Estimating State Expenditures for New Jersey, Florida, and California

Susan L. King

Mathematical Statistician

OPLC/SMD

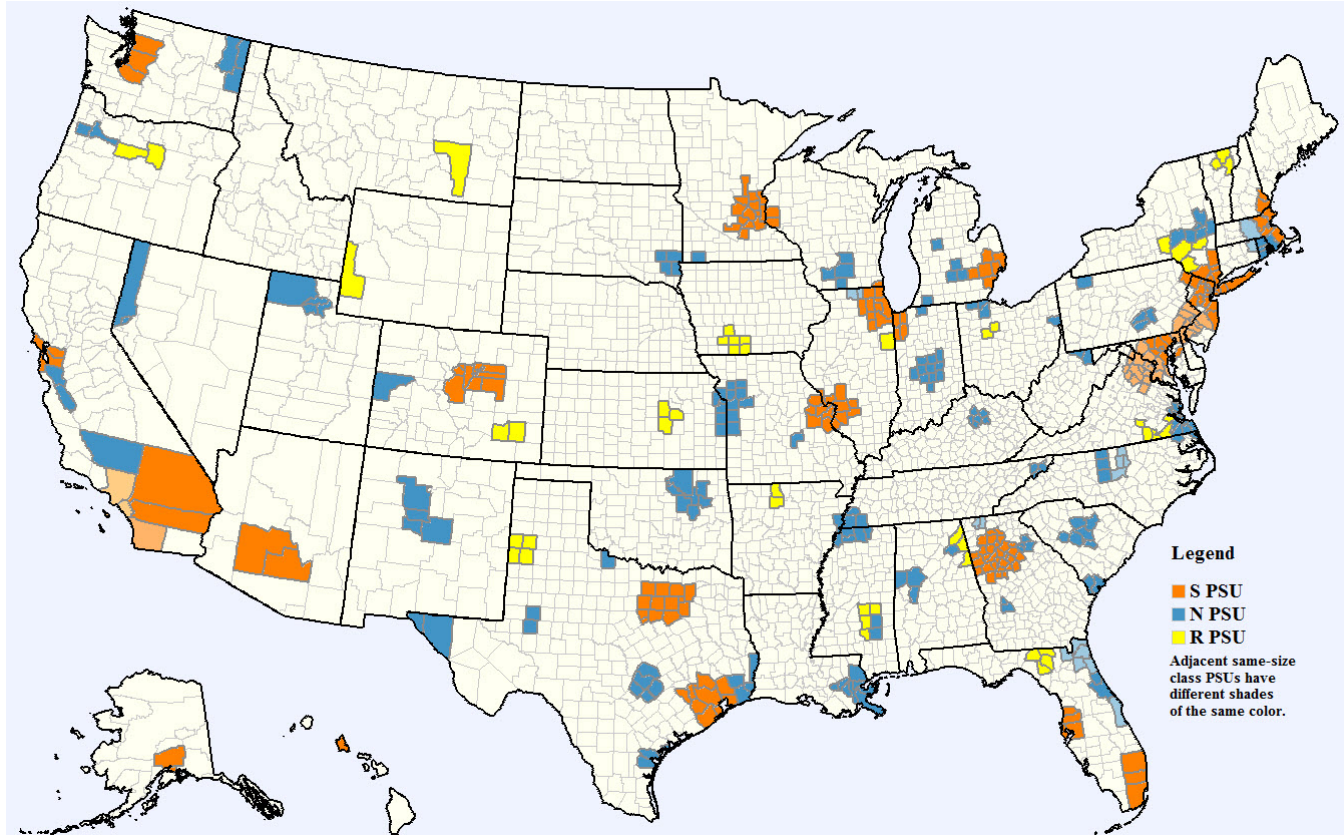**Survey Methods Symposium and CE Microdata Users' Workshop**

July 20, 2017

Objective

- CE Survey designed to produce unbiased national and regional <u>expenditure estimates</u>

- Modify the national base weight equation using U.S. Census tracts, allowing CE to calculate state weights for selected states

- Provide an extra set of weights on CE's Public Use Microdata to allow users to make state estimates for their research projects

- Research in progress

Simulated Design 2010 CE PSUs

Legend
- ■ S PSU
- ■ N PSU
- ■ R PSU

Adjacent same-size
class PSUs have
different shades
of the same color.

Census Tracts

- Small, relatively permanent, contiguous areas within a County or equivalent entity
- Locally updated before decennial census
- Optimum size 4,000 people, but can range from 1,200 to 8,000 people
- Vary in geographical size
- Maintained from census to census

Stratification

- Census tracts in a state are assigned to one of five strata

- Each stratum has approximately equal, population--constrained clustering algorithm
  - ▶ median household property value
  - ▶ median household income

- Each sampled household has a U.S. Census Tract and is assigned to a stratification group

BLS

Base Weights State Estimates

State Base Weight $= \dfrac{1}{\text{Probability of Selection}}$ x

(Within PSU Sampling Interval)

Where

Probability of Selection =

$$\frac{\text{Sum of CE's Tract Populations in a Stratum}}{\text{Sum of the State Tract Populations in a Stratum}}$$

Other Weight Adjustments

- Control Factor Weight
  - ▶ Adjust for multiple housing units where one housing unit was expected
- Non-Interview Adjustment Weight
  - ▶ Cell collapsing procedure that accounts for refusal to participate
- Calibration Adjustment Weight
  - ▶ Adjusts weights to known population counts

Calibration Constraints

- Total number of consumer units in a state

- Total number of homeowner consumer units

- Total state population by age
  - Age 14-24
  - Age 25-34
  - Age 35-44
  - Age 45-54
  - Age 55-64
  - Age 65-74
  - Age 75 +

BLS

Variance State Estimates

- **Jackknife**
  - ▶ U.S. Census Tracts are unique within a county, CTY_TRACT, *i,* and n_h is the number of CTY_TRACTs in stratum h
  - ▶ Calculate the full sample mean for expenditures, $\hat{\theta}$
  - ▶ Calculate the replicate mean for expenditures, $\hat{\theta}_{(hi)}$
    - – Set the weight of CTY_TRACT i in stratum h = 0
    - – Re-weight the other CTY_TRACTs in stratum h, by $\frac{n_h - 1}{n_h}$
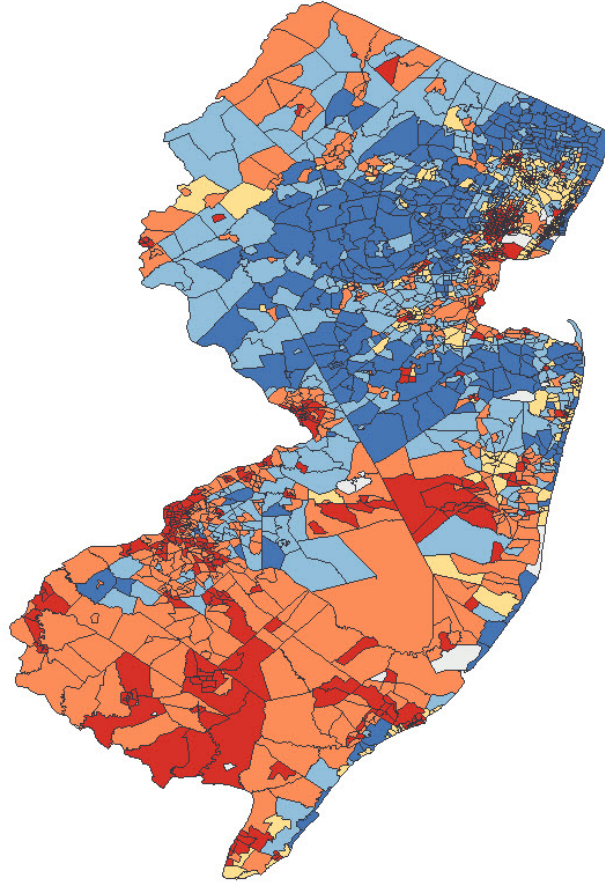   - – Weights in other stratum remain at their original weight

  - ▶ $V(\theta) = \sum_{h=1}^{5} \frac{n_h}{n_h - 1} \sum_{i=1}^{n_h} \left(\hat{\theta}_{(hi)} - \hat{\theta} \right)^2$

New Jersey

- 2,010 U.S. Census Tracts

- 1,397 CUs (2013 Interview & Diary +

    2014 Quarter 1 Interview)
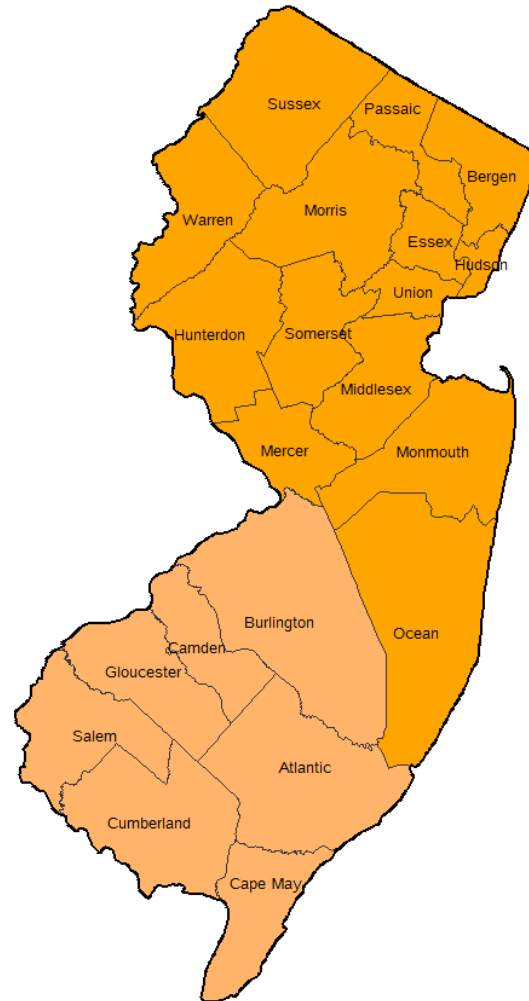
- 557 tracts with CUs

New Jersey

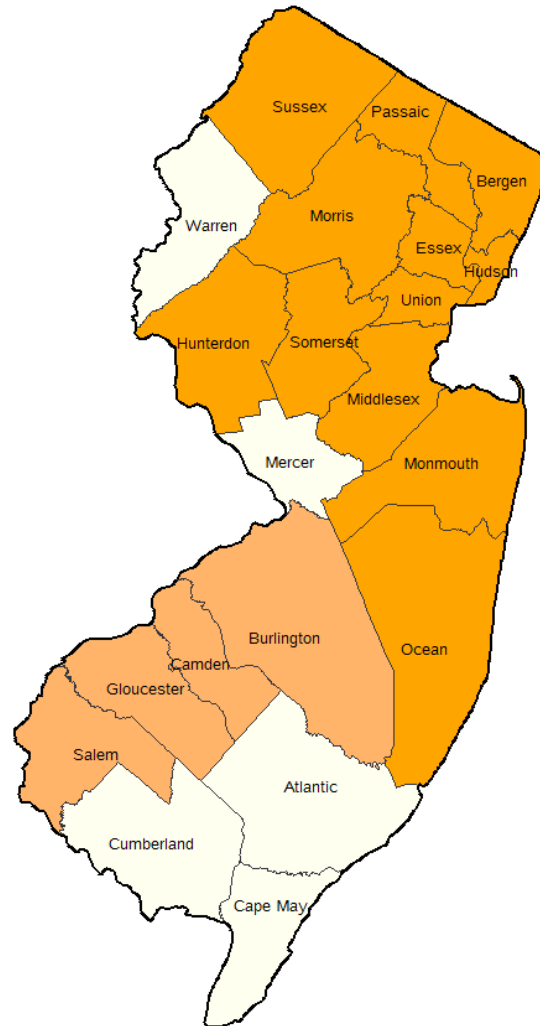|					
■ (191,700 , 38,842)	■ (241,161 , 72,787)	■ (349,476 , 55,966)	■ (357,079 , 98,217)	■ (603,371 , 132,422)	□ No Information

New Jersey Design 2000

New Jersey Design 2010

Legend

■ New York PSU
■ Philadelphia PSU
□ Not Sampled Design 2010

Results for New Jersey

Expenditure Category	CE Estimated State Expenditures				CE's MSA Tables	
	Design 2000		Design 2010		New York	Philadelphia
	Mean ($)	SE ($)	Mean ($)	SE ($)	Mean($)	Mean ($)
Average annual expenditures	65,165	2,408	65,277	2,662	63,193	57,907
Food	7,842	524	7,735	556	7,329	7,263
Housing	25,064	850	25,074	827	25,046	20,475
Transportation	9,177	790	9,118	906	8,442	9,500
Healthcare	3,857	228	3,945	260	3,937	4,386
Personal insurance and pensions	6,950	469	7,030	487	6,993	5,800

Comparison to ACS

- **ACS Public Use Microdata Sample (ACS-PUMS)**
  - ▶ Sample in every state
  - ▶ Ask questions on housing, providing comparisons to CE
    - – CE asks more detailed questions
  - ▶ CE calibrates to Current Population Survey (CPS)
  - ▶ ACS–PUMS calibrates to Census Population Estimates (PEP)

Expenditure Comparison Between CE and ACS – New Jersey

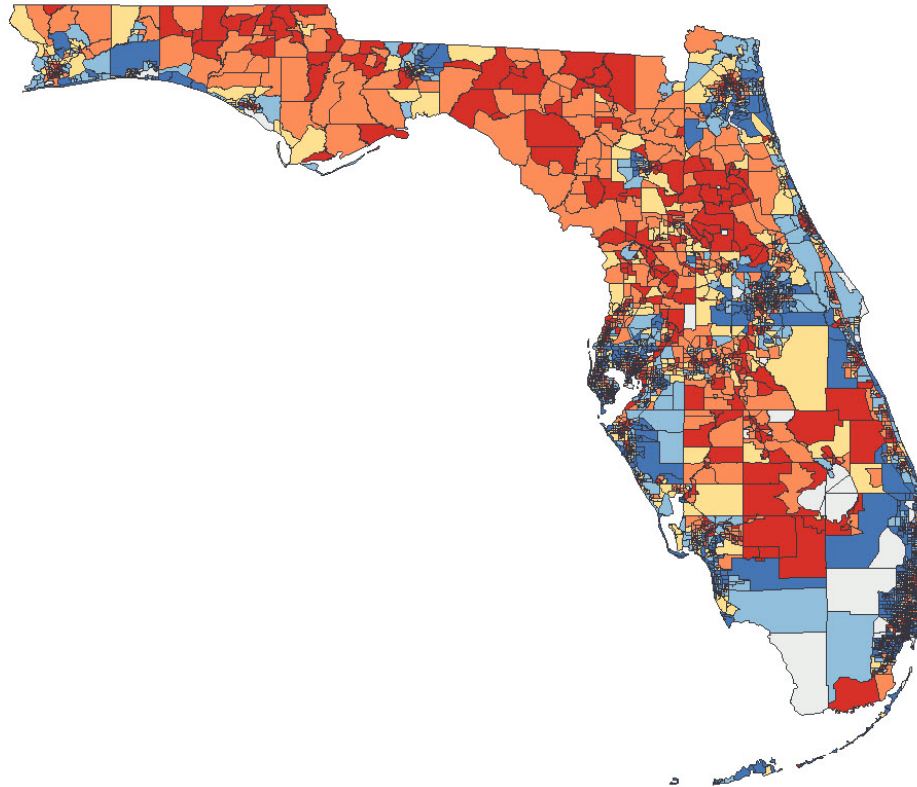| Expenditure	National			New Jersey		
	CE ($)	ACS ($)	CE/ACS	CE ($)	ACS ($)	CE/ACS
Electricity and Natural Gas	1,814.16	2,117.00	0.86	2,308.24	2,667.57	0.87
Rented Dwellings	3,323.61	4,220.06	0.79	4,507.20	5,167.57	0.87

BLS

Florida

- 4,245 U.S. Census Tracts

- 2,858 CUs (2013 Interview & Diary +

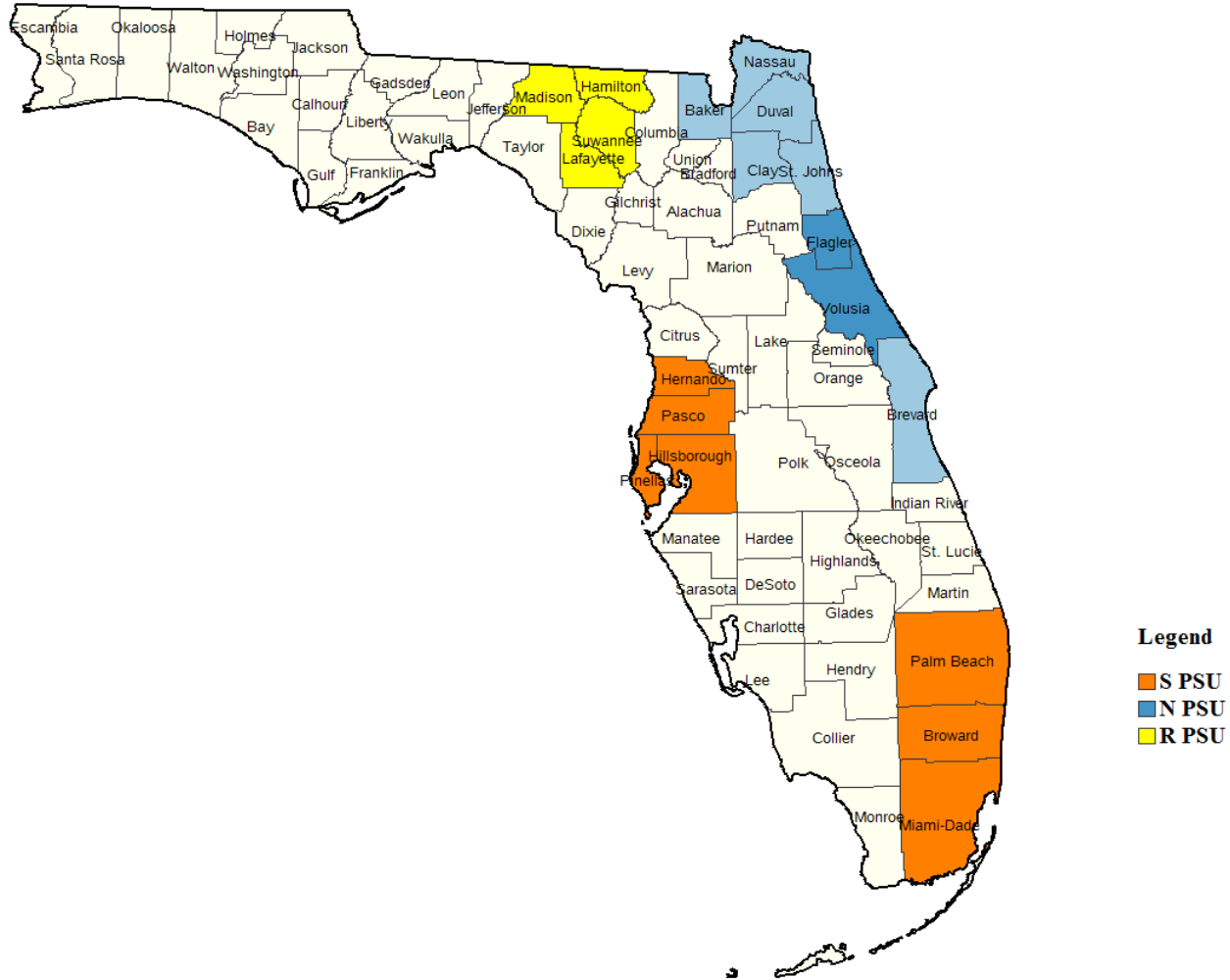 2014 Quarter 1 Interview)

- 716 tracts with CUs

Florida

(88,280 , 28,752)   (102,787 , 42,713)   (173,068 , 45,690)   (201,267 , 62,666)   (381,096 , 86,491)   No Information

Simulated Florida Design 2010

Legend
- S PSU (orange)
- N PSU (blue)
- R PSU (yellow)

Results for Florida

Expenditure Category	CE Estimated State Expenditures		Miami MSA
	Mean ($)	SE ($)	Mean ($)
Average annual expenditures	45,944	1,787	43,066
Food	6,142	370	5,610
Housing	16,719	591	16,981
Transportation	8,304	629	7,243
Healthcare	2,976	177	2,433
Personal insurance and pensions	4,895	427	4,823

Expenditure Comparison Between CE and ACS – Florida

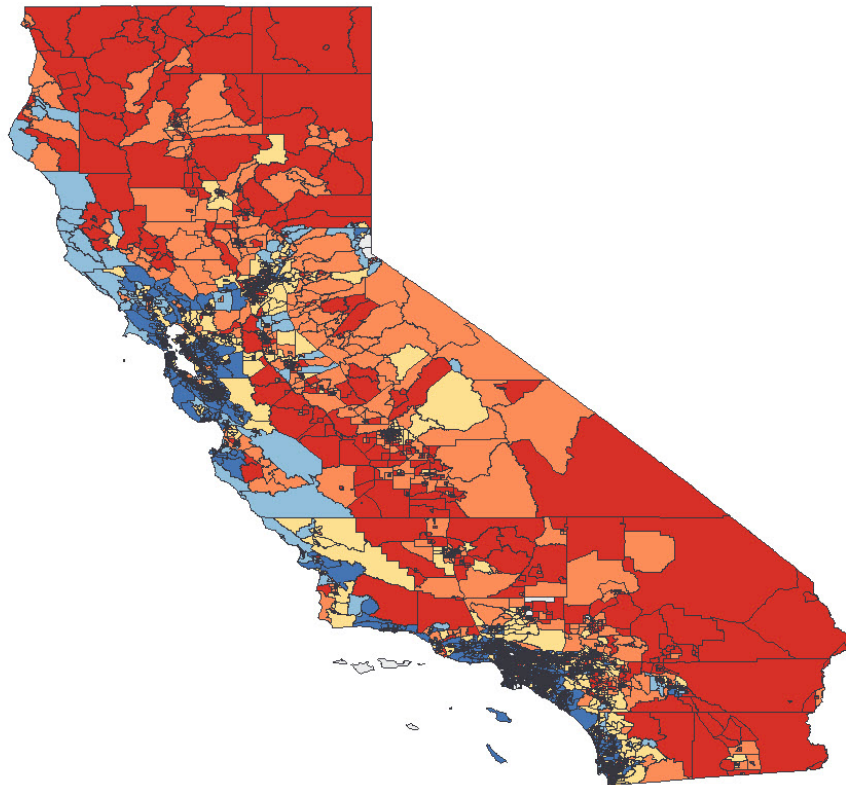| Expenditure	National			Florida		
	CE ($)	ACS ($)	CE/ACS	CE ($)	ACS ($)	CE/ACS
Electricity and Natural Gas	1,814.16	2,117.00	0.86	1,671.94	1,905.32	0.88
Rented Dwellings	3,323.61	4,220.06	0.79	3,605.01	4,229.70	0.85

California

- 8,057 U.S. Census Tracts

- 4,912 CUs (2013 Interview & Diary +

  2014 Quarter 1 Interview)

- 1,472 tracts with CUs

California

(185,957 , 34,332) (248,834 , 56,379) (404,182 , 85,636) (480,867 , 52,513) (792,884 , 114,260) No Information

Simulated California Design 2010

Legend
- **S PSU** (orange)
- **N PSU** (blue)

Results for California

Expenditure Category	CE Estimated State Expenditures		CE's MSA Tables		
	Mean ($)	SE ($)	Los Angeles Mean ($)	San Francisco Mean ($)	San Diego Mean ($)
Average annual expenditures	58,583	1,358	55,546	68,765	63,189
Food	7,441	258	7,278	8,152	6,936
Housing	22,574	519	21,501	25,663	23,774
Transportation	8,566	372	8,315	9,404	10,319
Healthcare	3,352	149	3,178	4,459	4,395
Personal insurance and pensions	6,457	250	5,926	8,438	7,162

Expenditure Comparison Between CE and ACS – California

Expenditure	National			California		
	CE ($)	ACS ($)	CE/ACS	CE ($)	ACS ($)	CE/ACS
Electricity and Natural Gas	1,814.16	2,117.00	0.86	1,449.44	1,723.91	0.84
Rented Dwellings	3,323.61	4,220.06	0.79	6,315.01	7,148.09	0.88

Future Products

- New Jersey 2016 will be on CE PUMD
  - Separate database -- available late fall
  - 5 quarters Interview and 4 quarters Diary Survey
  - Variables: NEWID, STATE, QINTRVYR, QINTRVMO, STATE_WGT
  - Information on variance calculation supplied later
  - Merge state weight data by STATE and NEWID with CE PUMD and proceed as usual

Conclusion

- Range of conditions tested
  - ▶ Census Tracts and CUs
  - ▶ Self-representing and non-self-representing PSUs
- Expenditure estimates are similar for
  - ▶ Both Designs in NJ
  - ▶ MSA tables and ACS comparisons
- Promising approach for calculating state weights producing consistent expenditure estimates with varying types of PSUs

Contact Information

Susan L. King

Mathematical Statistician

OPLC/SMD

202-691-6895

king.susan@bls.gov