Alternative Poverty Measurement for the U.S.: Focus on Supplemental Poverty Thresholds

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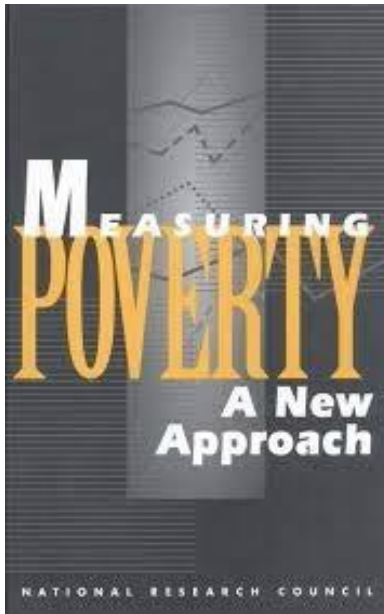
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All Poverty Measures
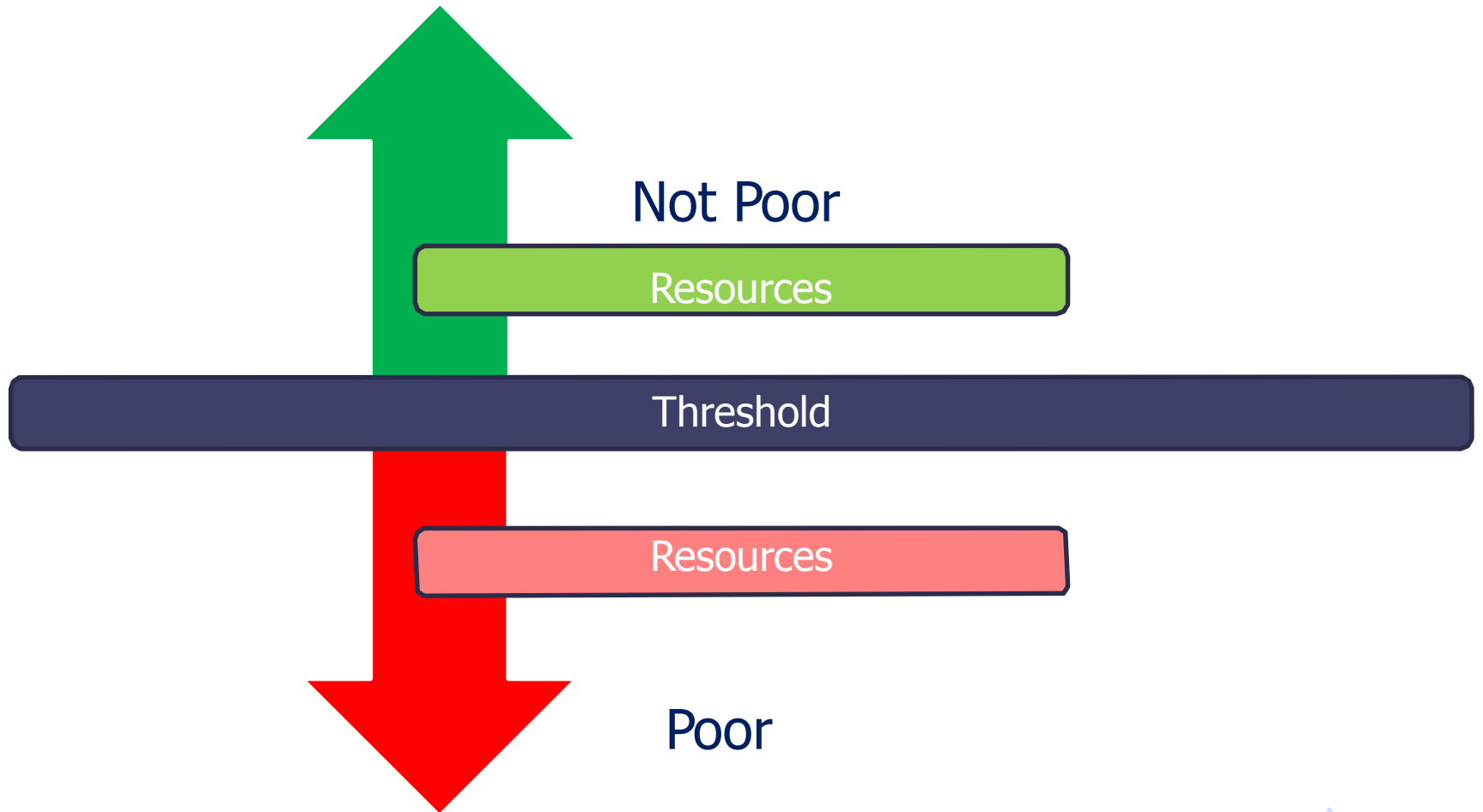
National Academy of Sciences Panel on Poverty and Familiy Assistance

May 1995 report, *Measuring Poverty: A New Approach*

The official measure does not account for

- Higher standards and levels of living since 1965
- Provision of noncash benefits (food benefits, housing subsidies, energy assistance)
- Necessary expenses (taxes, work-related, health care)

Recommended Changes to Improve the Measure of Poverty in the U.S.

- Thresholds: Bureau of Labor Statistics (BLS)
- Resources and poverty statistics: Census Bureau

Supplemental Poverty Meaures (SPM)

Interagency Technical Working Group - March 2, 2010

- Will not replace the official poverty measure

- Will not be used for resource allocation or program eligibility

- **Justification**: Evaluate impact of benefit programs on poverty

- Based on National Academy of Sciences expert panel recommendations *Measuring Poverty: A New Approach (Citro and Michael, 1995)*

BLS: Research Experimental SPM Thresholds

Census Bureau: Resources and Poverty Statistics

SPM and Concepts

- **Poverty Concept, based on NAS recommendations**
  - *"…proposed thresholds, although developed in somewhat different ways, reflect concept of budget for consumption needs" (NAS Report, 1995, pp. 66-67) …*
  - *"Hence, … resources should add to money income the value of near-money in-kind benefits that are intended to support consumption" (pp. 67)*

- **Measurement concept for thresholds assumed**
  - *Expenditures are a good proxy for consumption (with the exception of owner shelter)*

- **Interagency Technical Working Group (ITWG) placed value on:**
  - **Consistency** between threshold and resource definitions in terms of poverty concept
  - **Data availability, simplicity in estimation, stability of the measure over time, and ease in explaining the methodology**

Threshold Estimation *... thus far...*

- Food, clothing, shelter, and utilities (*FCSU*) expenditures

- Consumer Expenditure Interview Survey data: 5 years of data

- *FCSU* "expenditures" in constant year dollars

- Estimation sample: Consumer Units (CUs) with 2 children

- Reference sample: 2 adults with 2 children (3-parameter equivalence scale applied to +2 children FCSU expenditures)

- Rank CUs by their $FCSU$ "expenditures"

  ▶ Identify 33rd percentile represented by 30th to 36th percentile range

  ▶ Produce means of $FCSU$ and SU by housing status

  ▶ Estimate thresholds by housing tenure

- ❖ Send to Census Bureau to derive other CU thresholds and make geographic adjustment

Housing Status Thresholds

- Housing Status Groups, j
  - Owners with mortgages
  - Owners without mortgages
  - Renters

- *SPM Threshold$_j$*

$$= (1.2 * FCSU_A) - SU_A + SU_j$$

$FCSU_A$, SU_A , SU_j *are means within 30th to 36th percentile range of $FCSU_A$ for reference CUs*

In addition to owner-occupied housing...

Expenditures ≠ Consumption

when in-kind benefits not accounted for in spending

This Research

- **Purpose**
  - Highlight poverty concept underlying SPM and issue of consistency
  - Examine options to value consumption needs when data are missing
  - Produce 2014 SPM thresholds that reflect the "consumption" of FCSU, with expection of owner-occupied housing

- **Contribution**
  - Improved SPM thresholds that more nearly reflect consumption value of FCSU basic needs
  - Improve overall SPM to better evaluate impact of in-kind benefit programs considered in resources

Poverty Concept: Economic Deprivation

■ **Thresholds represent "needs"**

■ **Resources meet "needs"**

"Consumption Needs" defined as
▶ Food
▶ Clothing
▶ Shelter
▶ Utilities
▶ + "a little bit more" for personal care, non-work related transportation, etc.
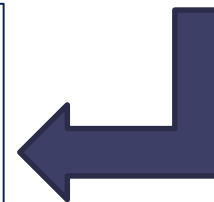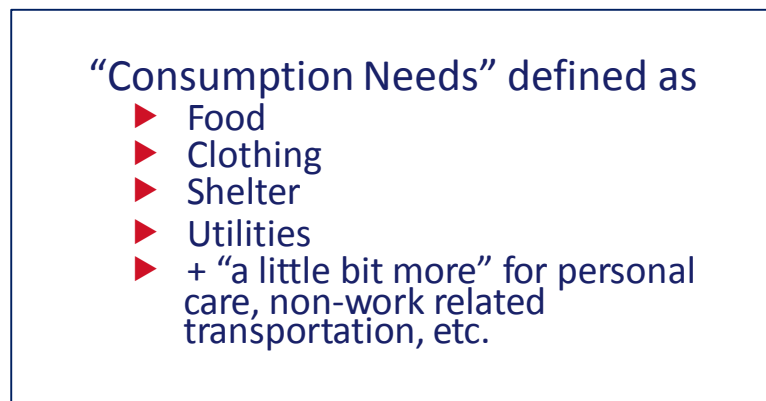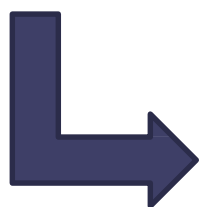
■ **Poverty Concept:** deprivation based on comparison of resources and consumption "needs"

■ **Consumption "needs" proxied by spending (or expenditures)**

▶ NAS Panel assumption: "CE expenditures include housing assistance subsidies (rent and utilities)" … and "benefits from food stamps and other meals provided free" (paraphrase of NAS Report, 1995, pp. 393-394)

▶ BUT: CE expenditures only account for food stamps or SNAP

SPM Thresholds and Housing Tenure Shares (2005 – 2015)

Two-Adult-Two-Child BLS-DPINR Research Experimental Supplemental Poverty Measure (SPM) Thresholds[*]										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
OWNERS WITH MORTGAGES											
	$21,064	**$22,010**	**$22,772**	**$24,259**	**$24,450**	**$25,018**	**$25,703**	**$25,784**	**$25,639**	**$25,844**	**$25,930**
S.E.	$200	$194	$171	$259	$242	$323	$347	$368	$289	$345	$297
% Sample	0.483	0.472	0.5	0.493	0.489	0.486	0.459	0.439	0.438	0.415	0.371
OWNERS WITHOUT MORTGAGES											
	$17,643	**$18,301**	**$19,206**	**$20,386**	**$20,298**	**$20,590**	**$21,175**	**$21,400**	**$21,397**	**$21,380**	**$21,806**
S.E.	$230	$279	$299	$340	$335	$341	$298	$233	$337	$470	$417
% Sample	0.118	0.102	0.086	0.082	0.084	0.093	0.11	0.12	0.115	0.108	0.119
RENTERS											
	$20,641	**$21,278**	**$22,418**	**$23,472**	**$23,874**	**$24,391**	**$25,222**	**$25,105**	**$25,144**	**$25,460**	**$25,583**
S.E.	$224	$241	$249	$257	$345	$379	$378	$398	$400	$363	$282
% Sample	0.399	0.426	0.414	0.425	0.426	0.421	0.431	0.442	0.447	0.476	0.51

* Based on out-of-pocket expenditures for food, clothing, shelter, and utilities. Shelter expenditures include those for mortgage principal payments.

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SPM (and Official) Thresholds for Two Adults with Two Children: 2015

	Official	SPM Owners with mortgages	SPM Owners without mortgages	SPM Renters
Threshold	$24,036	$25,930	$21,806	$25,583

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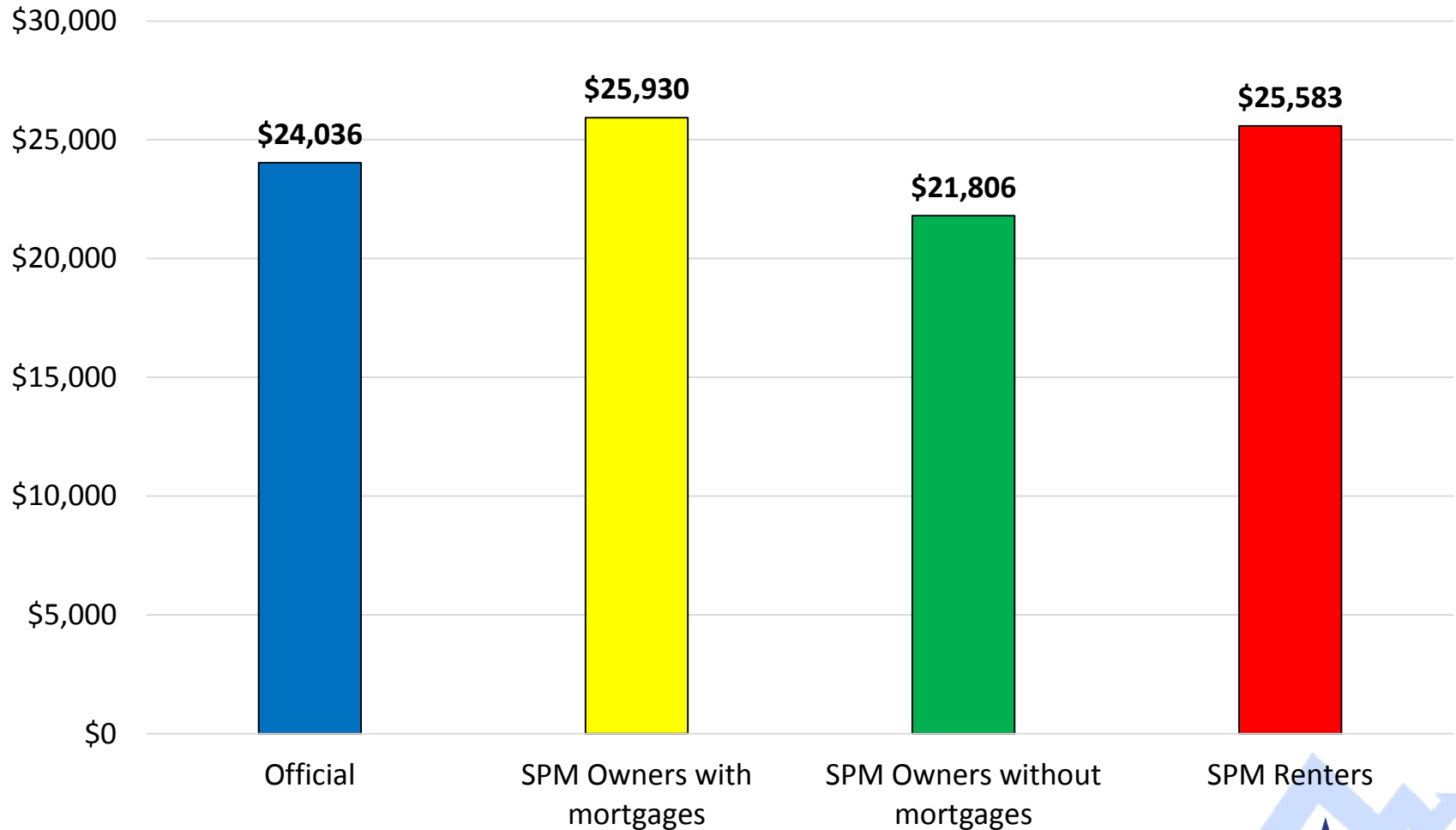
Thresholds Distribution Shares by Component: 2015

Owners with Mortgages

- Other 16%
- Food 29%
- Shelter+Utilities 51%
- Clothin...

Owners without Mortgages

- Other 19%
- Food 35%
- Shelter+Utilities 41%
- Clothing 5%

Renters

- Other 16%
- Food 30%
- Shelter+Utilities 50%
- Clothing 4%
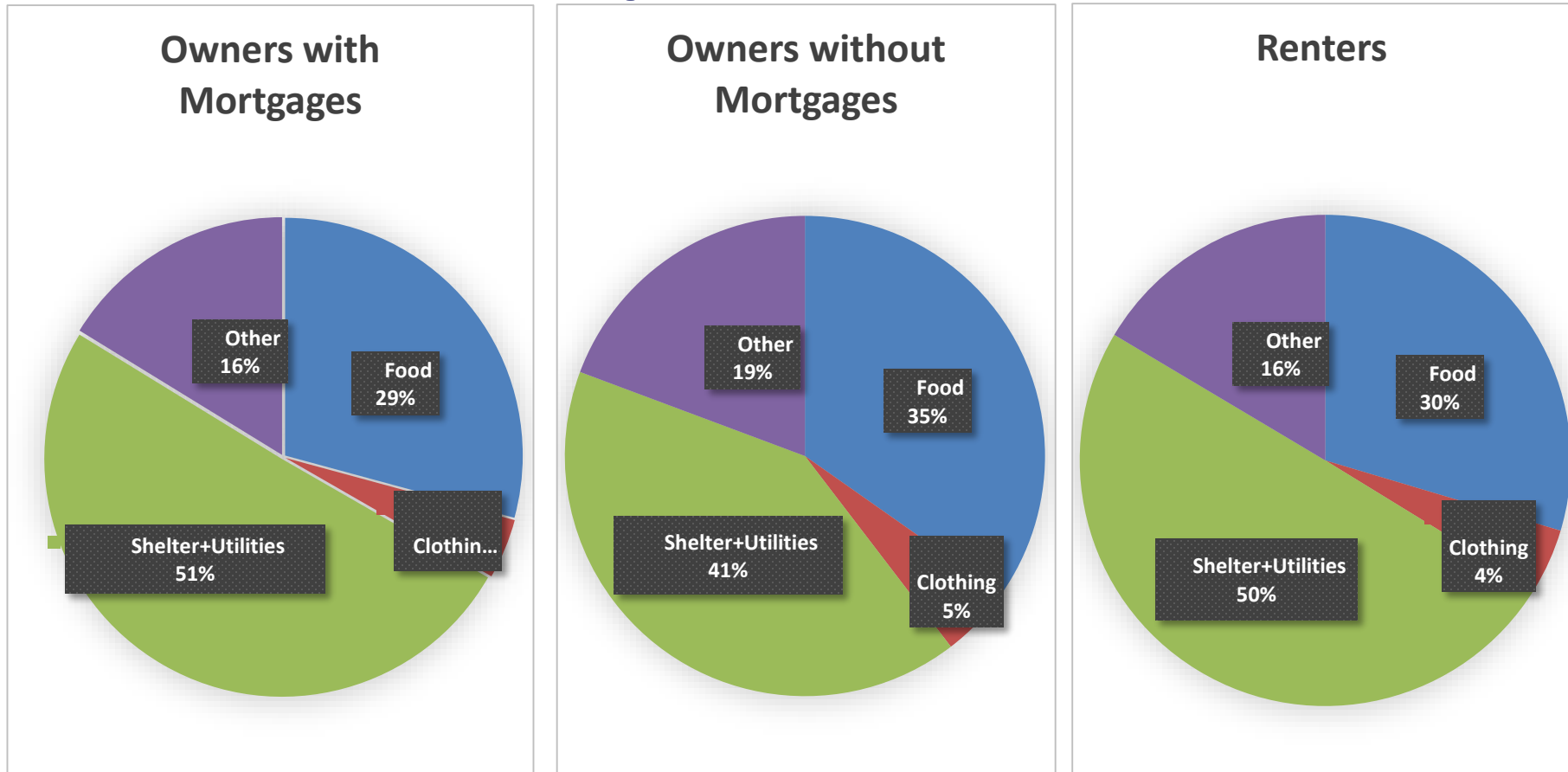
❖ Send SPM thresholds and housing (shelter+utilities) shares to Census Bureau to derive other CU thresholds and make geographic adjustments

Consistency in Poverty Concept:
Resources to Meet FCSU and Evaluate In-Kind

Thresholds

Consumption Value of FCSU+"little bit more"

← Consistent

Resources

Housing & Energy Subsidies

Other Food Subsidies

With SNAP In-Kind Benefits

Cash income
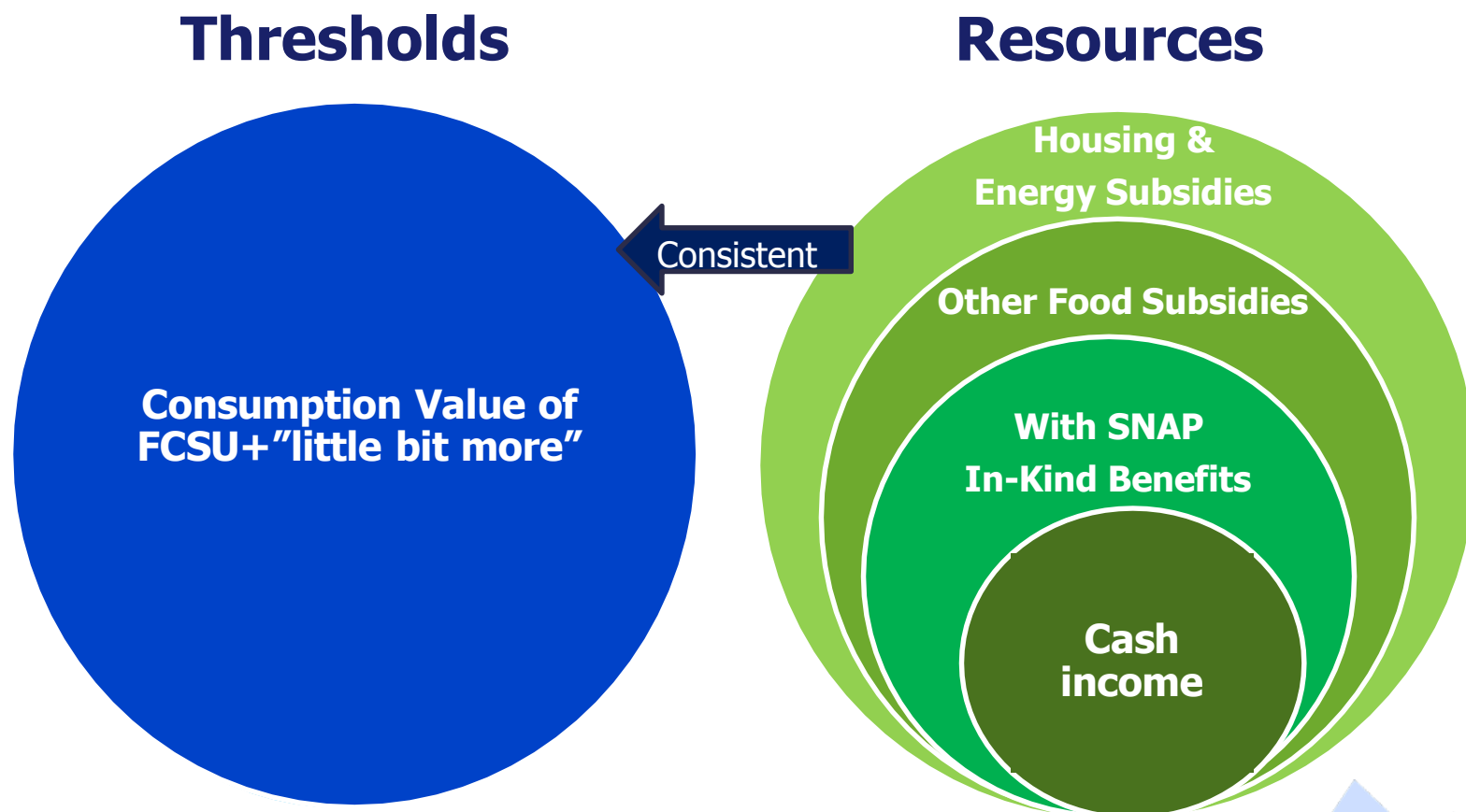
Missing Data Problem in Thresholds Leads to Inconsistency in Poverty Measure

(current measure)

Thresholds

Resources

Housing & Energy Subsidies

Other Food Subsidies

With SNAP In-Kind Benefits

Cash income

Expenditures for FCSU (including SNAP)+"little bit more"

Inconsistent

Consistent

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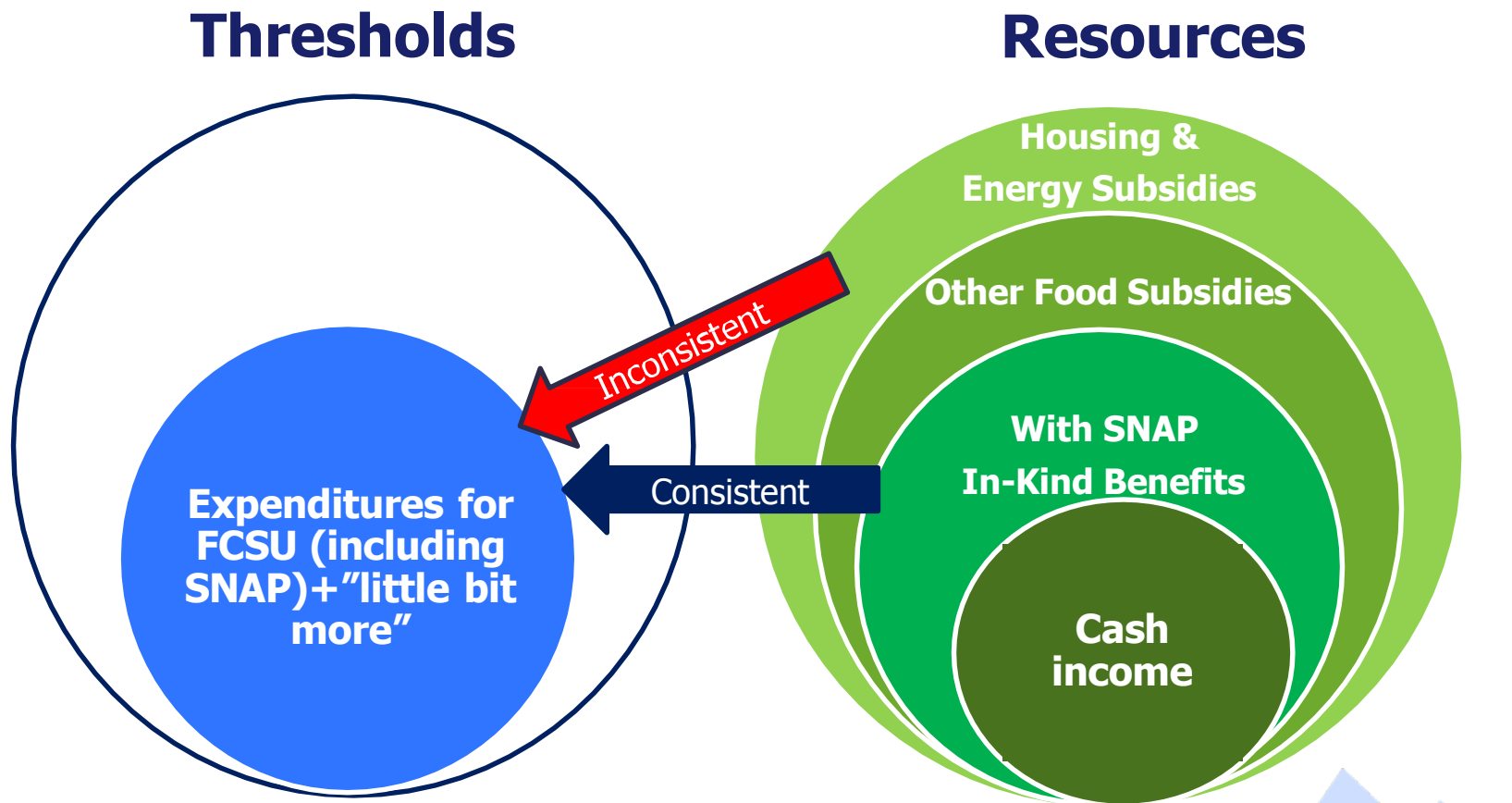
Example of Subsidized Renter: the Case of Rent Spending in Thresholds

Thresholds

Renter Resources

1/3 of market rent paid OOP Spending

Money income used to pay contract rent = 1/3 of market rent

????

rental voucher covers 2/3 of market rent (not fungible)

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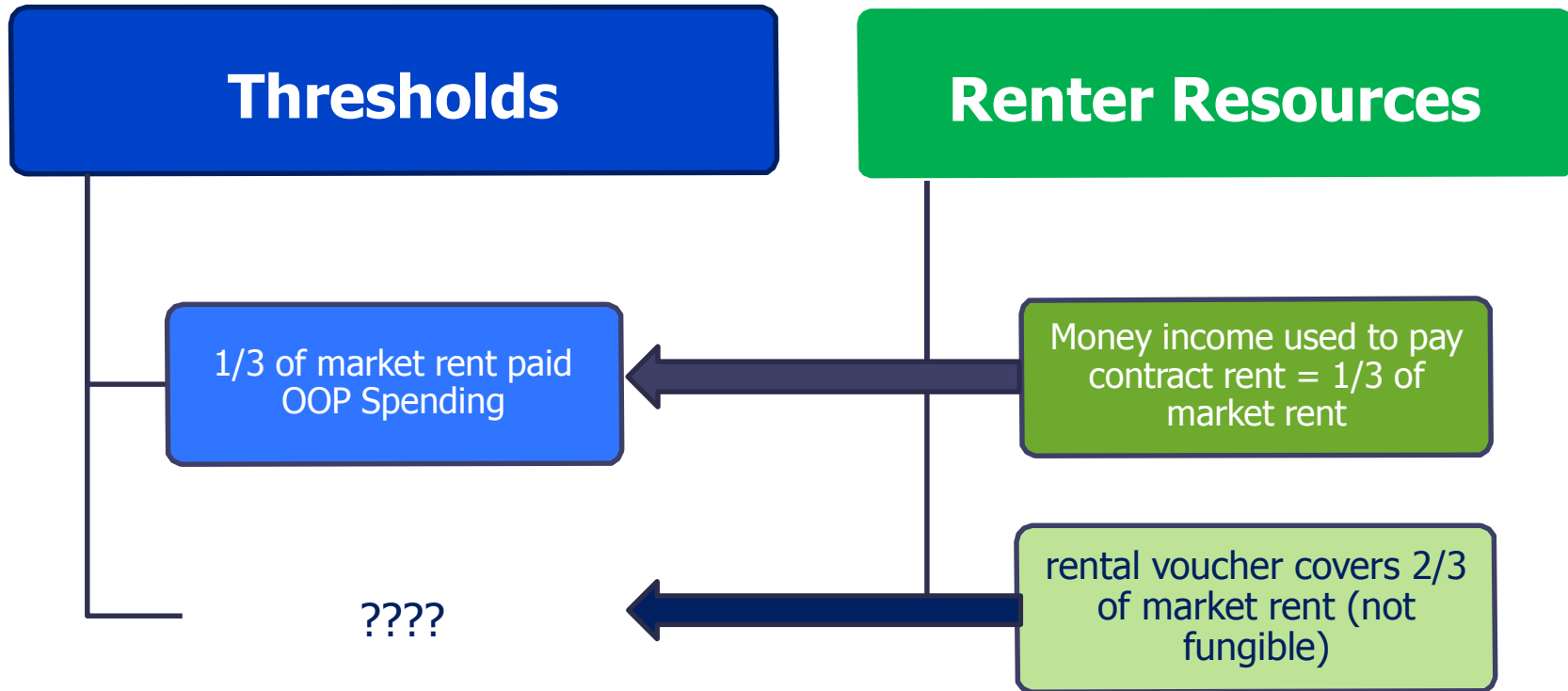
Example of Subsidized Renter: Consumption Rent Value in Thresholds

Thresholds

Renter Resources

1/3 of market rent paid OOP Spending

Money income used to pay contract rent = 1/3 of market rent

2/3 of market rent paid with voucher (in-kind benefit)

rental voucher covers 2/3 of market rent (not fungible)
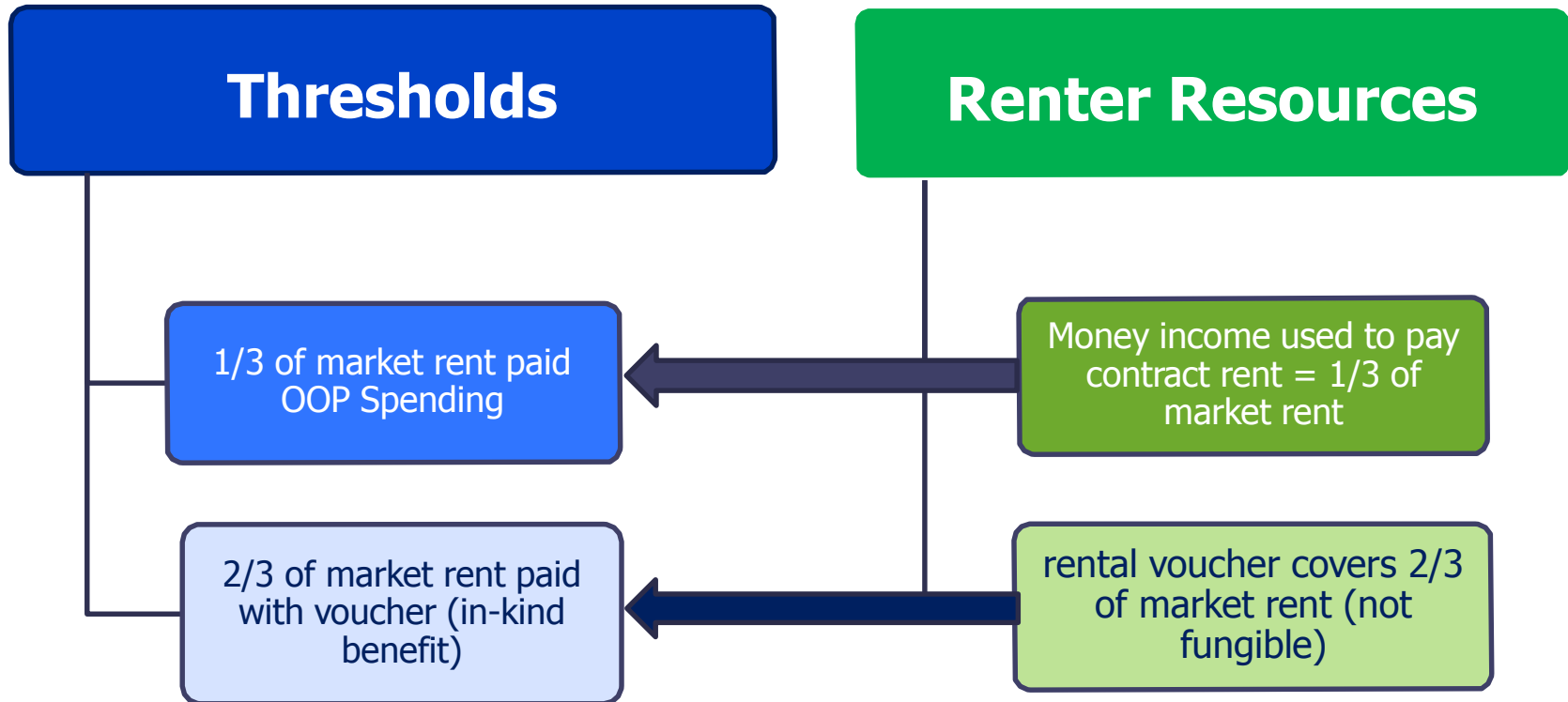
Challenges in Using
U.S. Consumer Expenditure Interview Survey for SPM

- Expenditures collected: out-of-pocket

- Limited data on Rental Assistance Programs

  - Indicator variables for rented living quarters
    - Is this house a public housing project, that is, it is owned by a local housing authority or other local public agency? (CE variable: pub_hous)
    - Are your housing costs lower because the Federal, State, or local government is paying part of the cost? (CE variable: govtcost)

  - Total rent payments for each of last 3 months (do not include direct payments by local, state, or federal agencies)

  - Expenditures for utilities

- No data on programs but data on potential participants

  - National School Lunch Program (NSLP)

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

  - Low income Home Energy Assistance (LIHEAP)

- SNAP implicitly included in reported food expenditures

Acknowledged CE Measurement Issue: ITWG (2010) Guidelines for SPM Thresholds

➢ **ITWG stated** …

▶ *"so far as possible with available data, the calculation of FCSU should include any in-kind benefits that are counted on the resource side for food, shelter, clothing and utilities.* *This is necessary for consistency of the threshold and resource definitions**."* (March 2010)

FCSU = sum (food, clothing, shelter, utilities) at micro-level

SPM Threshold = FCSU + little bit more
Supplemental Nutrition Assistance Program (SNAP)
Housing Subsidies
National School Lunch Program (NSLP)
Supplemental Nutrition Program for Women, Infants, and Children (WIC)
Low-Income Home Energy Assistance (LIHEAP)

ITWG Solution to CE Missing Data Problem

Thresholds

Resources

Housing & Energy Subsidies

Other Food Subsidies

FCSU Expenditures (Including SNAP)

Consistent →

Consistent →

Housing & Energy Subsidies

Other Food Subsidies

With SNAP In-Kind Benefits

Cash income

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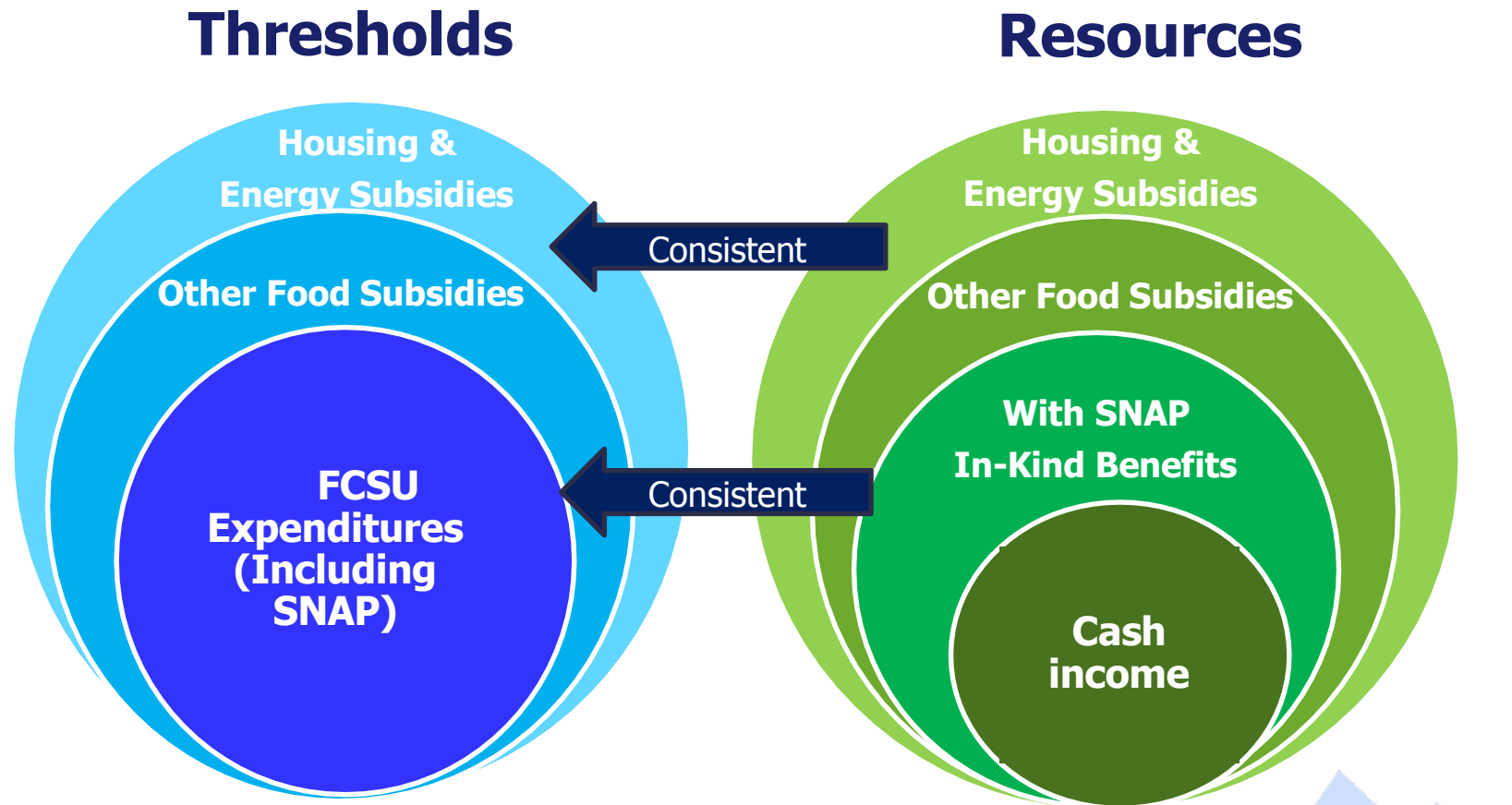
Options: Valuing "Needs" when Data Are Missing

All Imputed

Impute NSLP, WIC, LIHEAP using CPS recipiency; CE rental program reported participation
Impute NSLP, WIC, LIHEAP; Rental Subsidy values (based on CE)

Impute "better" measured

Impute NSLP using CPS recipiency; CE rental program reported participation
Impute NSLP; Rental Subsidy values (based on CE)

Rental Impute - CE

CE rental program reported participation
Impute Rental Subsidy values (based on CE)

"No" Imputes

Limit population to CUs without benefits
(exception NSPL paid)
Assumption: spending=consumption

Rental Impute - CE Data Only

CE rental program reported participation
Impute Rental Subsidy values (based on CE imputed rents)

greater data availability & simplicity in estimation

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In-Kind Benefits, Expenditures, and Resources

Benefit	Form of Benefit	Value of Commodity or Service in CE Reported Expenditures?	SPM Resources Include
SNAP	EBT cash-value to CU	Yes, food expenditures= food consumption	yes
NSLP	Direct payment to school	No, < consumption	yes
WIC	Voucher paper or EBT for commodities to CU	No, < consumption	yes
LIHEAP	Direct payment to vendor	No, < consumption	yes
Rental Subsidies	Landlord accepts voucher or CU lives in public housing	No, < consumption	yes

EBT: Electronic benefit transfers
Consumption value could be at recipient or market value

Impute for Missing In-Kind Benefit Program Participation: NSLP, WIC, & LIHEAP

- Impute recipiency to CE from U.S. Current Population Survey Annual Social and Economic Supplement (CPS ASEC) reported recipiency

- Data
  - Household level data with household and member characteristics
  - Same years as in CE: collected 2011-2015 refers to 2010-2014
  - CPS ASEC public use data accessed from NBER

- Method
  - Treat CE as having missing data so combine CPS and CE into one data file to impute from CPS to CE

  - SAS Proc MI
    - Logistic regression method when the classification variable has binary response (assuming monotone missing pattern for classification variable)
      - Renter with subsidy (=1)
      - Renter without subsidy (=2)
    - Draw random uniform error between 0 and 1 to impute recipiency= 1 or = 2 for each observation

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Impute for Missing NSLP, WIC, & LIHEAP Benefits

- **NSLP: U.S. Department of Agriculture for 2010-2014**
  - ▶ Average per school lunch payment rates x # school days by state
    - Over 48 contiguous states plus Hawaii and Alaska
    - Rates for schools in which less than 60% of lunches served were free or reduced price for all but District of Columbia Louisiana, Mississippi, and New Mexico (60% or more with free or reduced, USDEd)
    - Number of school days by state from Department of Education , Schools & Staffing Survey (2011-2012 school year)
  - ▶ Different values (same values for commodities' subsidy)
    - Free
    - Reduced
    - Student paid full price for lunch (=commodities subsidy)

- **WIC: U.S. Department of Agriculture for 2010-2014**
  - ▶ Monthly average values of monthly pre-rebate value per person, by state
  - ▶ Higher average infant rebate assigned to infants

- **LIHEAP: U.S. Department of Health and Human Services for 2010**
  - ▶ Average annual benefit levels per household per state
  - ▶ Benefits assigned based reference months in CE
    - Heating (October to March) – all states
    - Cooling (April to September) - not all states offer this benefit

Impute Missing Market Rents for Subsidized Renters

- Need market rent for consumption of rental services
  - ▶ Market rent=(rent paid + rental subsidy)
  - ▶ Do not need rental subsidies for thresholds (produce for data comparison)
- Market values assigned to subsidized rental units, approaches:
  1. Imputed market rents from CE data using 2-stage regression model
     - Stage 1: Logit regression of subsidized renters versus non-subsidized renters (CU sample selection)
     - Stage 2: Market rents paid controlling for sample selection, rental unit characteristics, and geography
  2. U.S. Department of Housing and Urban Development 2010-2014 Fair Market Rents (FMRs) matched to CE by Census tract and number of bedrooms

RESULTS

Results

- U.S. Population Comparisons
  - ▶ Aggregates
  - ▶ Program participation
  - ▶ Annual average benefits

- SPM Threshold Estimation Sample (within FCSU 30th-36th percentiles of FCSU+IK) compared to all CUs
  - ▶ Aggregate shares
  - ▶ Shares of in-kind benefits by participate type
  - ▶ Distribution of CUs with in-kind benefits by housing tenure group

- Thresholds with and without in-kind benefits imputed

CE-Imputed In-Kind Benefits for U.S.: Aggregates

Data Source	NSLP	WIC[2]	LIHEAP	Rent Subsidies	
				FMR	CE imputed rent
CE Imputed Participation TH2014 (5 years of data) with ...	**$12.3**	**$3.6**	**$1.1**	**$29.8**	**$27.5**
	free=$4.7 reduced=$5.7 paid=$1.9	children=$2.1 infants=$1.2 women=$0.3			
CPS 2014	*$12.0*	*$3.4*	$1.8	$41.2	
USDA 2014 (9 months Jan.-May, Sept.-Dec.)	$10.4-$10.5[1]				
USDA Calendar Year 2014		$6.1			
HHS FY2010 in 2014$			$3.2		
Heating			$2.9		
Cooling			$0.3		
HUD & USDA 2014				$38.1	
HUD 2014					*$37.0*
Public Housing					*$6.2*
Voucher and other					*$30.9*
USDA 2014					*$1.1*

[1] Lower value assumes all schools less than 60% free/reduced lunch; higher value assumes all school 60% or higher free/reduced lunch
[2] WIC: CE estimates and USDA based on pre-rebate values for infant food; CPS values based on cost to USDA, not benefit value.

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CE-Imputed In-Kind Benefits for U.S.: CU/HH Participation

Data Source	NSLP	WIC*	LIHEAP	Rent Subsidies	
				FMR	**CE imputed rent**
CE Imputed Participation (5 years of data) with …	18.5%	2.9%	2.2%	3.4%	4.1%
	free=3.5% reduced=5.0% paid=10.1%	children=1.9% infants=0.5% women=0.6%			
CPS 2014	17.2%	3.1%	3.4%		4.1%
HHS 2010**					
Heating			6.3%		
Cooling			0.8%		
HUD 2014					3.9%
Public Housing					0.9%
Voucher and other					3.1%
USDA 2014					0.2%

*WIC: CE estimates based on pre-rebate values for infant food
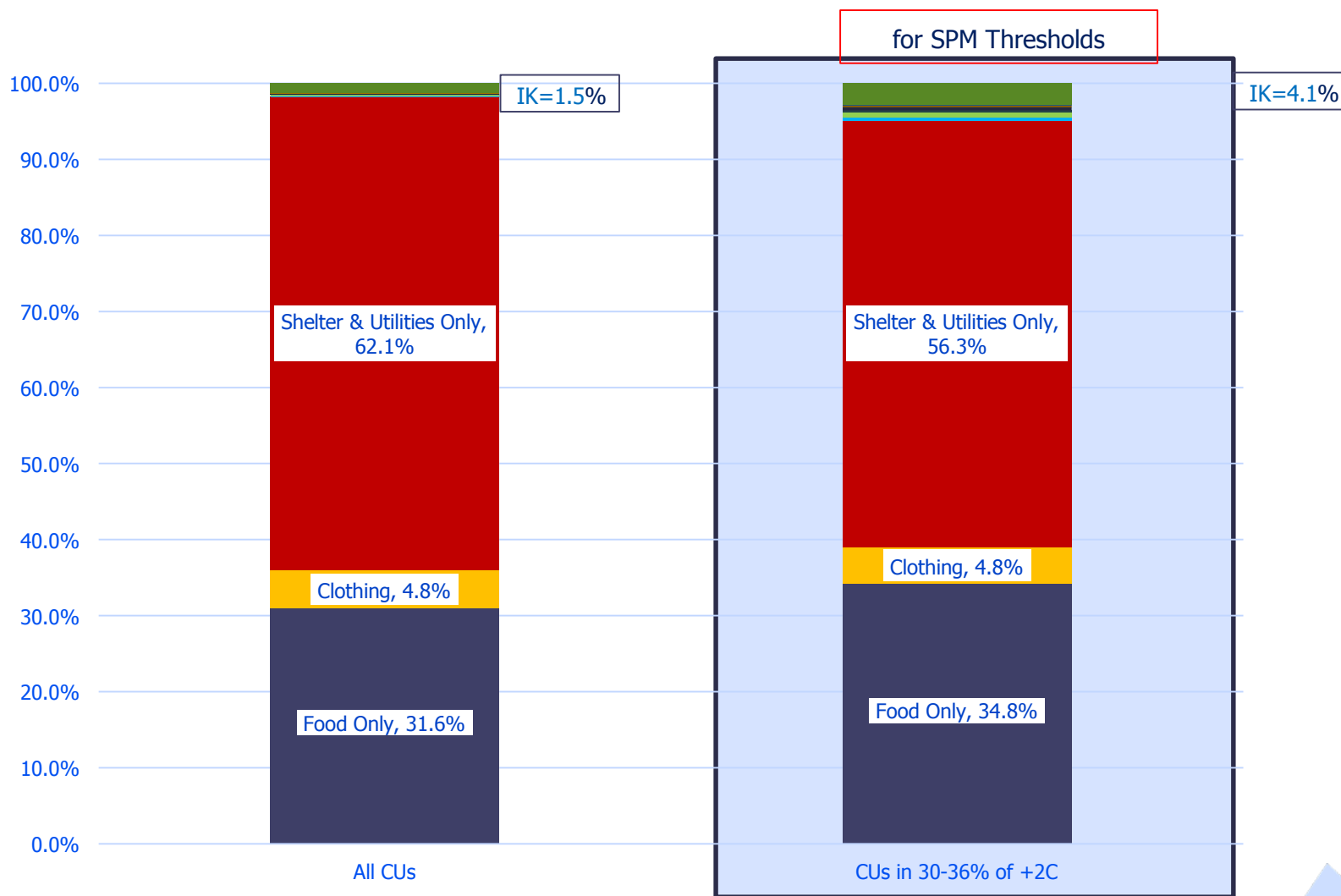**HUD 2010 latest data availables; 34% of all housing units received heating and cooling assistance in FY2010.

CE-Imputed In-Kind Benefits for U.S.: Annual Average Benefit per CU/HH

Data Source	NSLP	WIC*	LIHEAP	Rent Subsidies	
				FMR	CE imputed rent
CE Imputed Participation (5 years of data) with …	$535	$983	$390	$7,078	$5,386
	free=$1,098 reduced=$912 paid=$154	children=$904 infants=$2,052 women=$400			
CPS 2014	*$534*	*$828*	$395	$7,643	
HHS FY2010 in 2014$					
Heating			$406		
Cooling			$332		
HUD 2014					*$7,992*
Public Housing					*$5,784*
Voucher and other					*$9,500*
USDA 2014					*$4,148*

*WIC: CE estimates based on pre-rebate values for infant food.

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Percent of 2014 Aggregate Dollars Using 5 Years of CE Data

for SPM Thresholds

IK=1.5%

IK=4.1%

Shelter & Utilities Only, 62.1%

Shelter & Utilities Only, 56.3%

Clothing, 4.8%

Clothing, 4.8%

Food Only, 31.6%

Food Only, 34.8%

100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
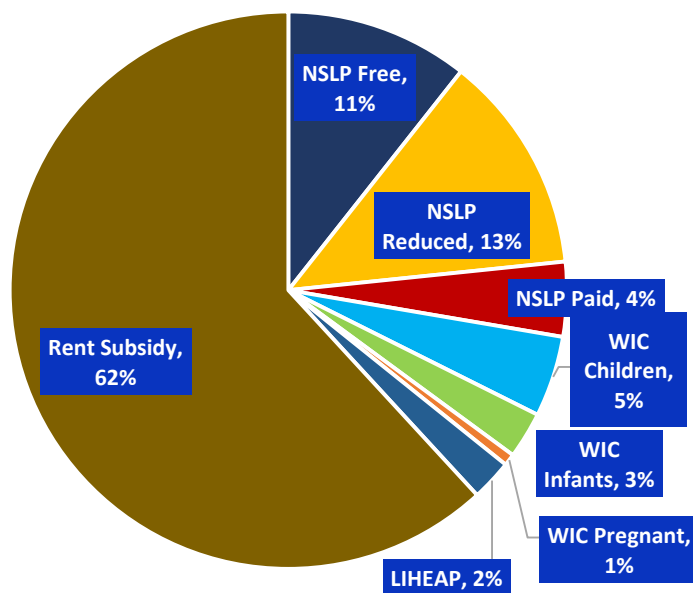30.0%
20.0%
10.0%
0.0%

All CUs

CUs in 30-36% of +2C

Aggregates based on CE imputed rent subsidies

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Aggregate Shares of In-kind Benefits by Participant Type

All CUs:
IK = 1.5% of Aggregate

- NSLP Free, 11%
- NSLP Reduced, 13%
- NSLP Paid, 4%
- WIC Children, 5%
- WIC Infants, 3%
- WIC Pregnant, 1%
- LIHEAP, 2%
- Rent Subsidy, 62%

CUs in 30-36th Percentile "2+2":
IK = 4.1% of Aggregate

- NSLP Free, 16%
- NSLP Reduced, 16%
- NSLP Paid, 6%
- WIC Children, 8%
- WIC Infants, 4%
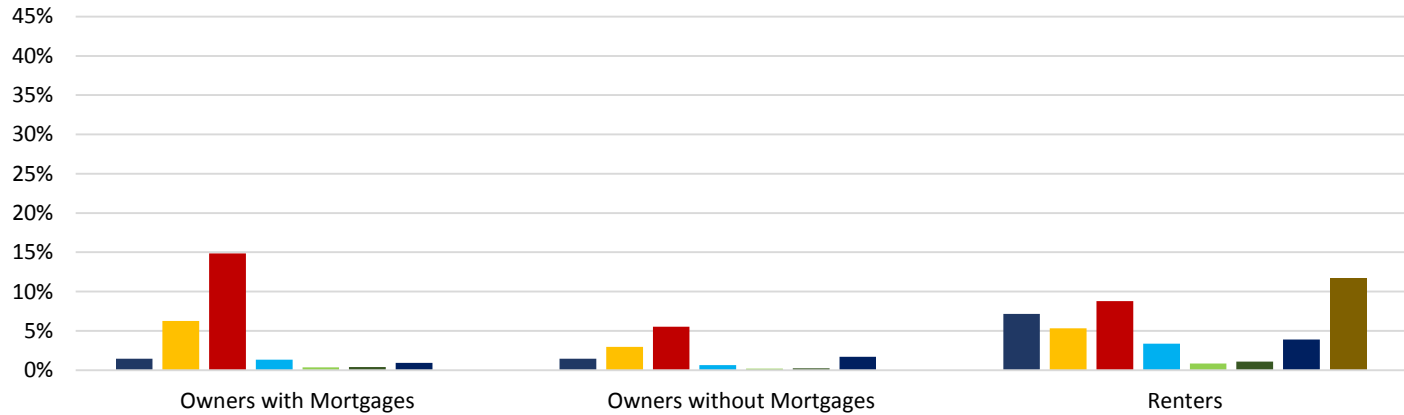- WIC Pregnant, 1%
- LIHEAP, 1%
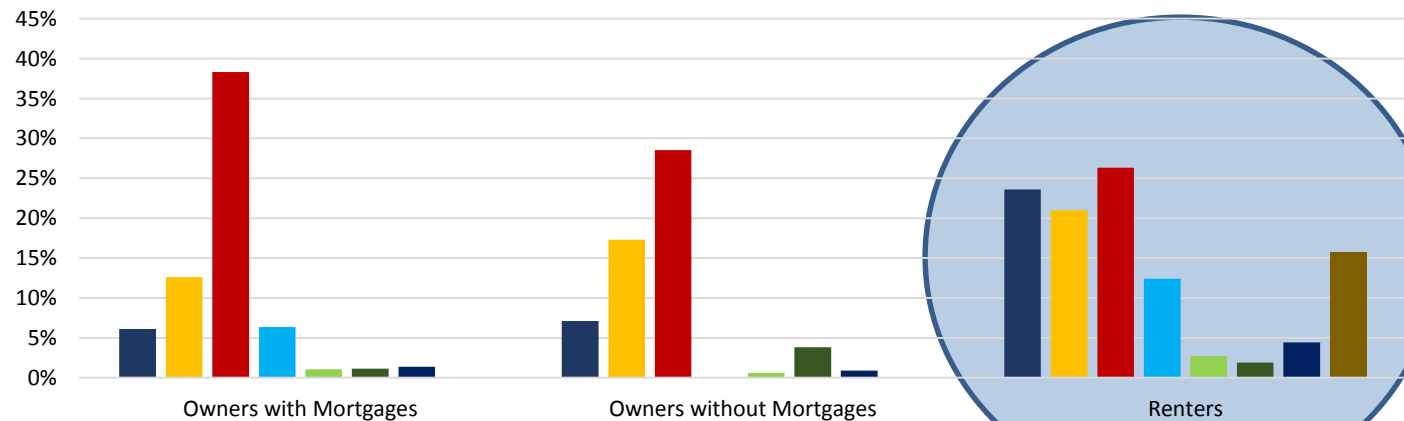- Rent Subsidy, 48%
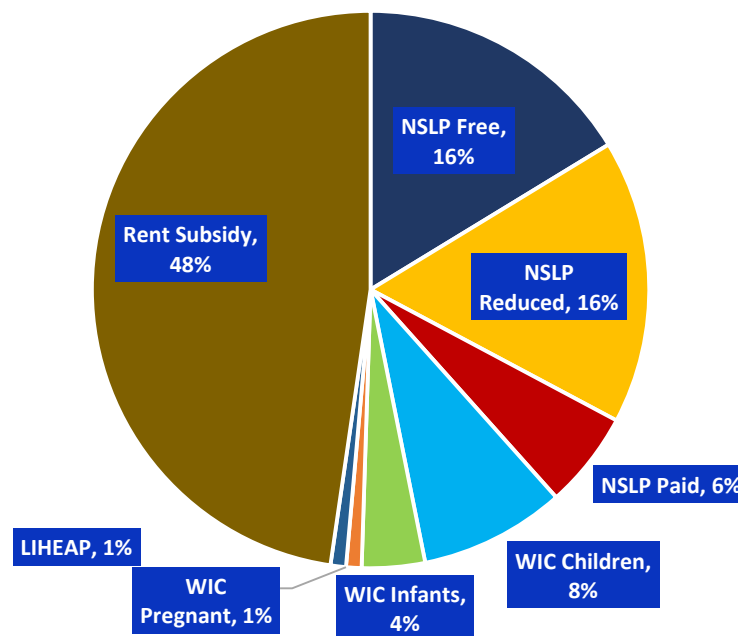
Aggregates based on imputed rent subsidies

Distribution of CUs with In-kind Benefits

Legend: NSLP Free, NSLP Reduced, NSLP Paid, WIC Children, WIC Infants, WIC Pregnant, LIHEAP, Rent Subsidy
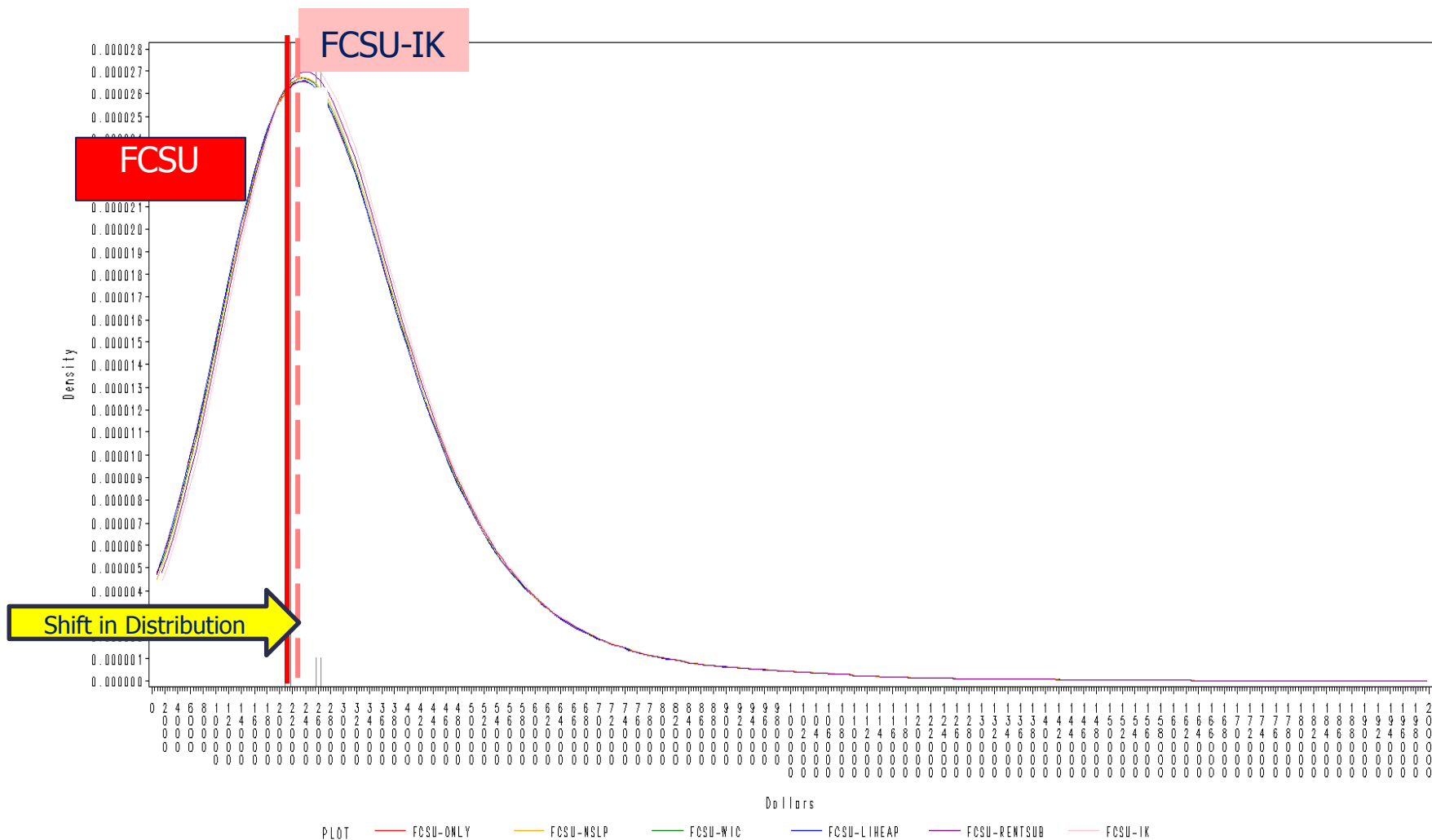
All CUs

CUs with 2 children in 30-36th

Going from FCSU to FCSU-IK in Thresholds

Density of FCSU and FCSU-IK for 2A+2C around "33rd" Percentile

2014 SPM Thresholds with and without In-Kind Imputed Benefits: 2 Adults with 2 Children ("2A+2C")

Owners with mortgages

Owners without mortgages

Renters

$25,844 — $26,689 — $26,742

$21,380 — $22,300 — $22,499

$25,460 — $26,348 — $26,576

- Only Food Stamps
- FCSU + NSLP + WIC + LIHEAP + Rent Subsidy (Imputed)
- FCSU + NSLP + WIC + LIHEAP + Rent Subsidy (FMR)

2014 SPM Thresholds with and without In-Kind Imputed Benefits: 2 Adults with 2 Children ("2A+2C")

Owners with mortgages

Renters

Owners without mortgages

- **Only Food Stamps** — $25,844 / $21,380 / $25,460
- **FCSU + NSLP + WIC + LIHEAP + Rent Subsidy (Imputed)** — $26,689 / $22,300 / $26,348
- **FCSU + NSLP + WIC + LIHEAP + Rent Subsidy (FMR)** — $26,742 / $22,499 / $26,576
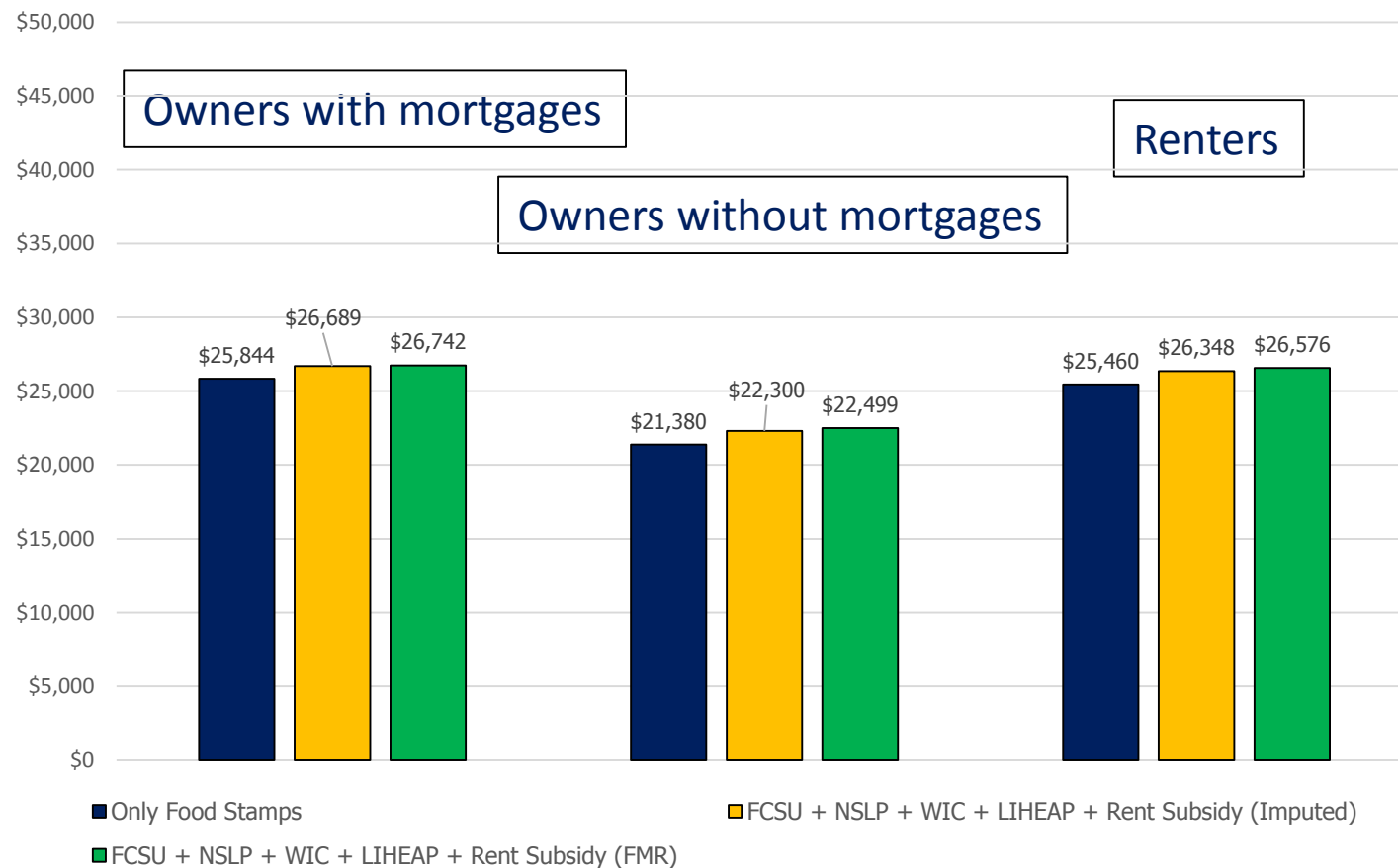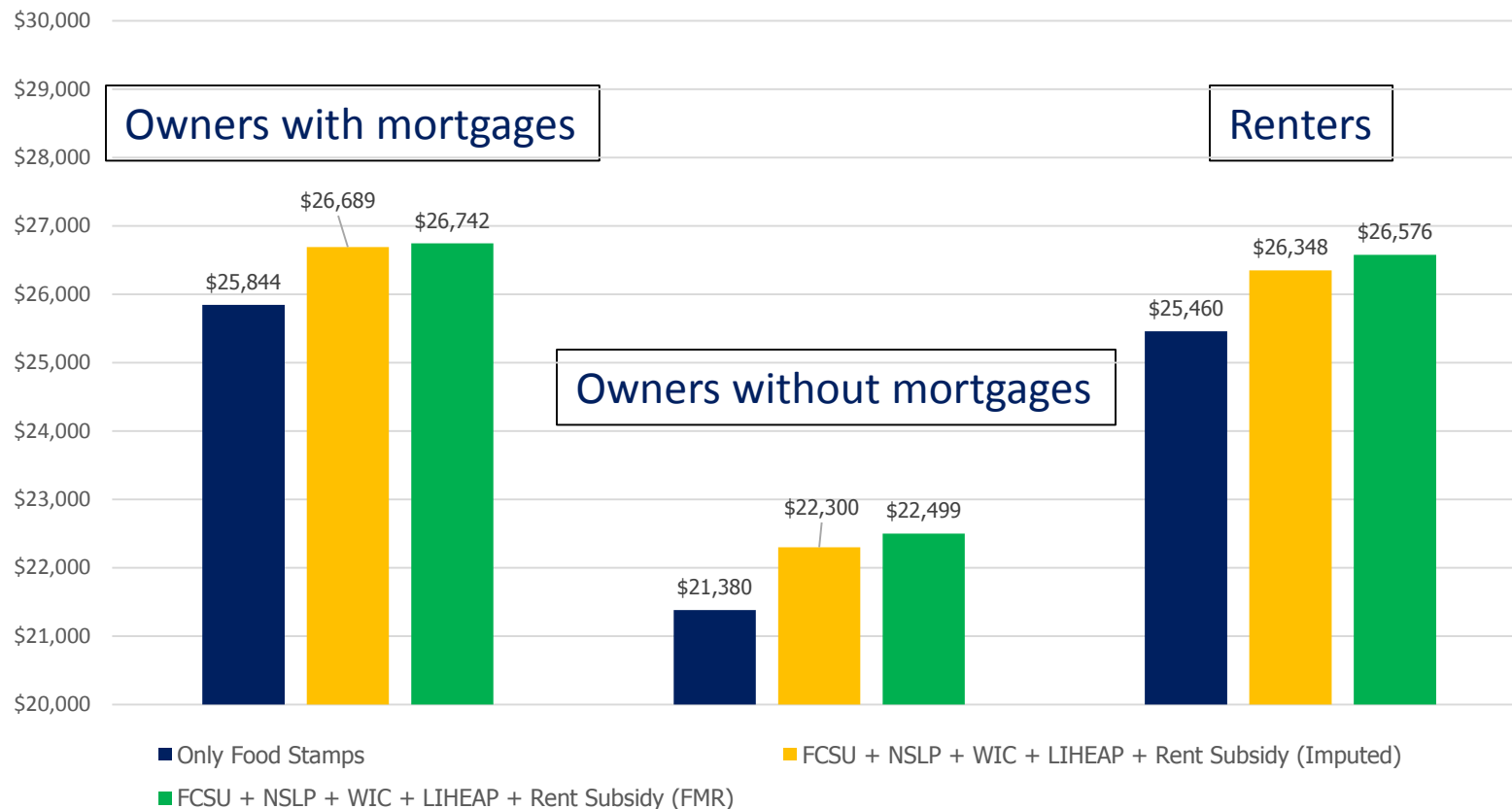
2014 Poverty Rates for Thresholds with and without In-Kind Imputed Benefits
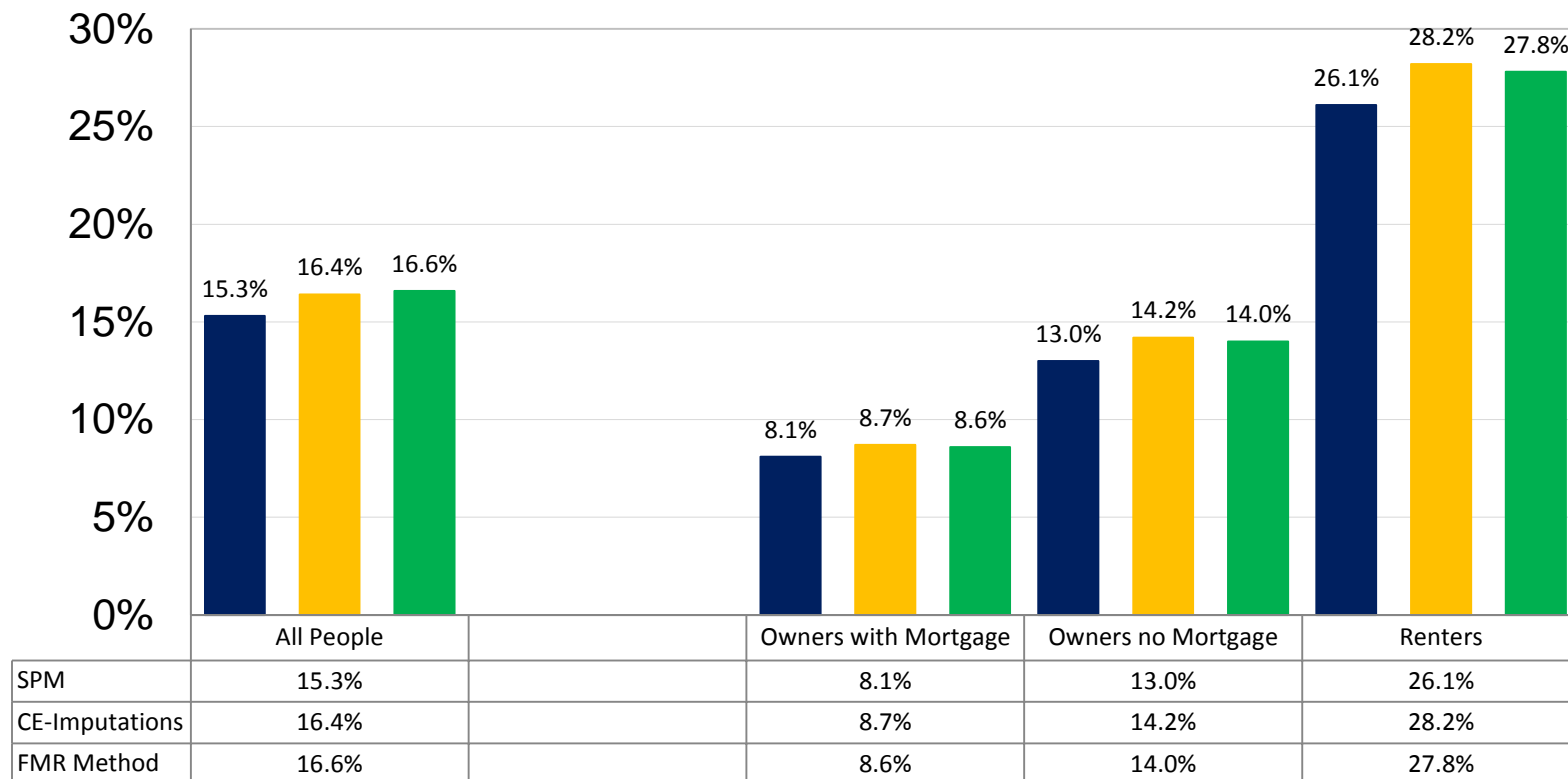
	All People		Owners with Mortgage	Owners no Mortgage	Renters
SPM	15.3%		8.1%	13.0%	26.1%
CE-Imputations	16.4%		8.7%	14.2%	28.2%
FMR Method	16.6%		8.6%	14.0%	27.8%

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Summary

- Expenditures ≠ Consumption in the presence of in-kind benefits

- Examined impact of different options to deal with missing data in the CE, imputing participation (with exception of subsidized rental housing) and benefits

- Estimating consumption of FCSU, when benefits present, results in better measure of "needs"

- Questions remain

  - To what source should consumption values be compared?

    - Administrative data

    - CPS reports

    - Other CUs

  - Should two thresholds for renters be produced (renters with and renters without subsidies) like the treatment of owners?

  - Are benefit valuations sufficient to estimate consumption needs?

Conclusions

1. Spending ≠ Consumption in the presence of in-kind benefit participation

2. Estimating consumption of FCSU, when benefits present, results in better measure of "needs"
   - Improved SPM thresholds that reflect values of FCSU "purchased by/made available to" CUs (*consumption* for all but owner-occupied housing)
   - Consistency in threshold and resource concepts: resources to meet "needs"

3. Imputing for missing data in CE for in-kind benefit recipients -- one approach to value consumption

4. Questions remain
   - To what should consumption values be targeted?
     - Administrative data
     - CPS statistics

5. Continue research to address missing data problem in the CE
   - Explore possibility of 2 renter thresholds (with and without subsidies)

Contact Information

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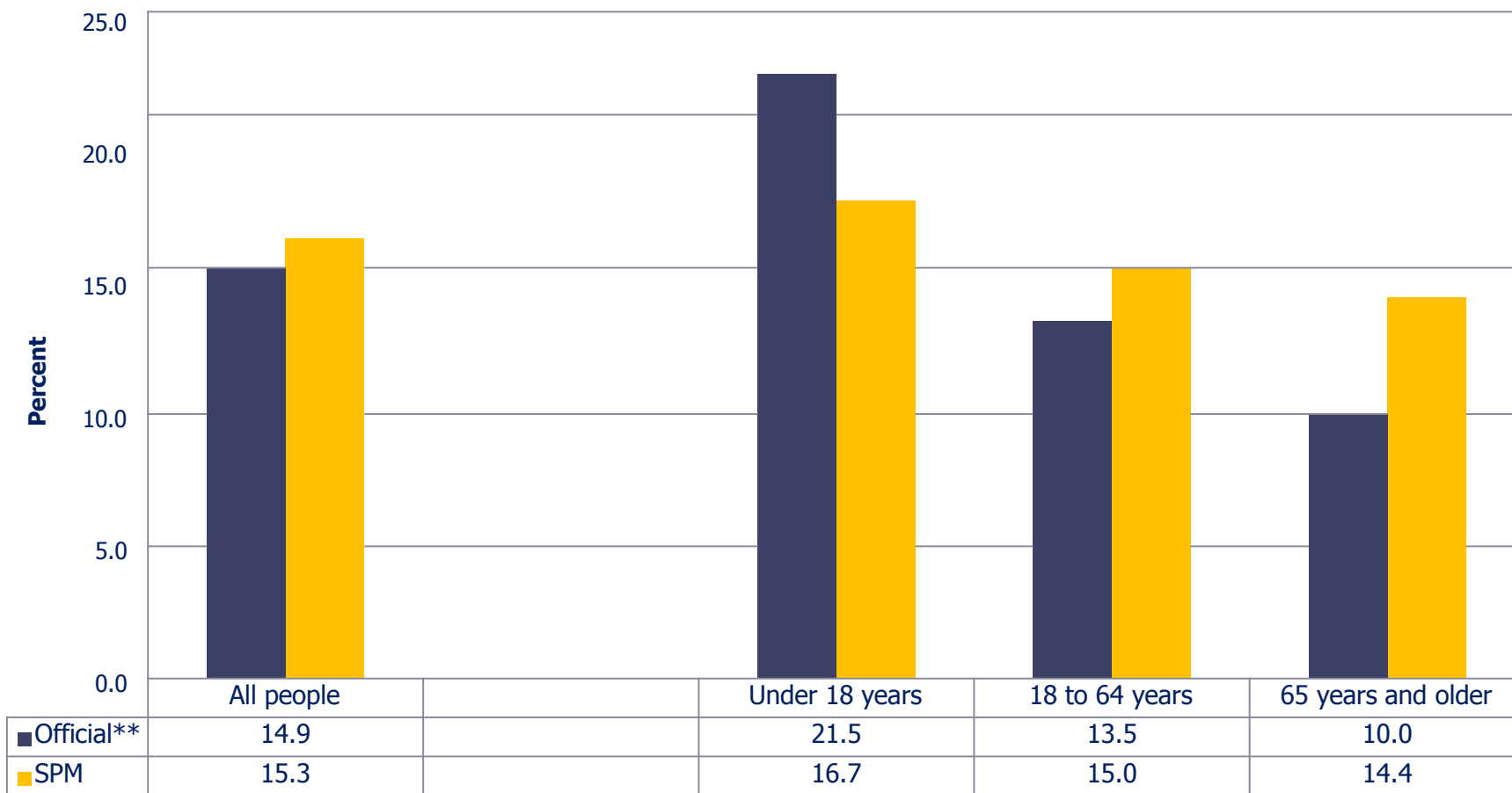http://stats.bls.gov/pir/spmhome.htm
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Extra Slides

Figure 1: Poverty rates using two measures for total population and by age group: 2014

	All people		Under 18 years	18 to 64 years	65 years and older
Official**	14.9		21.5	13.5	10.0
SPM	15.3		16.7	15.0	14.4

**Includes unrelated individuals under the age of 15.
Source: Current Population Survey, 2015 Annual Social and Economic Supplement.
Southern Economics Association Annual Conference, November 2015.

Expenditures, In-Kind Benefits, and Resources

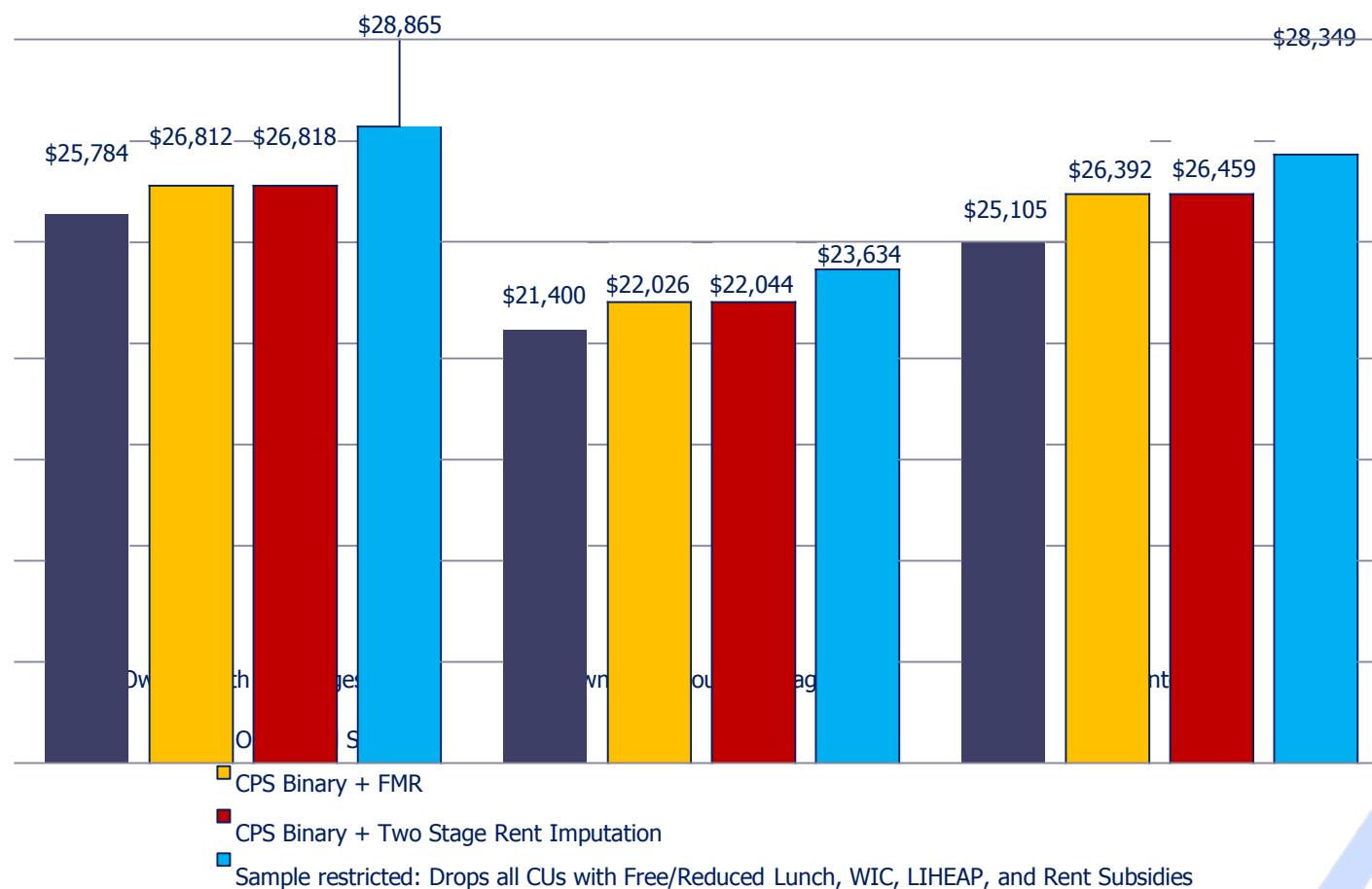| Benefit	Form of Benefit	Value of Commodity or Service in CE Reported Expenditures?	Commodity or Service Value in Thresholds	In Resources
SNAP	EBT cash-value to CU	yes, as food expenditures= full value	OOP	cash value
Housing Subsidies	Landlord accepts voucher or CU lives in public housing	< full value	OOP+imputed benefit	imputed benefit
NSLP	Direct payment to school	< full value	OOP+imputed benefit	imputed benefit
WIC	Voucher paper or EBT for commodities to CU (& cash value voucher for fruits and veggies to CU)	< full value, yes, as food expenditure for WIC fruits and veggies	OOP+imputed benefit	imputed benefit (w/$cash voucher)
LIHEAP	Direct payment to vendor (& check to CU to pay for "utilities" included in rent)	< full value, Yes, as expenditures for LIHEAP utilities	OOP+imputed benefit	imputed benefit (w/$check)

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Solution: Thresholds and Resources Consistently Defined

Thresholds

Resources

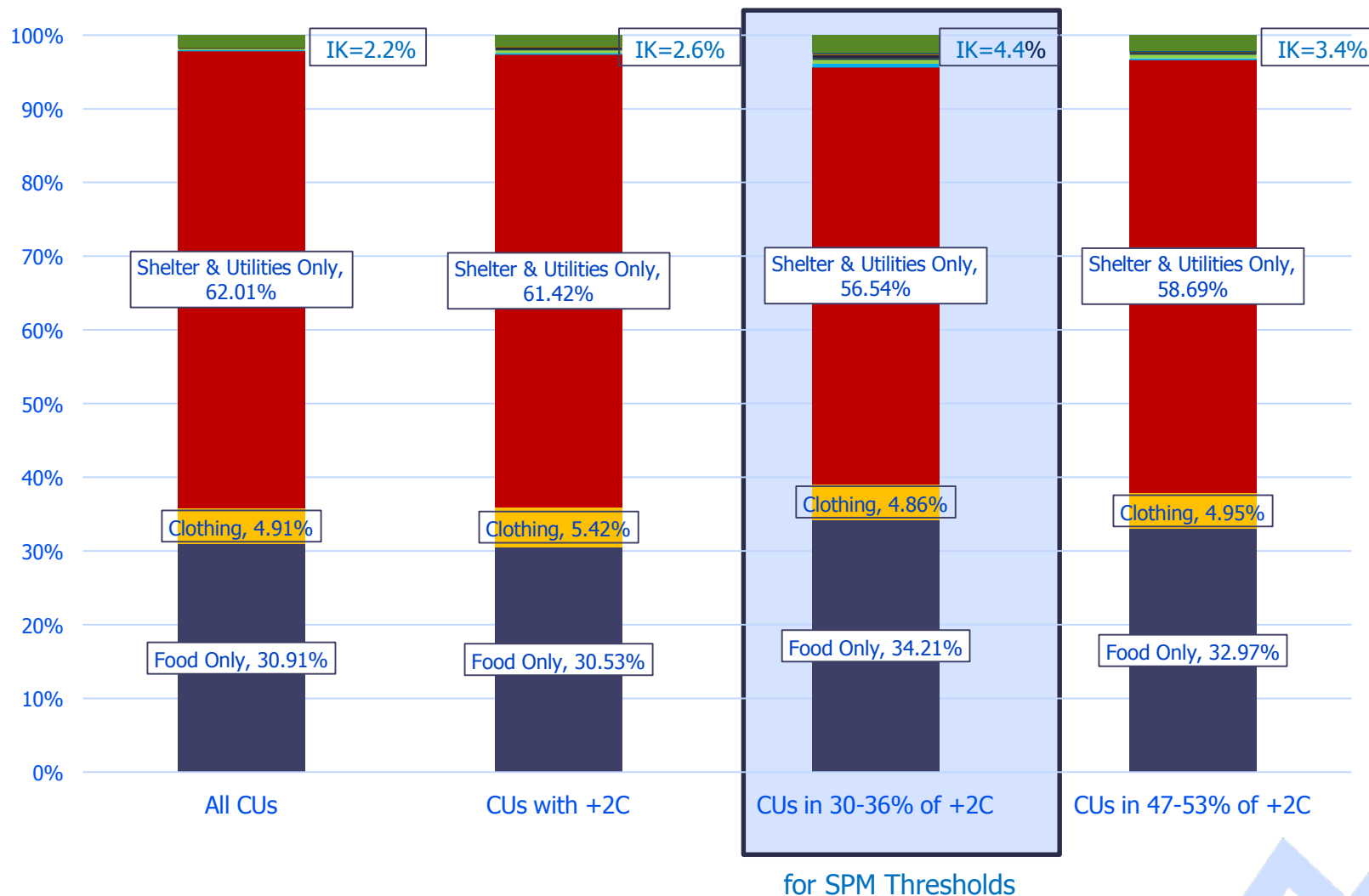Expenditures for FCSU (includng SNAP)

With SNAP In-Kind Benefits

Cash income
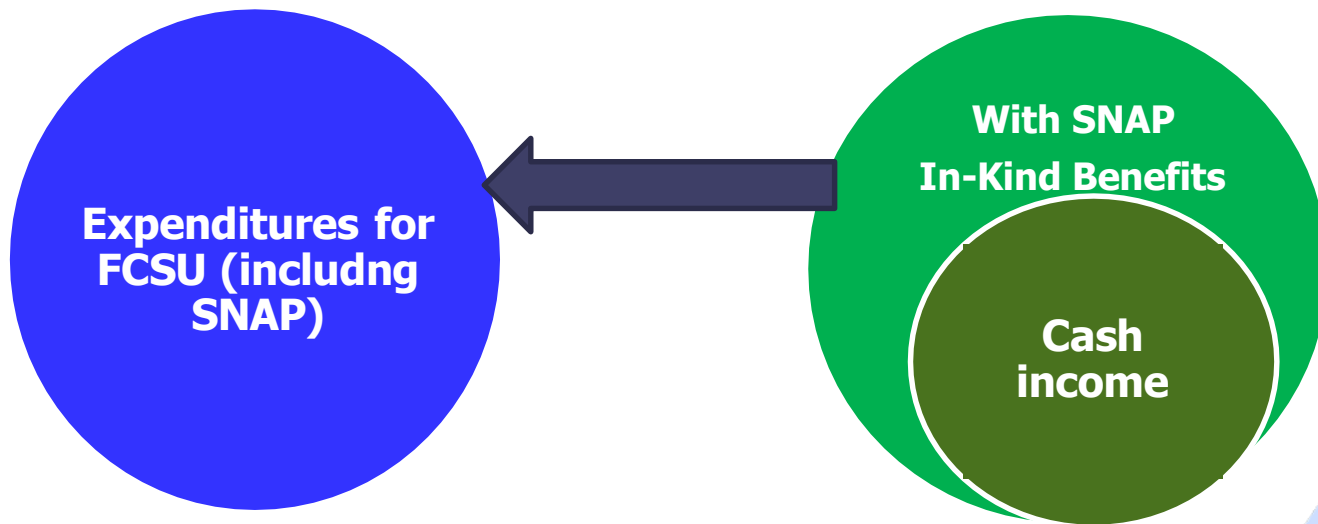
2012 Thresholds Based on Full Estimation Sample vs. Restricted by Benefit Non-participation: 2A+2C

Percent of 2012 Aggregate Dollars Using 5 Years of CE Data

All CUs
- IK=2.2%
- Shelter & Utilities Only, 62.01%
- Clothing, 4.91%
- Food Only, 30.91%

CUs with +2C
- IK=2.6%
- Shelter & Utilities Only, 61.42%
- Clothing, 5.42%
- Food Only, 30.53%

CUs in 30-36% of +2C
- IK=4.4%
- Shelter & Utilities Only, 56.54%
- Clothing, 4.86%
- Food Only, 34.21%

CUs in 47-53% of +2C
- IK=3.4%
- Shelter & Utilities Only, 58.69%
- Clothing, 4.95%
- Food Only, 32.97%

for SPM Thresholds

Consistency in Poverty Concept:
Resources to Meet FCSU but only Evalulate SNAP Impact

Thresholds
(currently used)

Resources

Expenditures for FCSU (includng SNAP)+"little bit more"

← Consistent

With SNAP In-Kind Benefits

Cash income
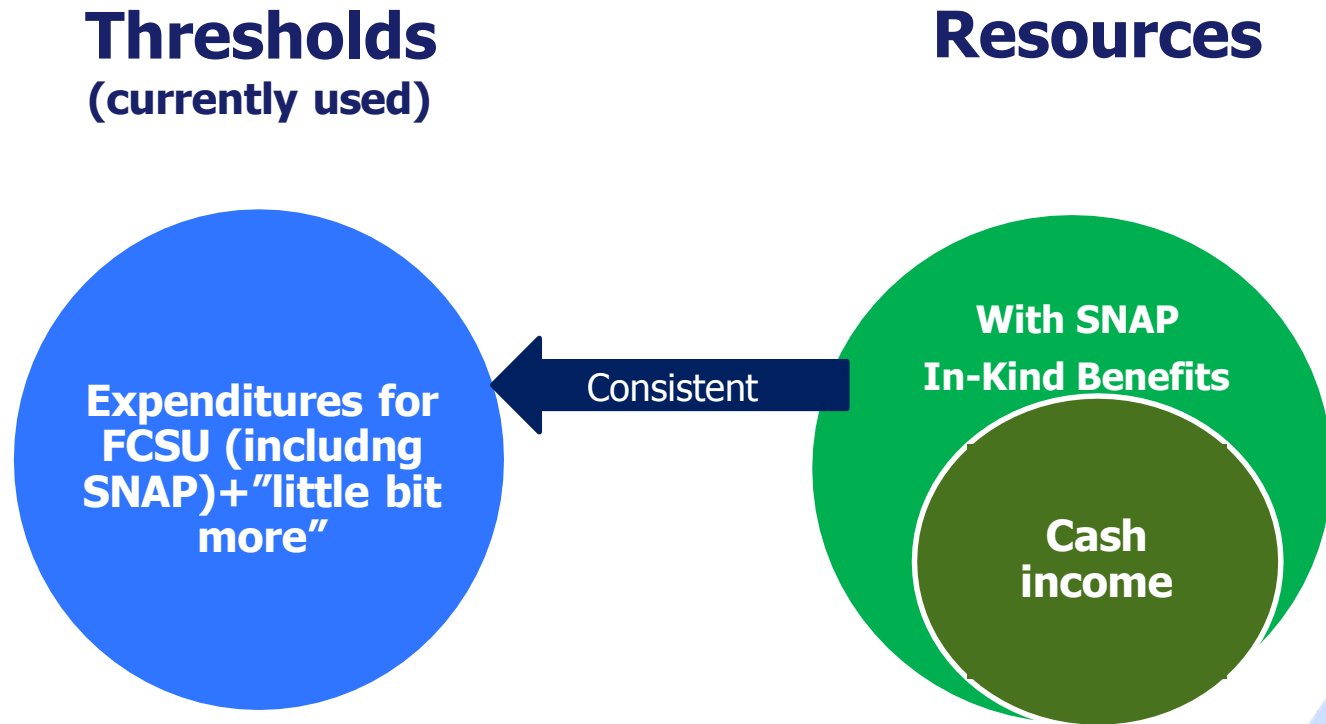
Logistic Regression Method for Monotone Missing Data

For a binary variable Y_j with responses 1 and 2, a logistic regression model is fitted using observations with observed values for the imputed variable Y_j and its covariates $X_1, X_2, ..., X_k$:

$$\text{logit}(p_j) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k$$

where $X_1, X_2, ..., X_k$ are covariates for Y_j, $p_j = \Pr(n_j = 1 | x_1, x_2, ..., x_k)$, and $\text{logit}(p) = \log(p/(1-p))$.

The fitted model includes the regression parameter estimates $\hat{\boldsymbol{\beta}} = (\hat{\beta}_0, \hat{\beta}_1, ..., \hat{\beta}_k)$ and the associated covariance matrix $\mathbf{V}_j$.

The following steps are used to generate imputed values for a binary variable Y_j with responses 1 and 2:

1. New parameters $\boldsymbol{\beta}_* = (\beta_{*0}, \beta_{*1}, ..., \beta_{*(k)})$ are drawn from the posterior predictive distribution of the parameters.

$$\boldsymbol{\beta}_* = \hat{\boldsymbol{\beta}} + \mathbf{V}'_{hj} \mathbf{Z}$$

where $\mathbf{V}'_{hj}$ is the upper triangular matrix in the Cholesky decomposition, $\mathbf{V}_j = \mathbf{V}'_{hj} \mathbf{V}_{hj}$, and $\mathbf{Z}$ is a vector of $k - 1$ independent random normal variates.

2. For an observation with missing Y_j and covariates $v_1, v_2, ..., v_k$, compute the expected probability that $Y_j = 1$:
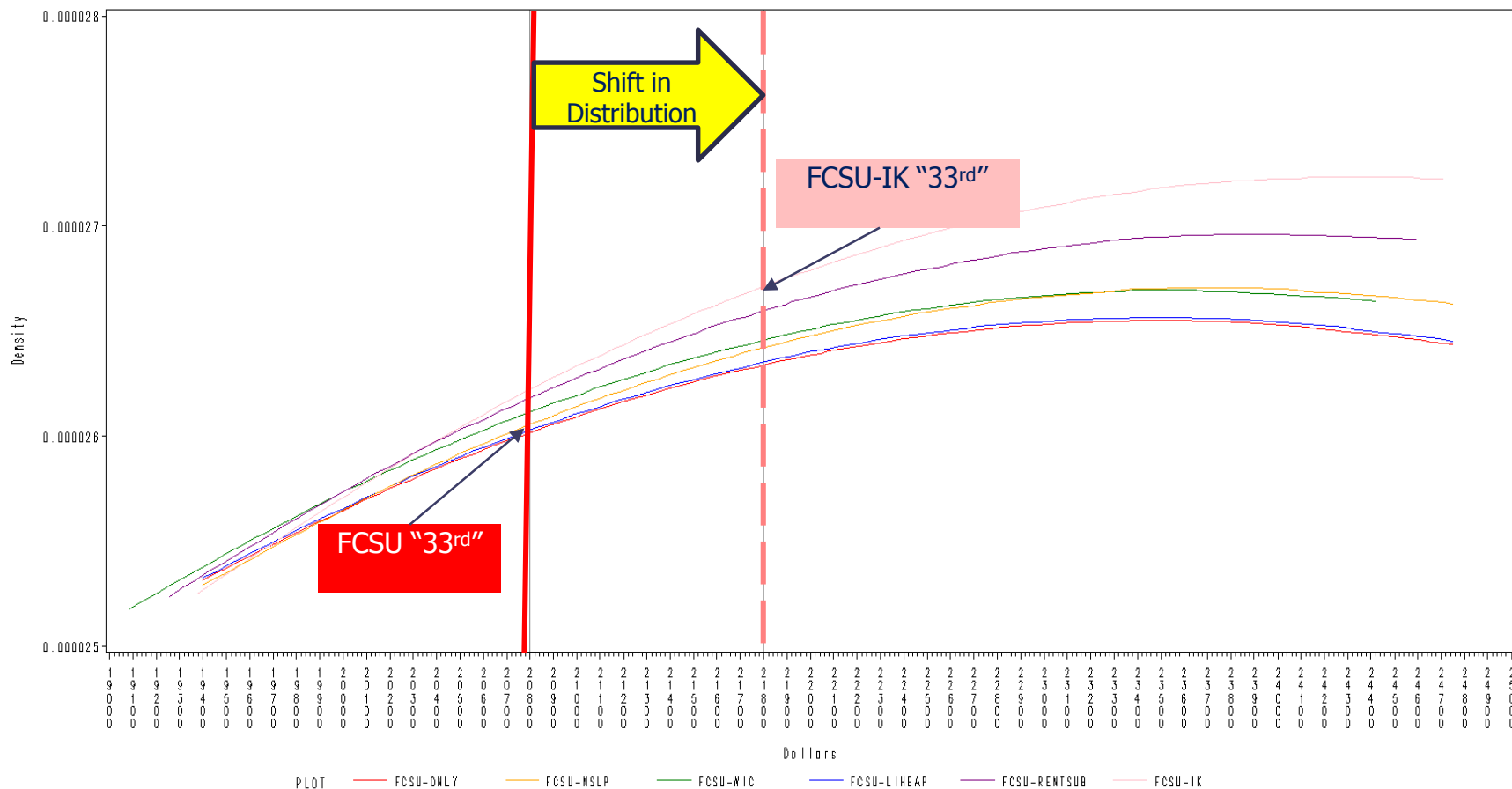
$$p_j = \frac{\exp(\mu_j)}{1 + \exp(\mu_j)}$$

where $\mu_j = \beta_{*0} + \beta_{*1} x + \beta_{*2} x_2 + ... + \beta_{*(k)} x_k$.

3. Draw a random uniform variate, u, between 0 and 1. If the value of u is less than p_j, impute $Y_j = 1$; otherwise impute $Y_j = 2$.
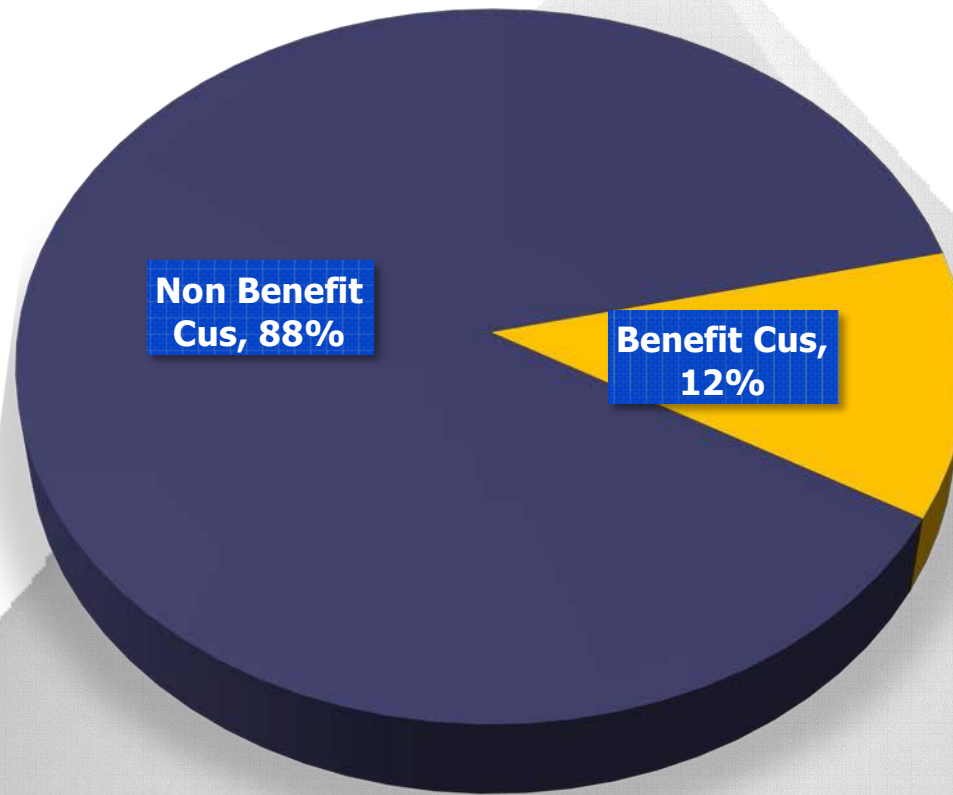
Reference: PROC MI: Logistic Regression Method for Monotone Missing Data: SAS/STAT® 9.2 User's Guide, Second Edition

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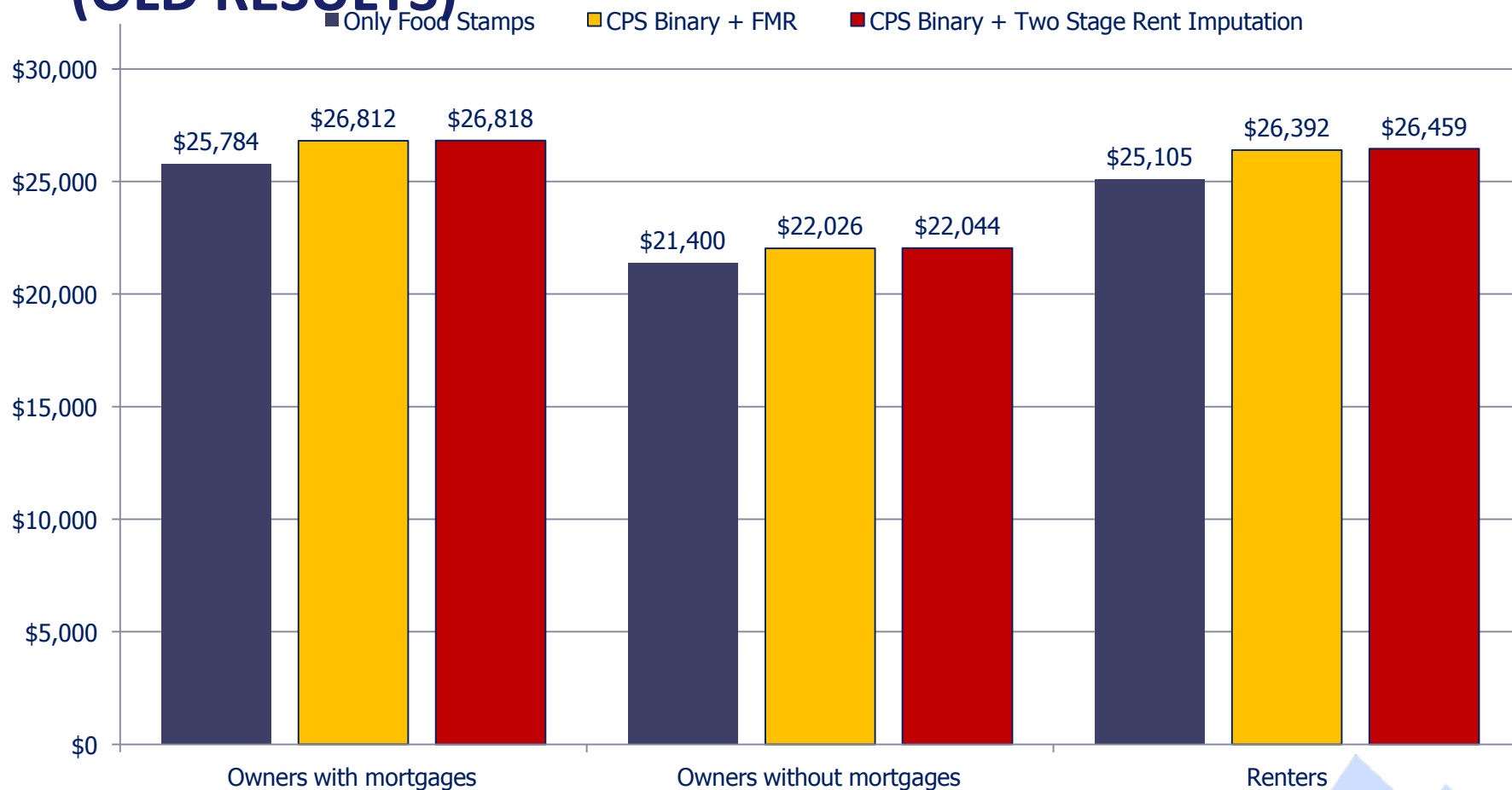# Density of FCSU and FCSU-IK for 2A+2C around the 33rd Percentile

Which CU Population's Economic Behavior Reflects Consumption Needs?

CU Sample Population

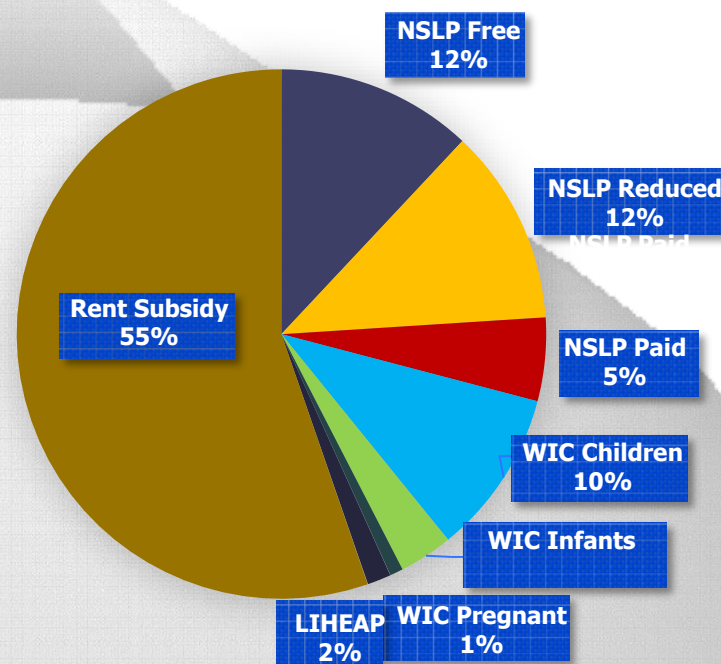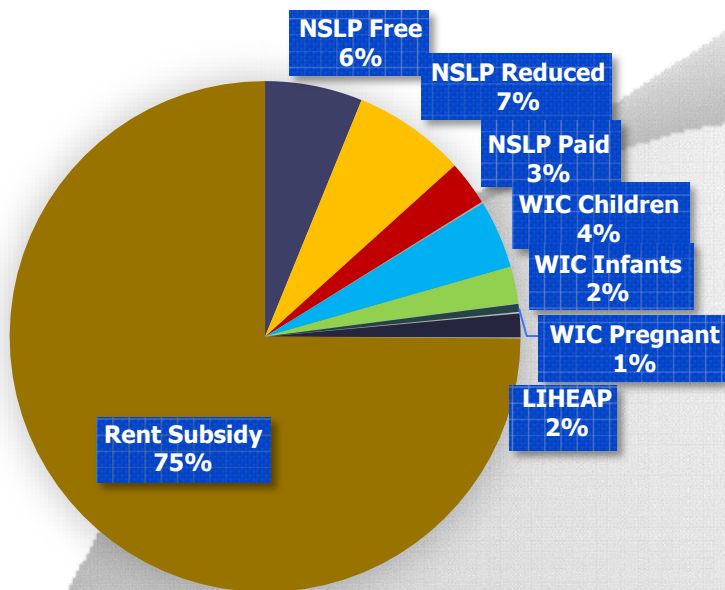Non Benefit Cus, 88%

Benefit Cus, 12%

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2012 SPM Thresholds with and without In-Kind Imputed Benefits: 2 Adults with 2 Children ("2A+2C") (OLD RESULTS)

Aggregate Shares of In-kind Benefits by Participant Type

All Cus: IK=1.8% of Aggregate

CUs in 30-36th Percentile "2+2": 4.9% of Aggregate

Left pie chart:
- NSLP Free 6%
- NSLP Reduced 7%
- NSLP Paid 3%
- WIC Children 4%
- WIC Infants 2%
- WIC Pregnant 1%
- LIHEAP 2%
- Rent Subsidy 75%

Right pie chart:
- NSLP Free 12%
- NSLP Reduced 12%
- NSLP Paid 5%
- WIC Children 10%
- WIC Infants
- WIC Pregnant 1%
- LIHEAP 2%
- Rent Subsidy 55%

Aggregates based on CE imputed rent subsidies

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