Projects 6 & 7: Generating Weighted Average Annual Education Expenditure and Standard Error

Project 6

So far – we've only looked at sample estimates. Instead, we want to look at *population* estimates. We'll calculate the education means based on the composition of the household

In this project you will:
  ▶ Learn about weighting in the CE
  ▶ Calculate collection year population estimates

Weight – FINLWT21

- The sum of FINLWT21 each quarter equals the U.S. Population (in CUs).

- The sum of FINLWT21 for four quarters equals 4 times the U.S. Population.

- FINLWT21 is the starting point for calculating expenditure weights and population weights
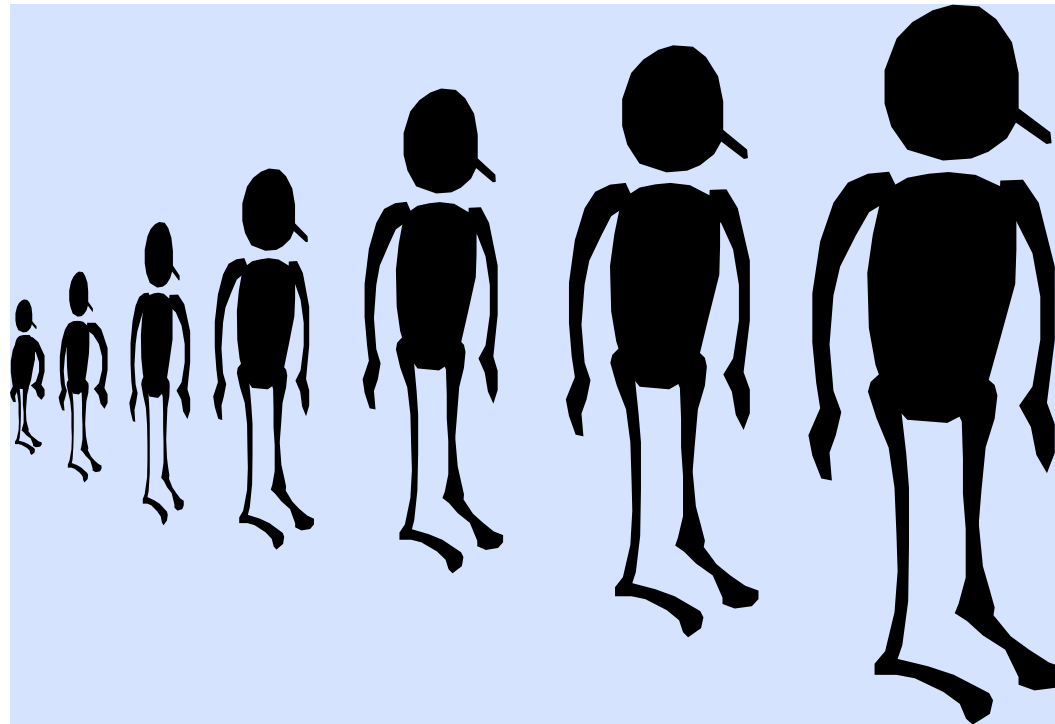
Expenditure Weights

- Basic definition: The expenditure weight is the number of similar CUs that a CU represents in any given quarter. It is the weight used when aggregating to expenditure totals.
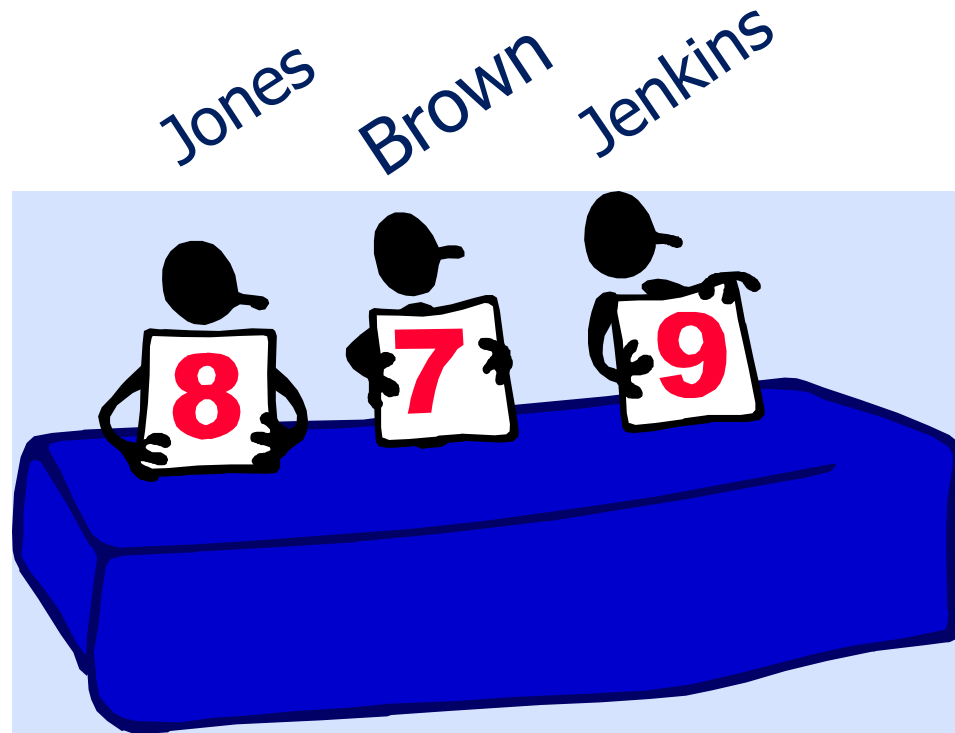
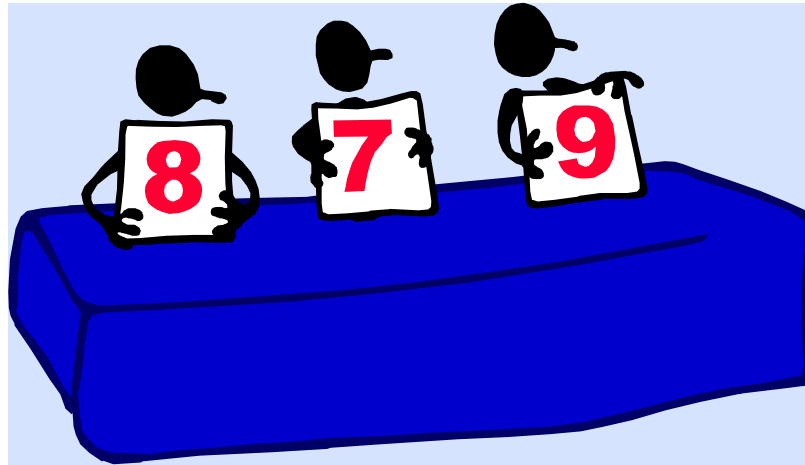# FIRST LOOK: QUARTERLY WEIGHTS AND ESTIMATES

Population

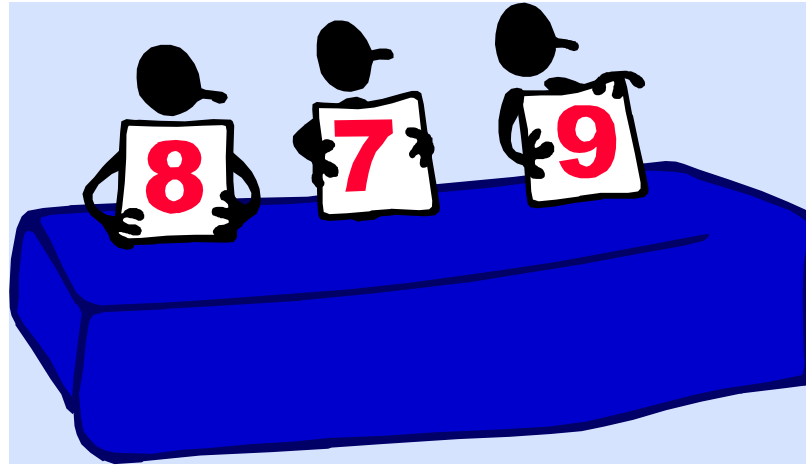# Quarter 1 Population: 24 CUs

Sample

Quarter 1 Sample: 3 CUs

Quarterly Estimates
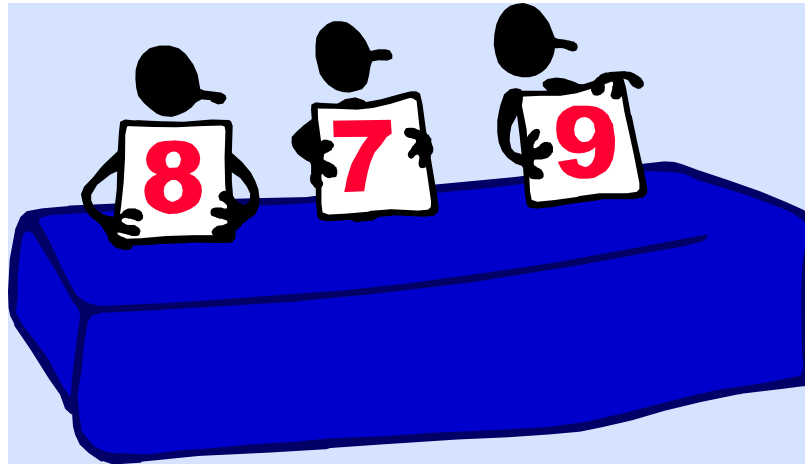

CU	Quarterly Expenditure	Weight	Weighted Quarterly Expenditures
Joness	$3,500	8	$28,000
Browns	$2,000	7	$14,000
Jenkins	$8,000	9	$72,000
POPULATION		**24**	**$114,000**

Quarterly Estimates

CU	Quarterly Expenditure	Weight	Weighted Quarterly Expenditures
Joness	$3,500	8	$28,000
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POPULATION		**24**	**$114,000**

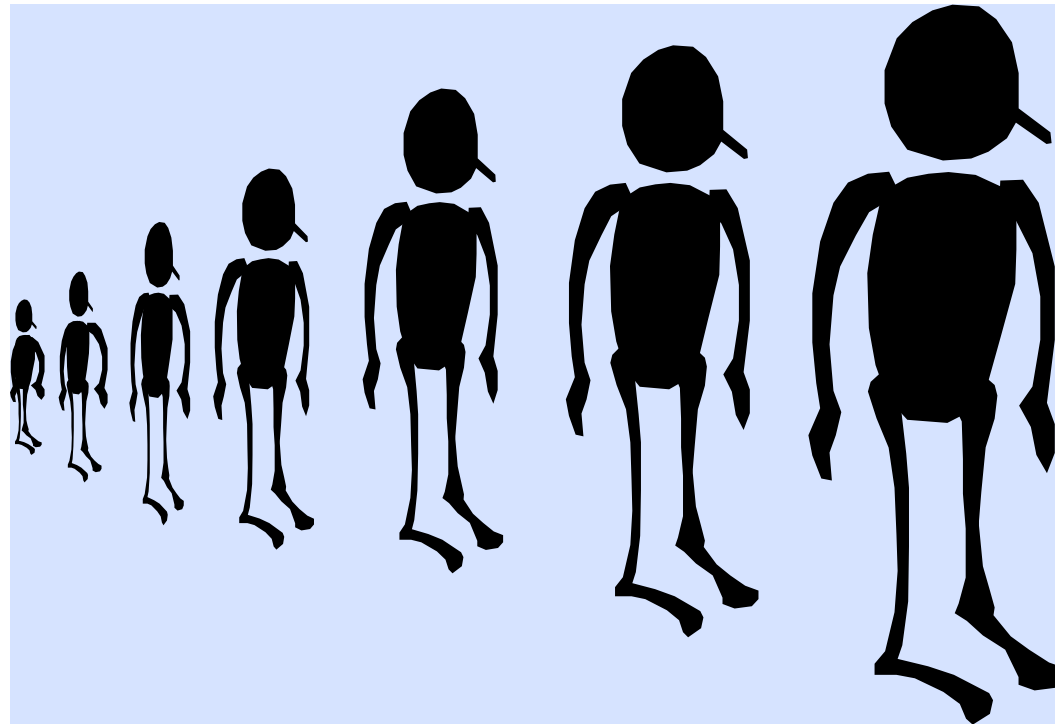# Quarterly Estimates

POPULATION	24	$114,000

Weighted quarterly average:
$114,000 / 24 = $4,750

SECOND LOOK: ANNUAL WEIGHTS AND ESTIMATES

Population

Annual Population: 27 CUs

Sample
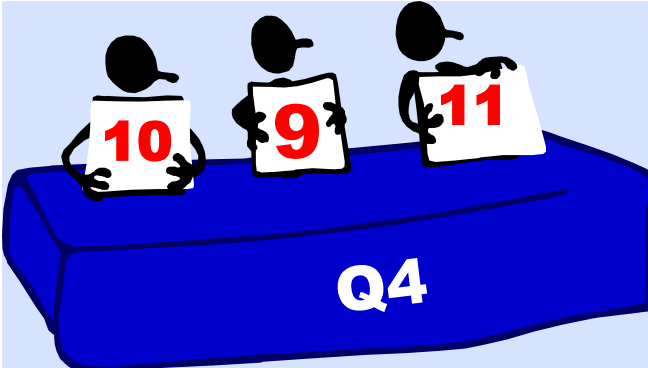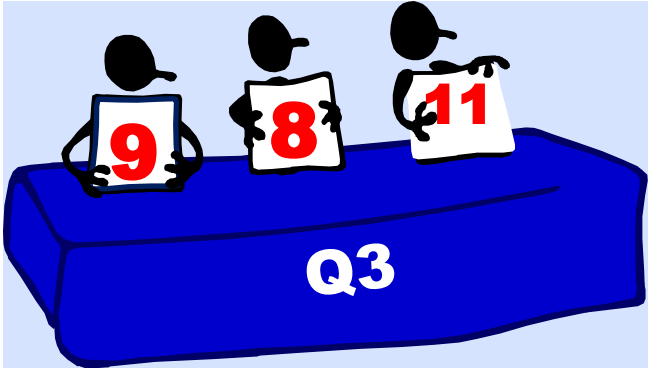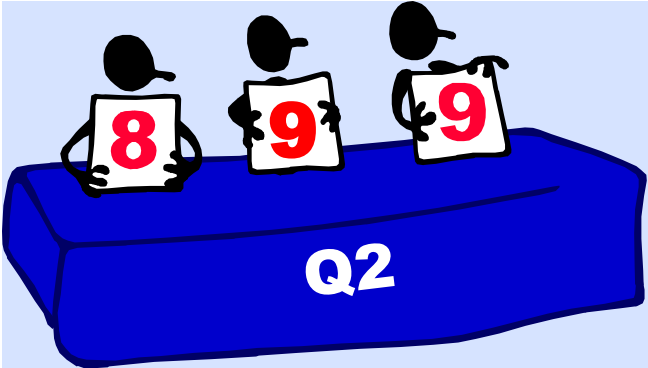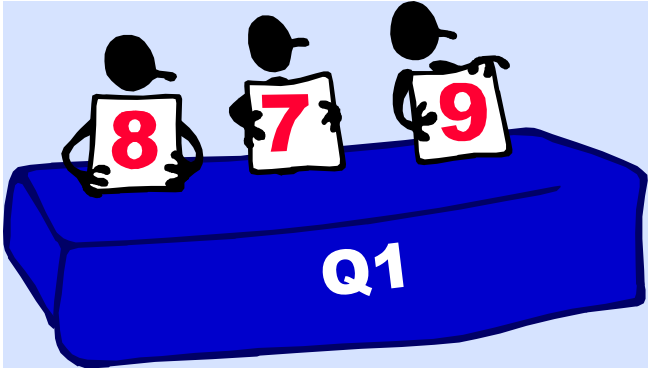
Annual Estimates
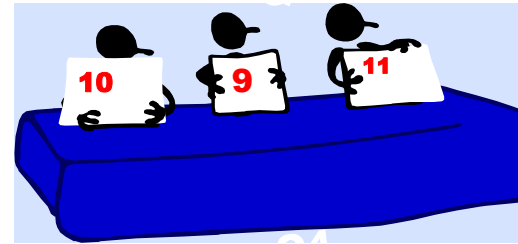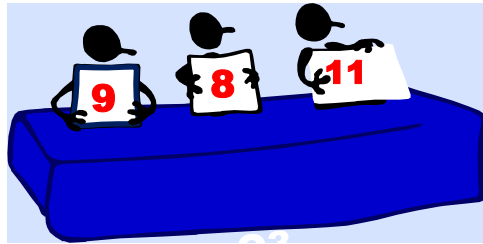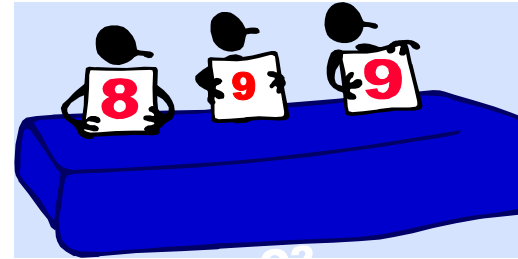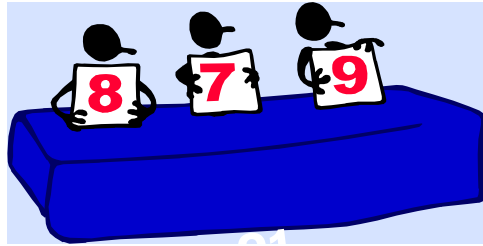
Quarter 1	Population	Quarterly weighted aggregate
Quarter 1	24	$114,000
Quarter 2	26	$110,400
Quarter 3	28	$116,200
Quarter 4	30	$125,000

Annual Estimates

Quarter 1	Population	Quarterly weighted aggregate
Quarter 1	24	$114,000
Quarter 2	26	$110,400
Quarter 3	28	$116,200
Quarter 4	30	$125,000

Annual aggregate:
114,000+110,400+116,200+125,000
=$465,600

Annual Estimates

Quarter 1	Population	Quarterly weighted aggregate
Quarter 1	24	$114,000
Quarter 2	26	$110,400
Quarter 3	28	$116,200
Quarter 4	30	$125,000

Annual mean:
Annual Aggregate / population
= $465,600 / ???

Quarterly Estimates

Quarter 1	Population	Quarterly weighted aggregate
Quarter 1	24	$114,000
Quarter 2	26	$110,400
Quarter 3	28	$116,200
Quarter 4	30	$125,000
		$465,400

Annual mean:
Annual Aggregate / average population
= $465,400 ÷ ((24+26+28+30)/4)
= $465,400 ÷ 27
= $17,237

Calculating a Standard Error

■ To compute actual standard errors, use all 44 replicate weights (WTREP01-WTREP44) and FINLWT21.

■ Use the same process just described for creating a mean, but do it 44 times, once for each replicate weight.

■ Create a new variable that sums the squared difference between each of the replicate means (WTREP01-WTREP44) and the actual mean

■ Calculate standard error

Project 6 Steps

1. Multiply quarterly education expenditures by FINLWT21 to obtain weighted aggregates (*NOT the annualized education expenditures!*)

2. Create population weights by dividing FINLWT21 by the number of quarters in our sample (4)

3. Aggregates: Sum the weighted expenditure estimates by each group

4. Populations: Sum the population weights by each group

5. Means: Calculate annual means for each of the group by dividing the aggregates by the populations

Project 6 Results
Collection year weighted mean

Number of Children	Sample	Education Expenditure Mean	Population
0 children	13,081	$681.74	83,238,035
1 child	3,210	$1,624.02	21,605,443
2 children	2,527	$2,058.27	17,626,936
3 children	1,028	$1,594.96	7,305,606
4 or more children	486	$1,614.42	3,519,580

Project 7

Calculate the <u>calendar year</u> education mean by the number of children in the household for the US population in 2021

In this project you will:

- ▶ Learn about calendar year versus collection year in CE
- ▶ Calculate calendar year population estimates using expenditure data from MTBI

Calendar Year Estimates

Two Main Differences:

- Use 5 quarters of data, but only select months that fall in the calendar year (Numerator)

- Population weights are adjusted based on the number of months in the calendar year the CU could report (Denominator)

Population Weights

■ Need another adjustment to FINLWT21

   ▶ Adjust weights based on the number of months that could have been included

   ▶ MO_SCOPE: "Months in Scope"

MO_SCOPE

Quarter 1 (FMLI191x)					
Oct 2020	**Nov 2020**	**Dec 2020**	**Jan 2021**	**Feb 2021**	**March 2021**
			0		
			X	1	
			X	X	2

Quarter 5 (FMLI201)					
Oct 2021	**Nov 2021**	**Dec 2021**	**Jan 2022**	**Feb 2022**	**March 2022**
X	X	X	3		
	X	X		2	
		X			1

MO_SCOPE

Quarter 2 (FMLI192)					
Jan 2021	**Feb 2021**	**March 2021**	**April 2021**	**May 2021**	**June 2021**
X	X	X	3		
	X	X	X	3	
		X	X	X	3

Population Weights

- Multiply FINLWT21 by MO_SCOPE / 3

- Still need to adjust to account for quarterly weights, so divide by 4.

- ...wait – did you say 4?? But I'm using 5 quarters?!

  Yes...but you're really only using 1/3 of the first quarter and 2/3 of the fifth quarter. So, dividing by 4 is easier then saying divide by:

  $(1/3)*1 + 1 + 1 + 1 + (2/3)*1 = 4$

Quick Guide to Adjusting Population Weights

FMLI191x	*POPWEIGHT* = FINLWT21 [(QINTRVMO-1)/3]/4
FMLI192	*POPWEIGHT* = FINLWT21 (3/3) / 4
FMLI193	*POPWEIGHT* = FINLWT21 (3/3) / 4
FMLI194	*POPWEIGHT* = FINLWT21 (3/3) / 4
FMLI201	*POPWEIGHT* = FINLWT21 [(4-QINTRVMO)/3]/4

Expenditures in Scope

- **REF_YR**
  - ▶ Identifies the reference year of the expenditure
- **REF_MO**
  - ▶ Identifies the reference year of the expenditure

Project 7 Steps

1. Append all five quarters of MTBI data.

2. Create calendar year education expenditures:

   ▶ For each NEWID, create an EDUCA variable by summing the following UCC's, if REF_YR = 2021:

   - Tuition: 670110, 670210, 670410, 670901
   - Test: 670903
   - Books: 660110, 660210, 660410, 660901, 660902
   - Other: 67092

3. Append all five quarters of FMLI data

4. Merge FMLI and MTBI

5. Create weighted expenditures by multiplying EDUCA by FINLWT21

6. Create population weights using months in scope (MO_SCOPE)

7. Aggregates: Sum the weighted expenditure by number of children

8. Populations: Sum the population weights by number of children

9. Means: Calculate annual means for each of the group by dividing the aggregates by the population weights by number of children

Project 7 Results
Calendar year weighted mean

Number of Children	Sample	Education Expenditure Mean	Population
0 children	16,469	$ 681.21	83,263,862
1 child	4,035	$1,492.60	21,710,654
2 children	3,123	$1,902.56	17,544,588
3 children	1,295	$1,435.77	7,576,975
4 or more children	596	$1,802.82	3,484,422