2018 CE Survey Microdata Users' Workshop

Sampling Methods and Derivation of Sampling Weights

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Overview

- **History and Concepts**
- **Sample Selection**
  - Define PSUs
  - Stratify and Select a Sample of PSUs
  - Stratify and Select a Sample of Households
- **Weighting the Households**

History of Sample Redesigns

- New sample of geographic areas selected <u>every decade</u>
  - 1980 Census-Based Sample Design (1986–1995)
  - 1990 Census-Based Sample Design (1996–2004)
  - 2000 Census-Based Sample Design (2005–2014)
  - 2010 Census-Based Sample Design (2015–2024?)
  - 2020 Census-Based Sample Design (2025–2034???)

Concepts

- Target Population:

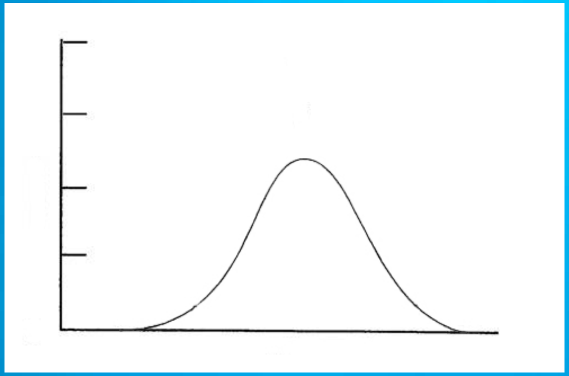
  U.S. non-institutional civilian population

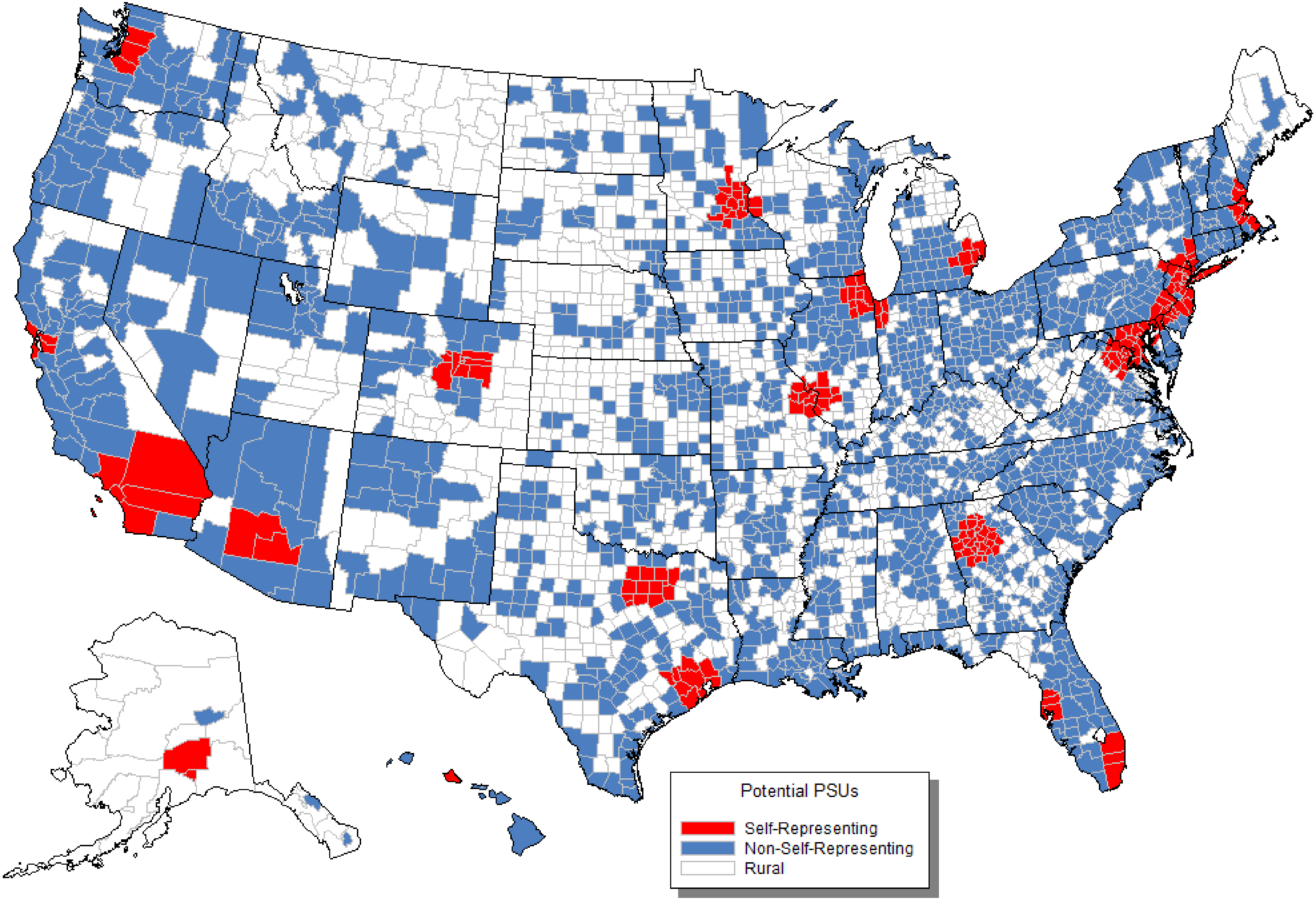
- Sampling Frame
  - List of households from which we draw our sample
  - Based on 2010 Census ("Master Address File")
  - Biannual updates from U.S. Postal Service (twice a year)

Sample Selection – Overview

- Geographic areas are randomly selected to represent the total U.S.
- Households are randomly selected to represent the geographic areas
- Guiding principle:

“Randomness ensures representativeness.”

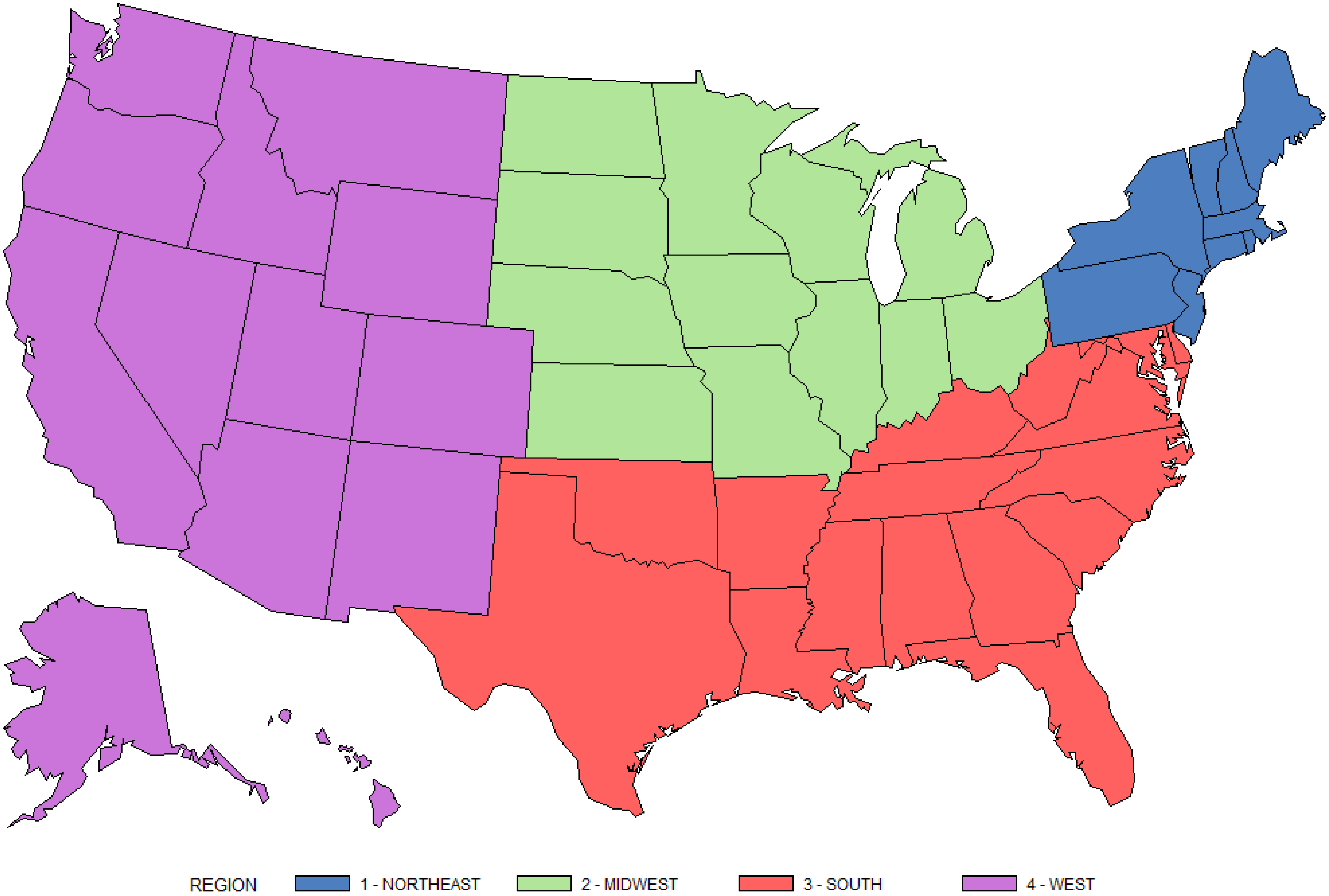



Potential PSUs
🟥 Self-Representing
🟦 Non-Self-Representing
□ Rural

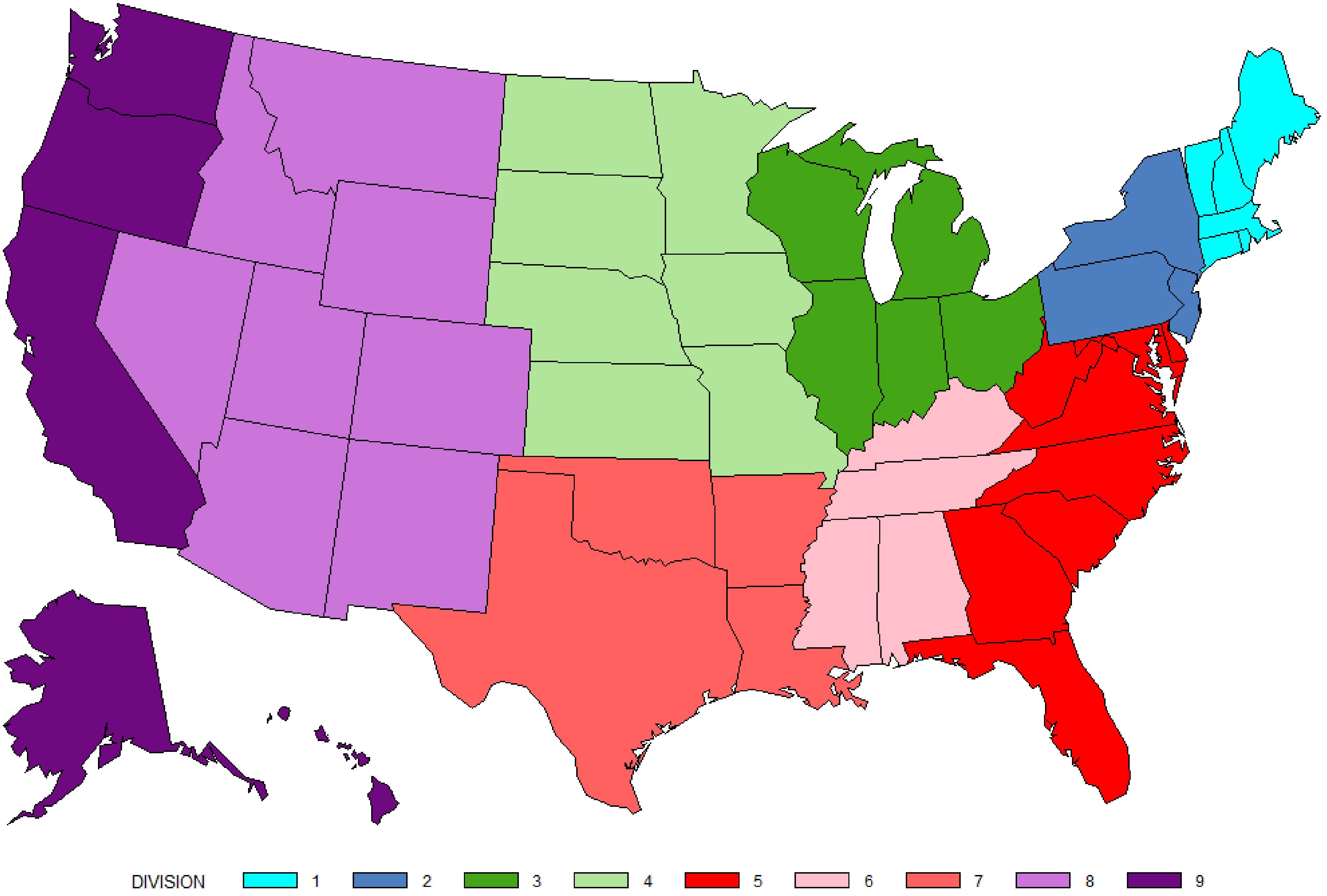
Selection of PSUs

PSU class	Description	CBSA/ Non-CBSA	Population Total	Examples	
S	Self-Representing	Metropolitan (urban)	More Than 2,500,000	S11A S49D	Boston MA Seattle WA
N	Non-Self-Representing	Metro- or Micropolitan (urban)	Less Than 2,500,000		*Topcoded*
R	Rural *(also not Self-Representing)*	Non-CBSA (rural)			*Topcoded*

The Four Census Regions



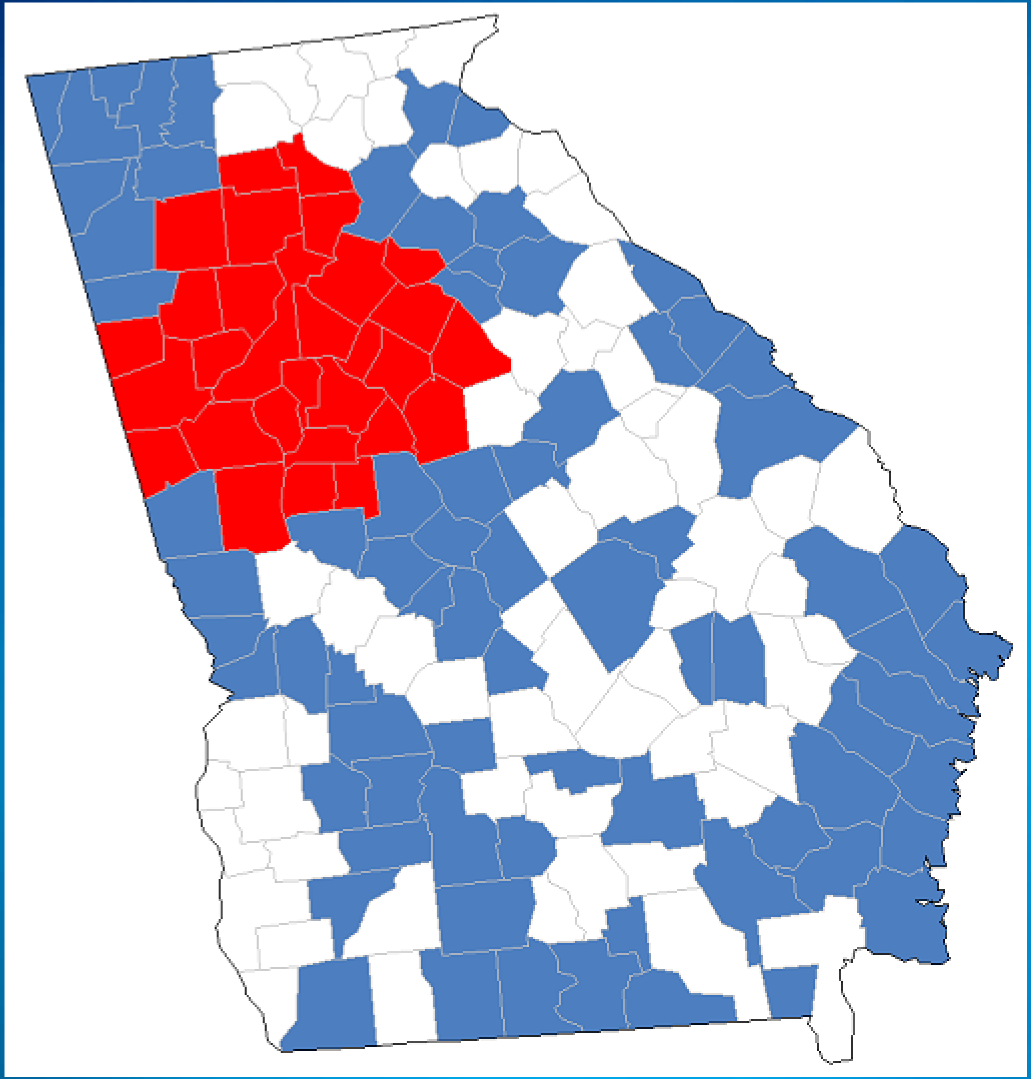
The Nine Census Divisions



Sample Selection:
CPI – 75 PSUs; CE – 91 PSUs

PSU Size	Region/Division									Total
	Northeast		Midwest		South			West		
	01	02	03	04	05	06	07	08	09	
S	1	2	2	2	5	0	2	2	7	23
N	2	4	8	4	12	6	8	4	4	52
R	1	1	2	2	2	2	2	3	1	16
Total	4	7	12	8	19	8	12	9	12	91

Hypothetical PSU Selection



Hypothetical PSU Selection (continued)

	CBSA	2010 Population	Probability of Selection
✓	Augusta, GA-SC	564,873	0.92208
	Jessup, GA	30,099	0.04913
	Fitzgerald, GA	17,634	0.02879
	Total	**612,606**	**1.00000**

	CBSA	2010 Population	Probability of Selection
	Columbus, GA-AL	294,865	0.47829
	Valdosta, GA	139,588	0.22642
✓	LaGrange, GA	67,044	0.10875
	Moultrie, GA	45,498	0.07380
	Douglas, GA	42,356	0.06870
	Thomaston, GA	27,153	0.04404
	Total	**616,504**	**1.00000**

Number of Addresses

- **Local Target Sample Size**
  - Allocate 12,000 addresses to individual PSUs, proportional to each stratum’s population
  - Minimizes CE’s nationwide variance

Number of Addresses (continued)

Given the values of p_i and r_i for every index area i, find the values of n_i that	
Minimize	$\sum_{i=1}^{91}\left(\frac{n_i r_i}{NR}-\frac{p_i}{p}\right)^2$
Subject to:	$\sum_{i=1}^{91} n_i = 12{,}000$
	$n_i \geq 0$, for $i = 1\ to\ 91$

Translate Addresses into Interviewed Households

- 83% "eligibility" rate: (most of the missing 17% are unoccupied)
- 60% response rate
- 50% "participation" rate (0.50 ≈ 0.83 × 0.60)

Number of Households from Number of Addresses

				Interviewed
PSU		**Population**	**Addresses**	**Households**
S11A	Boston	4.6 million	193	80
S12A	New York City	19.6 million	770	389
S12B	Philadelphia	6.0 million	191	109
S35A	Washington, DC	5.6 million	188	103
S35C	Atlanta	5.3 million	170	95
	etc.		*etc.*	*etc.*
Total		**308 million**	**12,000**	**6,350**

Select a Random Sample of Households (Mechanics)

- **Sort households from poor to rich based on information from Decennial Census and ACS:**
  - Number of people in household
  - Tenure (owner, renter)
  - Market value of home (owners)
  - Monthly rent (renters)

Select a Random Sample of Households (Continued)

- **Compute the sampling interval for each PSU**

- **Sampling interval = (# addresses in sampling frame) ÷ (# addresses in CE sample)**

- **Typical sampling intervals:**
  - Every 1,000th address (N and R PSUs)
  - Every 5,000th address (S PSUs)

Weighting Process

Weighting Process

- Base Weight (~10,000)

  Household + 9,999 others

- Weighting Control Factor (~1.00)

  Apartment Building instead of a House

- Non-interview Adjustment Factor (~1.50)

  Type A: Refusal to Participate

- Calibration Adjustment Factor (~1.15)

  Adjusts sample estimate to CPS Totals

Base Weight

A Hypothetical Example: (Non-Self-Representing PSU)

- PSU Population 538,200
  - MAF counts 224,250 housing units
  - 115 addresses allocated for each survey
  - “Take Every” = 224,250 / 115 ≈ 1,950
- Stratum population 2,800,000
- PSU Weight = 2,800,000 / 538,200 ≈ 5.2025
- Base Weight = “Take Every” ∗ PSU Weight

  ≈ 1,950 ∗ 5.2025 = 10,145

Final Weight

- Variable FINLWT21
- = Base Weight
  x Weighting Control Factor
  x Non-Interview Adjustment Factor
  x Calibration Adjustment Factor
- ~15,000 to 20,000

Conclusion

Both Sample Design and Weighting Work Together to Produce:

- Best Estimates of U.S. Expenditures
- Subject to Allotted CE Budget

Contact Information

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