumer unit. Adult equivalent expenditures are then converted to those for two-adult two-child consumer units by applying the equivalence scale factor for this CU type to the single adult equivalent value.

As recommended in the ITWG guidelines, the three-parameter equivalence scale is used to adjust FCSU expenditures. The three-parameter scale allows for a different adjustment for single parents (Betson, 1996). This scale has been used in several BLS and Census Bureau studies (for example, see: Garner and Short 2010; Johnson et al., 1997; Short et al., 1999; Short 2001). The three-parameter scale is shown below.

One and two adults: $scale \ = \ (adults)^{0.5}$ (3a)

Single parents: $scale = (adults + 0.8 * firstchild + 0.5 * otherchildren)^{0.7}$ (3b)

All other families: $scale = (adults + 0.5 * children)^{0.7}$. (3c)

The equivalence scale for two adults is set to 1.41. The economy of scales factor is set at 0.70 for other family types.

The SPM thresholds are based on a range of expenditure, plus the value of in-kind benefits at the consumer unit level, around the 33rd percentile of FCSU expenditures for two-adult two-child consumer units (but based on expenditures for all consumer units with exactly two children as described above). In this study, the imputed in-kind NSLP and WIC benefits are included in FCSU expenditures. As in earlier studies, SNAP benefits are assumed to be implicitly included in food expenditures and rent subsidies are also imputed and included. Thus, whenever "FCSU" is used in this paper, FCSU expenditures are assumed to include imputed subsidies for NSLP, WIC, and LIHEAP kin-Lind benefits, unless otherwise noted.

To identify the range around the 33rd percentile, FCSU expenditures are ranked from lowest to highest, weighting the data by the number of consumer units in the U.S. The range is defined as within the 30th and 36th percentile points in the FCSU distribution. Restricting the estimation sample to this range of expenditures results in thresholds that are based on the expenditures of a subsample of the original estimation sample composed of two-child consumer units.

The ITWG notes that separate SPM thresholds be produced for owners with mortgages, owners without mortgages, and renters. The reasoning behind this guideline is that thresholds should reflect differing spending needs and housing represents the largest share of the FCSU based thresholds (see Garner and Short 2010). The ITWG method to account for spending needs by housing status uses the within range means of FCSU and shelter plus utilities overall and, in addition, the means of shelter plus utilities for groups of consumer units distinguished by housing status. To produce housing-based FCSU thresholds, first a SPM threshold that is not distinguished by housing status is produced. The overall threshold equals the mean of the range of FCSU expenditures times 1.2 to represent a multiplier accounting for other basic goods and services. Second, expenditures for overall shelter and utility expenditures are substituted by the shelter plus utility expenditures for each housing status subgroup. Below is the equation used to produce the FCSU thresholds for two-adult, two child consumer units and for each j housing status group.

$$Threshold_j =$$

$$\left[(1.2 * FCSU) - (Shelter\&Utilities) + (Shelter\&Utilities)_j \right]_{Within\ 30th\ to\ 36th\ percentile\ range} \quad (7)$$

Variables *FCSU* and *Shelter&Utilities* are the means for all consumer units within the range without distinction by housing status, while *(Shelter&Utilities)$_j$* refers to the mean of shelter and utilities within the range by housing status group.

4.   Results

a. Predicted Probabilities and Benefit Values

The analysis, using the CPS ASEC data, are for a pooled sample of households whose data refer to calendar years 2008-2012 but are collected in 2009 through 2013. CE data to which the CPS program participation model coefficients are applied are collected in 2008 quarter two through 2013 quarter one; these data to refer to expenditures made in the previous three months of the interviews and essentially refer to the same time period as the CPS data, 2008 through 2012.

The CE data are collected quarterly, so the CE sample is pooled, assuming data from each quarter are independent of data from other quarters. Pooling the data allow for larger sample sizes by state for estimating state fixed effects. To create a consistent sample between the CPS ASEC and the CE, the CPS estimation sample covers all states excluding Iowa, New Mexico, North Dakota, Oklahoma, Vermont, Wyoming, Puerto Rico, Rhode Island.[8]

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[8] The Consumer Expenditure Survey, during the periods upon which this study is based, did not sample consumer units in these states. The concern for the CE is to produce population estimates by region, not states.

The universes for the CPS regression models for NSLP, WIC, and LIHEAP rely on different demographic qualifications. The universe for the NSLP model comes from combining the universes of the two CPS questions used to generate the model alternatives outlined in the previous section. These questions cover a child eating hot lunch and the number of children who receive a free or reduced price lunch. To be in the universe for a child eating a hot lunch, a household must have a child between the ages of 5 and 18, inclusive. To be in the universe for children who receive a free or reduced price lunch, a household must have a child between the ages of 5 and 18, inclusive. For outcome 1, they would need to answer YES to the NSLP participation question. The CE universe sample includes all consumer units with a child between the ages of 5 and 18 and whose consumer unit made and expenditure for school meals. The universe for the WIC model comes from the one CPS WIC question about whether anyone in the household participated in WIC. To be in this universe a household had to include at least one female member age 15 or above with a child less than 6 years of age, or include at least one female member between the ages of 15 and 45.[9] The CE WIC universe sample is defined according to the same demographic requirements for the CPS. The LIHEAP universe includes all households/consumer units.

Tables 2, 3, and 4, respectively, include the NSLP, WIC, and LIHEAP model variables, and their means and standard errors. In each case, means and standard errors are based on replicate weights using balanced repeated replication (BRR) with Fay's method in the case of the CPS_PU and balanced repeated replication in the case of the CE.[10]

Tables 5, 6, and 7 present the results of the multinomial logit and and two sets of logit estimations, respectively. [11] Column 1 in Table 5 contains the estimates for the choice "Subsidized Lunch with a Free or Reduced Price," and column 2 in Table 5 contains the estimates for the "Subsidized Lunch" choice. The choice "No Subsidized Lunch" is the reference outcome. The estimated coefficients do not represent marginal effects. The coefficients in Tables 6 and 7 contain the estimates for the "yes" choice for WIC, in Table 6, and for LIHEAP, in Table 7.

The results of applying the CPS_PU estimated coefficients to the CE sample and also to the CPS_PU sample, for validation, are presented first as kernel density plots and second as average participation rates. To produce the predicted probabilities, the CPS_PU estimated model coefficients are applied to household and consumer unit characteristics. Kernal density plots[12]

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[9] Defining the universe in this way also includes potentially pregnant women eligible for WIC.

[10] See https://www.bls.gov/cex/anthology/csxanth5.pdfor a description of BRR applied to the CE (Blaha 2003) and to http://smpbff2.dsd.census.gov/pub/cps/march/Use_of_the_Public_Use_Replicate_Weight_File_final_PR_2010.doc for a description of the Fay's method applied to the CPS (Judkins 1990). Also see Garner (2010b) for an application of the method to NAS thresholds.

[11] Any household reporting negative income or zero income was dropped from the models before estimation in order to include the natural log of household income. .

[12] The kernel density plots are generated using the proc KDE procedure in SAS with bandwidth multiplier of 3 and the over smoothed option for the smoothing parameter. The predicted probabilities are multiplied by 100 before generating the kernel density plots. *Kernel density estimation* is a nonparametric technique for density estimation

presented in Figure 1 for the NSLP and Figure 2 for WIC and LIHEAP. Plots on the left side are for the CPS_PU and the ones on the right are for the CE; all plots are based on the CPS_PU coefficients. The figures are based on the pooled weighted samples.

The average predicted probabilities in Tables 8 and 9 are first produced by year and then for the pooled samples. For the CPS_PU, the probabilities are based on models estimated with household replicate weights. Average CE probabilities are weighted using CU replicate weights.

Table 9 includes these probabilities for households and consumer units that have exactly two children. The focus on two children is because the SPM threshold estimation sample includes only two children. In the last row of Table 9, probabilities for the SPM sample, upon which the 2012 SPM thresholds are based, are presented. For threshold production, the pooled sample is used.

NSLP, WIC, and LIHEAP benefits are imputed for each quarter of the CE data. Then they are added to expenditures for food, clothing, shelter and expenditures and annualized before the CPS thresholds are produced. The per person dollar value of benefits are the same for the CPS_PU Program Participation and CE Eligibility/Participation approaches.

SPM thresholds and standard errors, based on the CPS_PU Program Participation Method and the CE Eligibility Method, are presented in Table 10. All thresholds and standard errors are based on replicate weights; the BLS provides 44 replicates for the production of statistics for the CE data. Thresholds that include food stamps are presented for comparison to those with imputed benefits for NSLP, WIC, and LIHEAP using the two methods. Figure 3 shows the relative magnitude of the SPM thresholds.

Statistical tests are conducted to determine if thresholds based on the CPS_PU and CE Methods are statistically different from each other, and whether there are differences between thresholds based on housing status within the imputation sets. The null hypothesis is that the difference is equal to zero. When comparing the CE and CPS based thresholds, a statistical test of differences in means for correlated data is used

5. Conclusions

There were two aims for this study: (1) to impute in-kind benefits for NSLP and WIC to the CE Interview based on a newly developed CPS Program Participation Method, and (2) to produce housing specific SPM thresholds using the imputed NSLP and WIC benefits based on this method. To evaluate the new method, SPM thresholds were also produced using an earlier CE Eligibility Method. In some cases, for 2009 thresholds, applying the CPS Program Participation

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in which a known density function (the *kernel*) is averaged across the observed data points to create a smooth approximation. PROC KDE uses a Gaussian density as the kernel, and its assumed variance determines the smoothness of the resulting estimate.

Method to the CE sample resulted in lower thresholds than when the CE Eligibility Method was used. This was expected since it is well known that fewer people and families participate in in-kind benefit programs than are eligible. Statistical tests of differences in the CE and CPS paired thresholds suggest that SPM thresholds are statistically significantly different overall, for owners with mortgages, and for owners without mortgages. The matched pair of renter CE and CPS Method thresholds are not statistically significantly different from each other at the significance level applied in this study.

Another issue examined in this study was whether thresholds for owners with mortgages, owners without mortgages, and renters differ within imputation method. Statistical tests of differences in housing-specific SPM thresholds, within imputation method type group, reveal that housing tenure thresholds are statistically different for owners without mortgages compared to renters and for owners without mortgages compared to owners with mortgages.

While the CPS Program Participation Method and CE Eligibility Method offer ways to impute in-kind benefits in the CE, additional methods should be explored. An alternative method is a statistical matching model. The model developed in this paper can be used as a basis for a predictive mean matching model where CE consumer units are matched to CPS households based on the predicted probabilities. The matched CPS household would serve as the "donor" observation for the NSLP or WIC benefit of the CE consumer unit. This method would need to rely on the public use CPS data (rather than the internal data) since, under current federal government regulations it is not possible to share internal household survey data across agencies. To test how well such a matching model might perform, the model created for this study could be applied to the CPS public use data with results compared to those from the current study.

Exact outcomes, rather than probabilities, are needed to assign benefits to CE consumer units in order that the FCSU distribution, underlying the SPM thresholds, reflect values for only participating consumer units. Otherwise, the distribution would not correctly reflect the consumption needs of consumer units with the benefits. Using predicted probabilities alone results in everyone in the demographic groups (used in the estimations) being assigned some benefit values--too little would be assigned to too many consumer units. More correctly would be an assignment to those expected to be participating in the programs, and thus, the FCSU distributions would reflect this—so more being assigned to fewer consumer units.

Once there is agreement on the method to impute in-kind benefits for school lunches and WIC, SPM thresholds with these benefits can be produced at the BLS. These then would be sent to the Census Bureau for geographic price adjustment.[13] The price-adjusted thresholds would

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[13] For a discussion of geographic adjustment methods and research, see Renwick (2009a,b, 2010, 2011). Also see Ziliak (2010).

then be used by Census Bureau staff to produce poverty statistics based on the ITWG guidelines.

Conclusions from this study are:

1. Results reveal that the 2012 SPM thresholds do not differ statistically with the two imputation approaches.
2. Results are similar for the CPS_PU and CE when the CPS_PU regression coefficients are used to produce predicted probabilities of participation.
3. However, these results suggest that more attention needs to be paid to identifying differences in the underly CPS_PU and CE samples before moving to the next step to impute 0,1 outcomes using multiple imputation methods. The z scores for the statistical tests are shown in Appendix Table A.

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Table 1: Explanatory Variables in Multinomial Logit and Logit Models

Variable Name	Description
CE Reference Person or CPS Head of Household Variables	
Age	
Age	Age in years
Age_squared	Age squared
Elderly	Reference person or head of household is aged 62 or older
Race	
White, non-Hispanic	Dummy variable for white, non-Hispanic
Black, non-Hispanic	Dummy variable for black, non-Hispanic
Hispanic	Dummy variable for Hispanic
Other race (excl. category)	Dummy variable for other race/non-Hispanic groups
Gender	
Male (excl. category)	Dummy variable for male
Female	Dummy variable for female
Education	
Low education (excl. category)	Dummy variable for low education (less than 12 years)
Medium education	Dummy variable for medium education (high scholol graduate to college graduate with Bachelor's degree, inclusive)
High education	Dummy variable for high education (greater than Bachelor's degree)
Marital Status	
Married (excl. category)	Dummy variable for married
Widowed	Dummy variable for widowed
Past marriage	Dummy variable for past marriage
Never married	Dummy variable for never married
Employment	
Not in labor force (excl. category)	Dummy variable for not in the labor force
Unemployed	Dummy variable for 0 hours worked
Part-time	Dummy variable for hours worked between 0 and 35
Full-time	Dummy variable for greater than or equal to 35 hours worked
Household Variables	
Household income	Household income
Household size	Household size
Housing Tenure	
Owner (excl. category)	
Renter	
Presence of disabled member	Dummy variable when at least one person in CU/HH is disabled
Single parent	Dummy variable when a single parent with child or children
Age composition of children	
Number of children 0-5	Number of children between ages 0 and 5, inclusive
Number of children 5-10	Number of children between ages 5 and 10, inclusive
Number of children 11-13	Number of children between ages 11 and 13, inclusive
Number of children 14-18	Number of children between ages 14 and 18, inclusive
Public Assistance	
Foodstamp	Dummy variable for anyone in household receiving food stamps
Welfare	Dummy variable for anyone in household receiving welfare
Medicaid	Dummy variable for anyone in household covered by Medicaid
Residence	
Urban	Dummy variable for residing in a metropolitan area
Rural (excl. category)	Dummy variable for residing in a nonmetropolitan area

Table 2: Weighted Sample Summary Statistics for NSLP Model: CPS_PU and CE Interview

Variable Name	CPS_PU ASEC 2009-2013 (n=121,843)[a]		CE Interview 2008Q2-2013Q1 (n=38,497)[b]	
	Mean	Standard Error	Mean	Standard Error
Head of Household/ Reference Person Variables				
Age	42.06	0.035	41.96	0.134
Race				
White, non-Hispanic	0.59	0.002	0.59	0.013
Black, non-Hispanic	0.15	0.001	0.15	0.010
Hispanic	0.19	0.001	0.20	0.015
Other race (excl. category)	0.07	0.001	0.06	0.003
Gender				
Male (excl. category)	0.47	0.002	0.42	0.006
Female	0.53	0.002	0.58	0.006
Education				
Low education (excl. category)	0.14	0.001	0.15	0.007
Medium education	0.76	0.001	0.75	0.008
High education	0.10	0.001	0.10	0.003
Marital Status				
Married (excl. category)	0.66	0.002	0.71	0.006
Widowed	0.03	0.001	0.02	0.002
Past married	0.17	0.001	0.16	0.003
Never married	0.14	0.001	0.11	0.004
Employment				
Not in labor force (excl. category)	0.20	0.001	0.19	0.005
Unemployed	0.07	0.001	0.02	0.001
Part-time	0.12	0.001	0.14	0.003
Full-time	0.61	0.002	0.66	0.005
Household/Consumer Unit Variables				
Household Income, 2012$	$84,596	$294	$78,695	$1,046
Household/ Consumer Unit Size	4.09	0.004	4.15	0.027
Age composition of children				
Number of children 5-10	1.57	0.007	0.73	0.009
Number of children 11-13	0.80	0.005	0.35	0.005
Number of children 14-18	1.33	0.006	0.64	0.008
Public Assistance				
Foodstamp	0.16	0.001	0.15	0.006
Welfare	0.03	0.001	0.02	0.002
Medicaid	0.33	0.002	0.18	0.007
Residence				
Urban	0.71	0.002	0.87	0.022
Rural (excl. category)	0.29	0.002	0.13	0.022
School Lunch Participation (%)				
Subsidized Lunch, FR	27.9%	0.001		
Subsidized Lunch	39.9%	0.002		
No Subsidized Lunch	32.2%	0.002		

[a] U.S. Census Bureau, Current Population Survey, 2009-2013 Annual Social and Economic Supplement. For outcomes, "Subsidized, FR" refers to receiving a subsidized lunch with a free or reduced price, "Subsidized Lunch" refers to receiving a subsidized paid lunch, and "No Subsidized Lunch" refers to not receiving a subsidized lunch. Standard errors are estimated using replicate weights (Fay's method). For information on sampling and nonsampling error, see www.census.gov/apsd/techdoc/cps/cpsmar10.pdf .
[b] Bureau of Labor Statistics, U.S. Department of Labor, Consumer Expenditure Interview Survey, 2008Q2-2013Q1. Sample statistics are weighted using the quarterly consumer unit weights. For information on sampling and nonsampling error, see https://www.bls.gov/cex/anthology/csxanth5.pdf

Table 3: Weighted Sample Summary Statistics for WIC Model: CPS_PU and CE Interview

Variable Name	CPS_PU ASEC 2009-2013 (n=314,331)[a]		CE Interview 2008Q2-2013Q1 (n=61,006)[b]	
	Mean	Standard Error	Mean	Standard Error
Head of Household/ Reference Person Variables				
Age	49.35	0.035	38.48	0.174
Race				
White, non-Hispanic	0.69	0.001	0.62	0.012
Black, non-Hispanic	0.13	0.001	0.14	0.009
Hispanic	0.12	0.001	0.17	0.012
Other race (excl. category)	0.06	0.000	0.07	0.003
Gender				
Male (excl. category)	0.50	0.001	0.39	0.006
Female	0.50	0.001	0.61	0.006
Education				
Low education (excl. category)	0.12	0.001	0.13	0.006
Medium education	0.77	0.001	0.76	0.006
High education	0.11	0.001	0.11	0.003
Marital Status				
Married (excl. category)	0.51	0.001	0.62	0.005
Widowed	0.09	0.001	0.02	0.002
Past married	0.18	0.001	0.13	0.003
Never married	0.21	0.001	0.22	0.005
Employment				
Not in labor force (excl. category)	0.33	0.001	0.17	0.005
Unemployed	0.05	0.000	0.02	0.001
Part-time	0.10	0.001	0.15	0.005
Full-time	0.51	0.001	0.67	0.006
Household/Consumer Unit Variables				
Household Income, 2012$	$72,740	$170	$72,744	$877
Household/ Consumer Unit Size	2.58	0.003	3.43	0.028
Age composition of children				
Number of children 0-5	1.05	0.005	0.45	0.007
Public Assistance				
Foodstamp	0.10	0.001	0.13	0.006
Welfare	0.02	0.000	0.02	0.001
Medicaid	0.19	0.001	0.15	0.006
Residence				
Urban	0.71	0.001	0.87	0.021
Rural (excl. category)	0.29	0.001	0.13	0.021
WIC Participation (%)	3.3%	0.000		

[a] U.S. Census Bureau, Current Population Survey, 2009-2013 Annual Social and Economic Supplement. Standard errors are estimated using replicate weights (Fay's method). For information on sampling and nonsampling error, see www.census.gov/apsd/techdoc/cps/cpsmar10.pdf .

[b] Bureau of Labor Statistics, U.S. Department of Labor, Consumer Expenditure Interview Survey, 2008Q2-2013Q1. Sample statistics are weighted using the quarterly consumer unit weights. For information on sampling and nonsampling error, see https://www.bls.gov/cex/anthology/csxanth5.pdf

Table 4: Weighted Sample Summary Statistics for LIHEAP Model: CPS_PU and CE Interview

Variable Name	CPS_PU ASEC 2009-2013 (n=340,617)[a]		CE Interview 2008Q2-2013Q1 (n=136,935)[b]	
	Mean	Standard Error	Mean	Standard Error
Head of Household/ Reference Person Variables				
Age	50.19	0.035	49.60	0.274
Elderly	0.27	0.001	0.26	0.005
Race				
White, non-Hispanic	0.70	0.001	0.70	0.010
Black, non-Hispanic	0.13	0.001	0.12	0.008
Hispanic	0.12	0.001	0.12	0.010
Other race (excl. category)	0.06	0.000	0.06	0.002
Gender				
Male (excl. category)	0.51	0.001	0.47	0.004
Female	0.49	0.001	0.53	0.004
Single Parent	0.0001	0.000	0.06	0.002
Disabled Household Member	0.37	0.002	0.09	0.003
Renter	0.33	0.001	0.34	0.005
Education				
Low education (excl. category)	0.12	0.001	0.14	0.005
Medium education	0.77	0.001	0.75	0.005
High education	0.11	0.001	0.11	0.003
Marital Status				
Married (excl. category)	0.51	0.001	0.52	0.005
Widowed	0.10	0.001	0.09	0.002
Past married	0.18	0.001	0.18	0.003
Never married	0.21	0.001	0.21	0.006
Employment				
Not in labor force (excl. category)	0.34	0.001	0.31	0.006
Unemployed	0.05	0.000	0.01	0.001
Part-time	0.10	0.001	0.13	0.004
Full-time	0.50	0.001	0.55	0.006
Household/Consumer Unit Variables				
Household Income, 2012$	$71,964	$163	$63,966	$702
Household/ Consumer Unit Size	2.51	0.003	2.50	0.018
Age composition of children				
Number of children 0-5	0.96	0.004	0.20	0.004
Public Assistance				
Foodstamp	0.10	0.001	0.09	0.004
Welfare	0.02	0.000	0.01	0.001
Medicaid	0.19	0.001	0.11	0.004
Residence				
Urban	0.70	0.001	0.85	0.021
Rural (excl. category)	0.30	0.001	0.15	0.021
LIHEAP Participation (%)	3.3%	0.000		

[a] U.S. Census Bureau, Current Population Survey, 2009-2013 Annual Social and Economic Supplement. Standard errors are estimated using replicate weights (Fay's method). For information on sampling and nonsampling error, see www.census.gov/apsd/techdoc/cps/cpsmar10.pdf .

[b] Bureau of Labor Statistics, U.S. Department of Labor, Consumer Expenditure Interview Survey, 2008Q2-2013Q1. Sample statistics are weighted using the quarterly consumer unit weights. For information on sampling and nonsampling error, see https://www.bls.gov/cex/anthology/csxanth5.pdf

Table 5: Multinomial Logit Model for NSLP Using CPS_PU ASEC 2009-2013

VARIABLES	(1) Subsidized Lunch With A Free or Reduced Price	(2) Subsidized Lunch
Age	-0.00443***	-0.00297***
	(0.001)	(0.001)
White, non-Hispanic	-0.426***	-0.0581*
	(0.049)	(0.035)
Black, non-Hispanic	0.478***	0.223***
	(0.059)	(0.046)
Hispanic	0.719***	0.131***
	(0.055)	(0.045)
Female	0.162***	0.00127
	(0.025)	(0.020)
Medium education	-0.268***	0.120***
	(0.043)	(0.038)
High education	-1.367***	-0.149***
	(0.075)	(0.043)
Widowed	0.586***	0.356***
	(0.076)	(0.055)
Past married	0.575***	0.285***
	(0.033)	(0.027)
Never married	0.242***	0.0401
	(0.040)	(0.031)
ln(household income)	-0.884***	0.235***
	(0.027)	(0.016)
Household size	0.199***	0.109***
	(0.012)	(0.008)
Number of children 5-10	0.0543***	0.0168***
	(0.007)	(0.006)
Number of children 11-13	0.150***	0.0863***
	(0.012)	(0.009)
Number of children 14-18	-0.0383***	-0.00824
	(0.009)	(0.006)
Foodstamp	0.918***	-0.997***
	(0.038)	(0.049)
Welfare	-0.0211	-0.146
	(0.075)	(0.091)
Medicaid	1.216***	0.161***
	(0.028)	(0.026)
Unemployed	0.415***	0.200***
	(0.058)	(0.044)
Part-time	0.135***	0.0949***
	(0.041)	(0.032)
Full-time	0.154***	0.280***
	(0.031)	(0.027)
Urban	-0.383***	-0.329***
	(0.040)	(0.032)
Constant	8.223***	-2.390***
	(0.332)	(0.222)
Observations	120,600	

Table reports multinomial logit model estimates with "No Subsidized Lunch" as the reference outcome. State and year fixed effects are included. Standard errors are estimated using replicate weights (Fay's method). *** $p<0.01$, ** $p<0.05$, * $p<0.1$
Source: U.S. Census Bureau, Current Population Survey, 2009-2013 Annual Social and Economic Supplement. For information on sampling and nonsampling error, see www.census.gov/apsd/techdoc/cps/cpsmar10.pdf .

Table 6: Logit Model for WIC Using CPS_PU ASEC 2009-2013

VARIABLES	WIC
Age	-0.0645***
	(0.001)
White, non-Hispanic	-0.0505
	(0.068)
Black, non-Hispanic	0.232***
	(0.081)
Hispanic	0.556***
	(0.077)
Female	0.0855***
	(0.026)
Medium education	0.000324
	(0.036)
High education	-0.967***
	(0.102)
Widowed	0.225**
	(0.090)
Past married	-0.263***
	(0.042)
Never married	-0.285***
	(0.036)
ln(household income)	-0.295***
	(0.014)
Household size	0.338***
	(0.009)
Number of children 0-5	0.373***
	(0.008)
Foodstamp	0.947***
	(0.040)
Welfare	0.293***
	(0.046)
Medicaid	1.783***
	(0.042)
Unemployed	0.102**
	(0.047)
Part-time	0.149***
	(0.047)
Full-time	0.106***
	(0.036)
Urban	-0.251***
	(0.035)
Constant	-0.418*
	(0.229)
Observations	310,113

Table reports logit model estimates. State and year fixed effects are included. Standard errors are estimated using replicate weights (Fay's method). *** p<0.01, ** p<0.05, * p<0.1

Source: U.S. Census Bureau, Current Population Survey, 2009-2013 Annual Social and Economic Supplement. For information on sampling and nonsampling error, see <www.census.gov/apsd/techdoc/cps/cpsmar10.pdf>.

Table 7: Logit Model for LIHEAP Using CPS_PU ASEC 2009-2013

VARIABLES	LIHEAP
Age	0.0362***
	(0.006)
Age Squared	-0.000281***
	(0.000)
Elderly	0.0596
	(0.059)
White, non-Hispanic	0.0107
	(0.059)
Black, non-Hispanic	0.177***
	(0.067)
Hispanic	-0.160**
	(0.067)
Female	0.230***
	(0.031)
Single Parent	0.0104
	(0.557)
Disabled Member	0.161***
	(0.025)
Renter	0.00315
	(0.041)
Medium education	-0.196***
	(0.035)
High education	-1.114***
	(0.102)
Widowed	0.349***
	(0.053)
Past married	0.334***
	(0.040)
Never married	0.205***
	(0.041)
ln(household income)	-0.383***
	(0.011)
Household size	-0.0306***
	(0.011)
Number of children 0-5	0.0137
	(0.010)
Foodstamp	2.017***
	(0.046)
Welfare	-0.0845*
	(0.049)
Medicaid	0.877***
	(0.036)
Unemployed	0.0278
	(0.050)
Part-time	-0.0456
	(0.037)
Full-time	-0.604***
	(0.040)
Urban	-0.451***
	(0.036)
Constant	-2.179***
	(0.211)
Observations	335,969

Table reports logit model estimates. State and year fixed effects are included. Standard errors are estimated using replicate weights (Fay's method). *** p<0.01, ** p<0.05, * p<0.1
Source: U.S. Census Bureau, Current Population Survey, 2009-2013 Annual Social and Economic Supplement. For information on sampling and nonsampling error, see
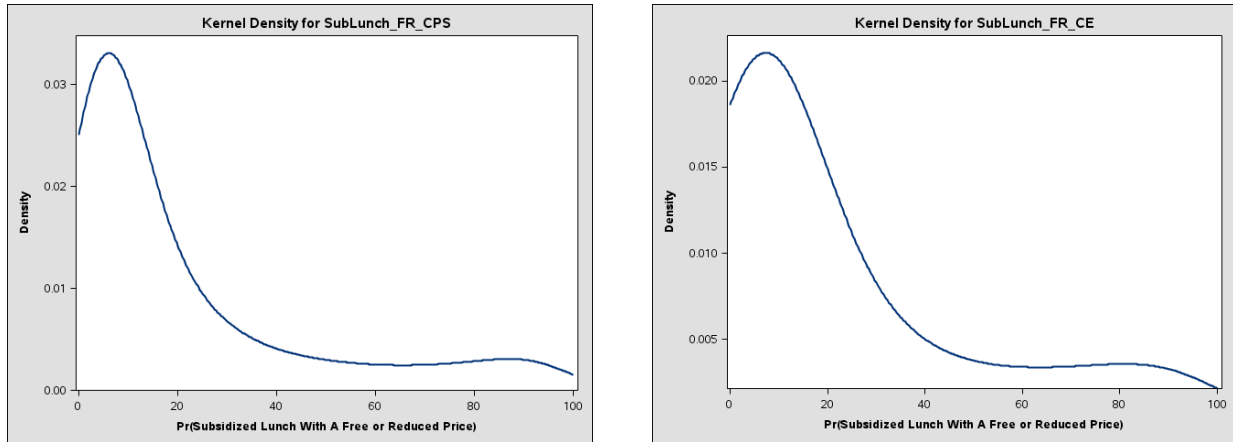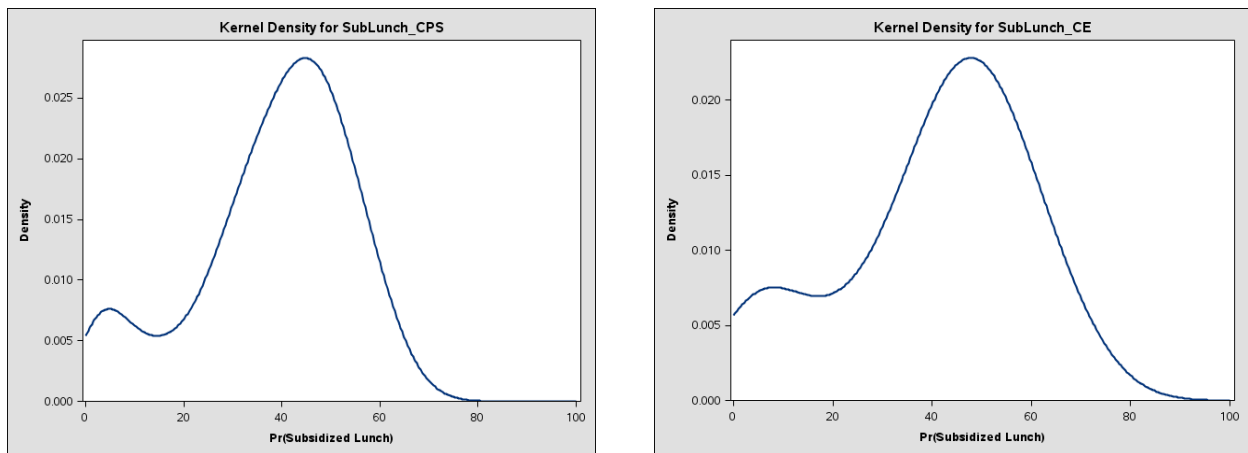<www.census.gov/apsd/techdoc/cps/cpsmar10.pdf>.

Figure 1: Predicted Participation in NSLP: Pooled Data for Pooled 5 Years of Data: Basis of 2012 SPM Thresholds

Predicted Free or Reduced Lunch Participation: CPS_PU ASEC 2009-2013 (left) and CE 2008Q2-2013Q1 (right)

Predicted Paid Lunch Participation: CPS_PU ASEC 2009-2013 (left) and CE 2008Q2-2013Q1 (right)
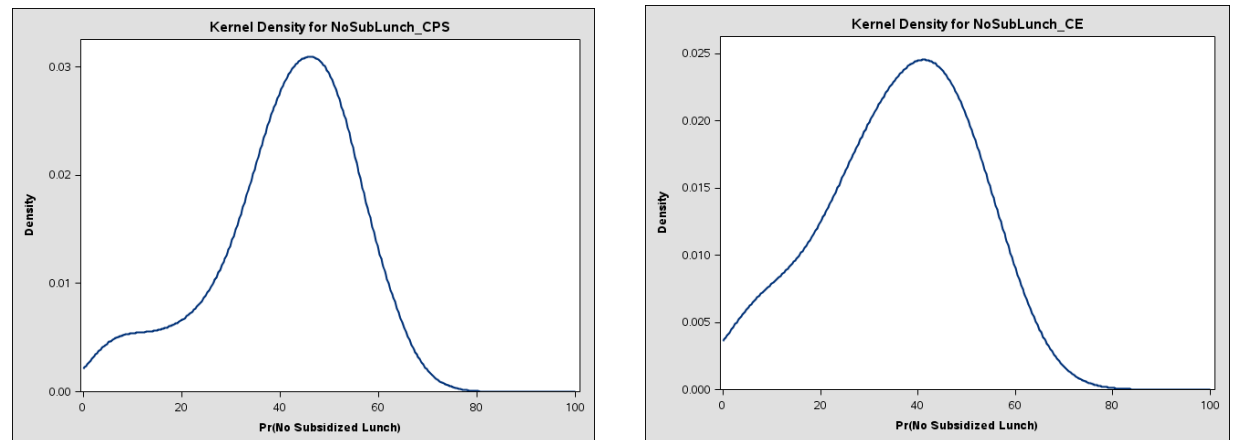
Predicted No School Lunch Participation: CPS_PU ASEC 2009-2013 (left) and CE 2008Q2-2013Q1 (right)

Figure 2: Predicted Participation in WIC and LIHEAP: Pooled 5 Years of Data: Basis of 2012 SPM Thresholds
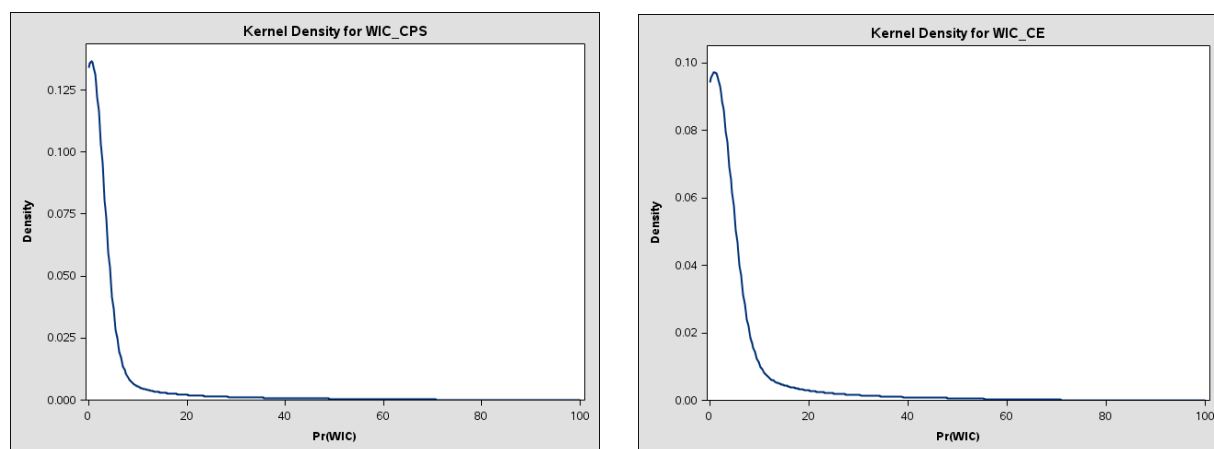
Predicted WIC Participation: CPS_PU ASEC 2009-2013 (left) and CE 2008Q2-2013Q1 (right)
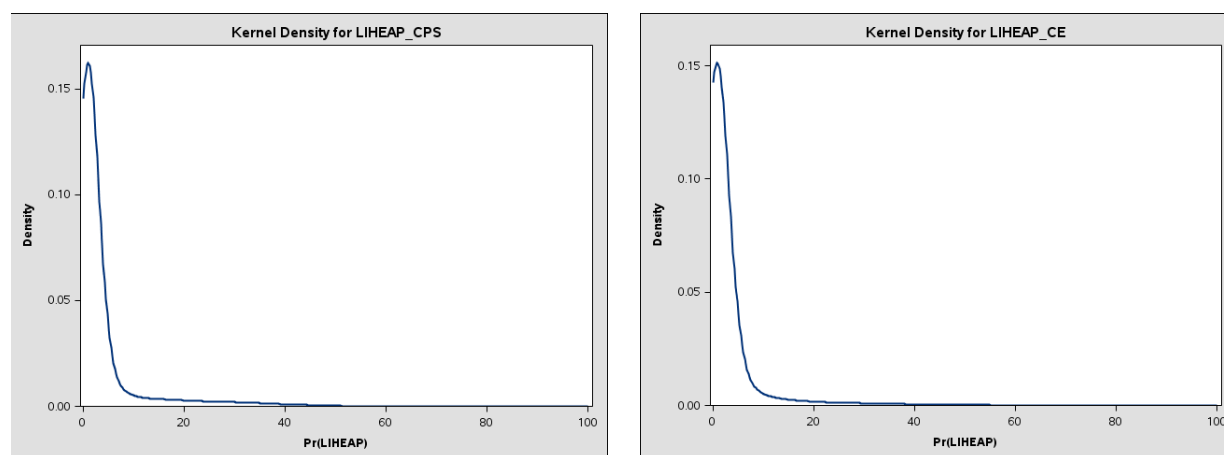
Predicted LIHEAP Participation: CPS_PU ASEC 2009-2013 (left) and CE 2008Q2-2013Q1 (right)

Table 8: Weighted Predicted Probabilities of School Lunch, WIC and LIHEAP Program Participation Using Model Estimation: CPS_PU ASEC and CE Interview

Data Collected	Source	Sample Size	School Lunch Model			WIC Model		LIHEAP Model	
			Subsidized, FR	Subsidized Lunch	No subsidized Lunch	Sample Size	WIC	Sample Size	LIHEAP
2009	CPS_PU ASEC	25,318	22.8%	44.3%	32.9%	63,649	3.6%	68,863	2.9%
2008Q2-2009Q1	CE Interview	7,880	19.8%	43.6%	36.6%	12,307	3.1%	27,404	2.2%
2010	CPS_PU ASEC	25,193	24.8%	43.5%	31.7%	63,660	3.9%	68,970	3.4%
2009Q2-2010Q1	CE Interview	7,925	22.2%	42.3%	35.4%	12,548	3.6%	28,121	2.5%
2011	CPS_PU ASEC	24,142	25.9%	43.0%	31.1%	62,734	3.8%	67,932	3.6%
2010Q2-2011Q1	CE Interview	7,831	23.0%	42.1%	34.9%	12,548	3.8%	27,921	2.8%
2012	CPS_PU ASEC	23,600	29.2%	38.6%	32.2%	61,977	3.8%	67,106	3.6%
2011Q2-2012Q1	CE Interview	7,401	26.9%	37.3%	35.9%	11,848	3.9%	26,769	2.8%
2013	CPS_PU ASEC	23,590	28.6%	38.0%	33.5%	62,311	3.6%	67,746	3.4%
2012Q2-2013Q1	CE Interview	7,460	26.4%	36.7%	36.9%	11,755	3.7%	26,720	2.6%
2009-2013	CPS_PU ASEC	121,843	26.2%	41.5%	32.3%	314,331	3.7%	340,617	3.4%
2008Q2-2013Q1	CE Interview	38,497	23.7%	40.4%	35.9%	61,006	3.6%	136,935	2.6%

[a] U.S. Census Bureau, Current Population Survey, 2009-2013 Annual Social and Economic Supplement. Sample probabilities are based on a model that uses household weights. For outcomes, "Subsidized, FR" refers to receiving a subsidized lunch with a free or reduced price, "Subsidized Lunch" refers to receiving a paid subsidized lunch, and "No Subsidized Lunch" refers to not receiving a subsidized lunch. For information on sampling and nonsampling error, see www.census.gov/apsd/techdoc/cps/cpsmar10.pdf.

[b] Bureau of Labor Statistics, U.S. Department of Labor, Consumer Expenditure Interview Survey, 2008Q2-2013Q1. Sample statistics are weighted using the quarterly consumer unit weights. For information on sampling and nonsampling error, see https://www.bls.gov/cex/anthology/csxanth5.pdf.

Table 9: Weighted CE Interview Predicted Probabilities of School Lunch, WIC, and LIHEAP Program Participation Using Model Estimation for Consumer Units with Two Children: CPS_PU ASEC and CE Interview

Data Collected	Source	School Lunch Model				WIC Model		LIHEAP Model	
		Sample Size	Subsidized, FR	Subsidized Lunch	No subsidized Lunch	Sample Size	WIC	Sample Size	LIHEAP
2009	CPS_PU ASEC	3,348	19.6%	46.1%	34.3%	11,052	2.4%	11,635	2.7%
2008Q2-2009Q1	CE Interview	3,149	18.2%	44.3%	37.4%	3,268	3.7%	3,622	1.9%
2010	CPS_PU ASEC	3,474	21.8%	44.5%	33.8%	11,162	2.4%	11,734	3.1%
2009Q2-2010Q1	CE Interview	3,115	20.1%	44.0%	35.9%	3,247	4.5%	3,597	2.3%
2011	CPS_PU ASEC	3,243	22.5%	42.5%	35.0%	10,958	2.5%	11,532	3.4%
2010Q2-2011Q1	CE Interview	2,988	20.1%	43.9%	36.0%	3,140	4.4%	3,488	2.6%
2012	CPS_PU ASEC	3,084	27.2%	39.3%	33.5%	10,824	2.8%	11,415	3.6%
2011Q2-2012Q1	CE Interview	2,903	23.5%	39.4%	37.1%	3,021	4.4%	3,416	2.7%
2013	CPS_PU ASEC	3,149	24.0%	38.8%	37.2%	10,844	2.2%	11,423	3.1%
2012Q2-2013Q1	CE Interview	2,909	23.7%	38.5%	37.8%	3,003	4.2%	3,392	2.5%
2009-2013	CPS_PU ASEC	16,298	22.9%	42.3%	34.7%	54,840	2.5%	57,739	3.2%
2008Q2-2013Q1	CE Interview	15,064	21.1%	42.0%	36.9%	15,679	4.2%	17,515	2.4%
2008Q2-2013Q1	CE Interview: in 30-36th FCSU range (threshold estimation sample)	967	30.2%	37.3%	32.6%	899	5.8%	961	3.2%

[a] U.S. Census Bureau, Current Population Survey, 2009-2013 Annual Social and Economic Supplement. Sample probabilities are based on a model that uses household weights. For outcomes, "Subsidized, FR" refers to receiving a subsidized lunch with a free or reduced price, "Subsidized Lunch" refers to receiving a paid subsidized lunch, and "No Subsidized Lunch" refers to not receiving a subsidized lunch. For information on sampling and nonsampling error, see www.census.gov/apsd/techdoc/cps/cpsmar10.pdf.

[b] Bureau of Labor Statistics, U.S. Department of Labor, Consumer Expenditure Interview Survey, 2008Q2-2013Q1. Sample statistics are weighted using the quarterly consumer unit weights. For information on sampling and nonsampling error, see https://www.bls.gov/cex/anthology/csxanth5.pdf.

| Table 10. FCSU (with In-Kind Benefits) Expenditures and Thresholds Based on 30th to 36th Percentile FCSU Expenditure Range: 2012																			
	2A+2C Consumer Units																		
	With Only Food Stamps (n=976)						**CE Eligibility/Participation + CE Characteristics (n=970)**						**CPS_PU Probit Estimation+ CE Characteristics (n=967)**					
Expenditure Groups	30-36th percentile range of FCSU	*Std. Error*	Shelter + Utilities within FCSU 30-36 range	*Std. Error*	FCSU Thresholds	*Std. Error*	30-36th percentile range of FCSU	*Std. Error*	Shelter + Utilities within FCSU 30-36 range	*Std. Error*	FCSU Thresholds	*Std. Error*	30-36th percentile range of FCSU	*Std. Error*	Shelter + Utilities within FCSU 30-36 range	*Std. Error*	FCSU Thresholds	*Std. Error*
FCSU	$20,799	*(295.57)*					$21,142	*(274.70)*					$21,121	*(279.15)*				
Food	$7,565	*(123.30)*					$7,796	*(107.69)*					$7,765	*(100.36)*				
Food Expenditures Only	-	-					**$7,453**	**(112.88)**					**$7,438**	**(97.73)**				
Imputed NSLP Subsidy	-	-					**$219**	**(21.88)**					**$256**	**(15.97)**				
Imputed WIC Subsidy	-	-					**$124**	**(12.52)**					**$71**	**(8.72)**				
Clothing	$1,069	*(51.06)*					$1,038	*(45.29)*					$1,062	*(46.47)*				
Shelter	$8,225	*(257.20)*					$8,400	*(275.74)*					$8,344	*(277.97)*				
Utilities	$3,939	*(72.68)*					$3,909	*(90.46)*					$3,950	*(77.66)*				
Utilities Expenditures Only	-	-					**$3,891**	**(91.52)**					**$3,940**	**(78.19)**				
Imputed LIHEAP Subsidy	-	-					**$18**	**(1.88)**					**$10**	**(1.31)**				
Other	*$4,160*	*(59.11)*					*$4,228*	*(54.94)*					*$4,224*	*(55.83)*				
Treatment of shelter+utilities																		
Not accounting for housing status			$12,165	*(272.90)*					$12,308	*(289.02)*					$12,294	*(299.01)*		
Accounting for housing status																		
Owners with mortgages			$12,990	*(266.51)*	$25,784	*(368.03)*			$13,114	*(307.11)*	$26,175	*(367.40)*			$13,088	*(284.81)*	$26,140	*(337.00)*
Owners without mortgages			$8,605	*(203.67)*	$21,400	*(233.31)*			$8,592	*(272.42)*	$21,653	*(297.01)*			$8,615	*(230.53)*	$21,667	*(265.21)*
Renters			$12,310	*(325.49)*	$25,105	*(397.58)*			$12,421	*(293.34)*	$25,482	*(336.03)*			$12,465	*(342.19)*	$25,516	*(375.75)*

CE sample restricted to owners with and without mortgages, and renters with and without government rental subsidies. Annual CPI-U All Items were used to adjust quarterly expenditures to 2012 year dollars. Five years of CE Interview data were used to produce these estimates; quarterly Interview reports were considered to be independent, as in official BLS publications of CE data.

*Threshold=(1.2*FCSU)-(shelter+utilties share for all) + (shelter+utilties for subgroup)

Thresholds produced by Marisa Gudrais, BLS, November 16, 2015.

Figure 3. 2012 SPM FCSU Thresholds for 2 Adults with 2 Children with and without In-Kind Imputed Benefits: CPS_PU ASE C Regression and CE Eligibility/Participation Approaches
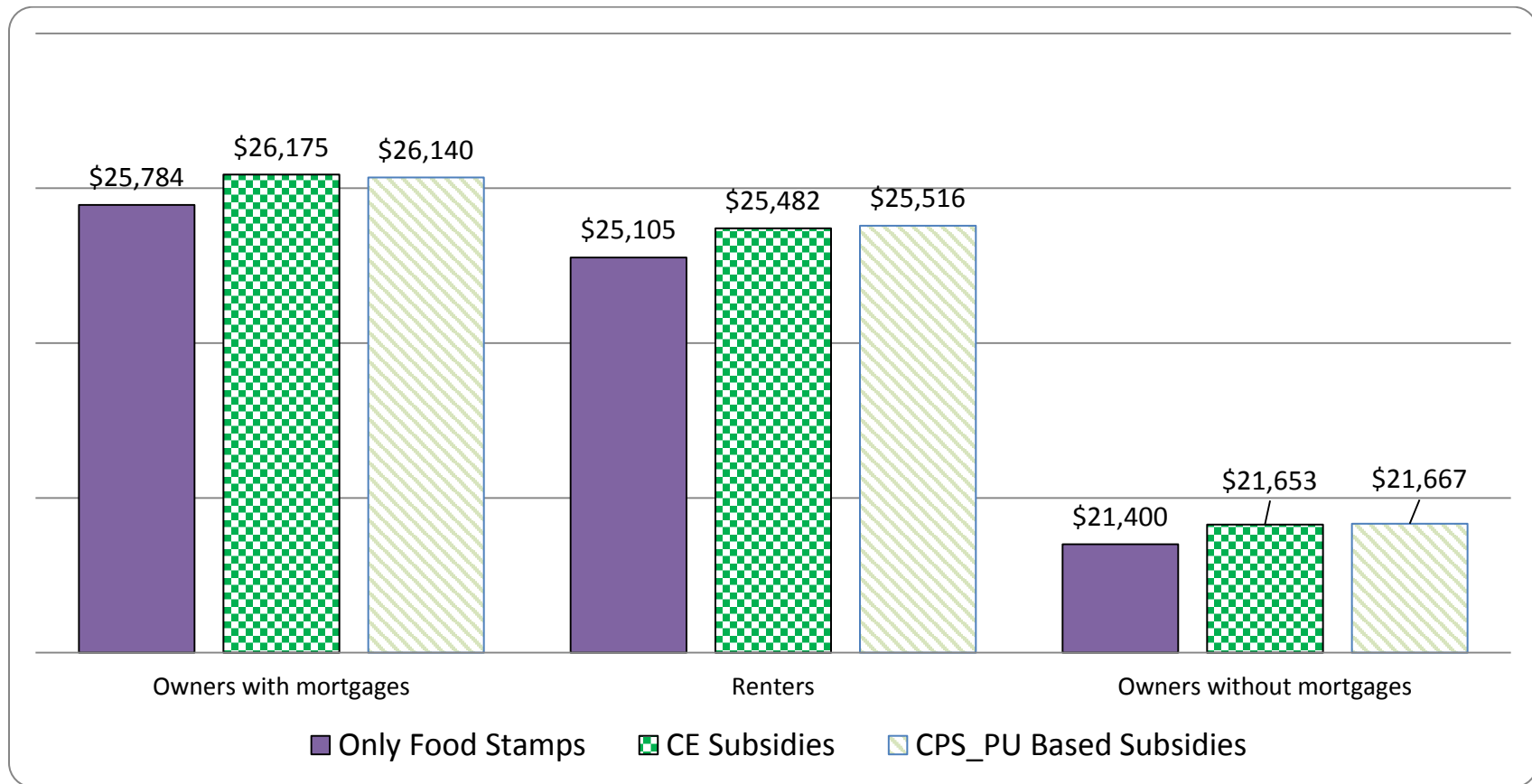
Appendix Table A. Statistical Tests for Differences in Means: CE vs. CPS Subsidy Imputations for 2012 Year Thresholds

	Difference in Means	Standard Error of Differences in Means	Z-Score
Correlated Data			
Between Paired CPS_PU Program Participation and CE Elig/Parti Methods Thresholds			
Owners with mortgages	-$36	$72	-0.49
Owners without mortgages	$13	$92	0.14
Renters	$34	$79	0.42
Uncorrelated Data			
Between Housing Type Thresholds within CP_PUS Program Participation Method			
Owners with mortgages & Renters	$624	$505	1.24
Owners with mortgages & Owners without mortgages	$4,473	$429	10.43
Renters & Owners without mortgages	$3,849	$460	8.37
Between Housing Type Thresholds Within CE Elig/Parti Method			
Owners with mortgages & Renters	$693	$498	1.39
Owners with mortgages & Owners without mortgages	$4,522	$472	9.57
Renters & Owners without mortgages	$3,829	$448	8.54

Standard errors are estimated using replicate weights. ****$p<0.001$, ***$p<.01$, *$p<0.1$