Creating custom multiyear ACS estimates using 1-year data from American FactFinder Tables

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Overview

- Background and purpose
- Methods
- Results
- Accuracy and reliability

Why create custom multiyear ACS estimates?

- Discontinuation of 3-year data products
- Consistency with prior estimates (though not comparable)
- More reliable estimates for smaller geographies or subgroups than 1-year ACS data

How to create custom multiyear estimates using tables from FactFinder

- Similar to methods used for deriving estimates and margins of error for aggregated counts and proportions
- Aggregate across years of data, instead of across geographies or subgroups
- Limited to geographies in 1-year ACS data
  - Areas with populations over 65,000
- Estimates can be calculated without statistical software

Estimate multiyear counts

1. **Obtain each 1-year estimate**
2. **Sum across years to create an aggregate estimate**
3. **Divide by the number of years**

$$\hat{X}_{my} = \frac{\hat{X}_{year\ 1} + \hat{X}_{year\ 2} + \hat{X}_{year\ 3}}{3}$$

Estimate multiyear counts

Black or African American Children in Colorado	
Year	# of children who are living in poverty
2011	18,467
2012	25,123
2013	17,268

Data come from Table C17001B for Colorado

$$\hat{X}_{my} = \frac{\hat{X}_{2011} + \hat{X}_{2012} + \hat{X}_{2013}}{3}$$

$$= \frac{18{,}467 + 25{,}123 + 17{,}268}{3}$$

$$= \frac{60{,}858}{3}$$

$$= 20{,}286$$

Estimate multiyear MOE for counts

1. **Obtain the MOE for each 1-year estimate**
2. **Square each 1-year MOE**
3. **Sum the squared MOEs**
4. **Take the square root of the sum of the squared MOEs**
5. **Divide by the number of years**

$$MOE_{my\_c} = \frac{\pm\sqrt{(MOE_{y1})^2 + (MOE_{y2})^2 + (MOE_{y3})^2}}{3}$$

Estimate multiyear MOE for counts

Black or African American Children in Colorado	
Year	1-year MOE for # of children who are living in poverty
2011	3,179
2012	3,352
2013	2,610

Data come from Table C17001B for Colorado

$$MOE_{my\_c}$$

$$= \frac{\pm\sqrt{(MOE_{2011})^2 + (MOE_{2012})^2 + (MOE_{2013})^2}}{3}$$

$$= \frac{\pm\sqrt{(3{,}179)^2 + (3{,}352)^2 + (2{,}610)^2}}{3}$$

$$= \frac{\pm\sqrt{28{,}154{,}045}}{3}$$

$$= \frac{\pm 5{,}306}{3}$$

$$= \pm 1{,}769$$

Estimate multiyear proportions

1. **Obtain each 1-year estimate for the numerator**
2. **Sum together to create an aggregate numerator**
3. **Repeat steps #1 and #2 for the denominator**
4. **Divide the aggregate numerator by the aggregate denominator**

$$\hat{p}_{my\_p} = \frac{(\hat{X}_{y1}^{num} + \hat{X}_{y2}^{num} + \hat{X}_{y3}^{num})}{(\hat{X}_{y1}^{denom} + \hat{X}_{y2}^{denom} + \hat{X}_{y3}^{denom})}$$

Estimate multiyear proportions

Black or African American Children in Colorado		
Year	# who are living in poverty	# of children
2011	18,467	50,029
2012	25,123	61,126
2013	17,268	51,931

Data come from Table C17001B for Colorado

$$\hat{p}_{my\_p}$$

$$= \frac{(\hat{X}^{num}_{2011} + \hat{X}^{num}_{2012} + \hat{X}^{num}_{2013})}{(\hat{X}^{denom}_{2011} + \hat{X}^{denom}_{2012} + \hat{X}^{denom}_{2013})}$$

$$= \frac{(18{,}467 + 25{,}123 + 17{,}268)}{(50{,}029 + 61{,}126 + 51{,}931)}$$

$$= .373$$

Estimate multiyear MOE for proportions

1. **Obtain the multiyear MOE for the numerator and denominator**
2. **Square the MOEs, square the derived proportion**
3. **Multiply the squared MOE for the denominator by the squared proportion**
4. **Subtract the result of #3 from the squared MOE for the numerator**
5. **Take the square root of the result of #4**
6. **Divide the result of #5 by the denominator**

$$MOE_{my\_p} = \frac{\pm\sqrt{\left[\left(MOE^{num}_{my\_ac}\right)^2 - \left(\hat{p}^2_{my\_p} * \left(MOE^{denom}_{my\_ac}\right)^2\right)\right]}}{\hat{X}^{denom}_{my\_c}}$$

Estimate multiyear MOE for proportions

Black or African American Children in Colorado		
Year	# in poverty	# of children
2011 (moe)	18,467 (3,179)	50,029 (4,860)
2012 (moe)	25,123 (3,352)	61,126 (4,878)
2013 (moe)	17,268 (2,610)	51,931 (3,975)

Data come from Table C17001B for Colorado

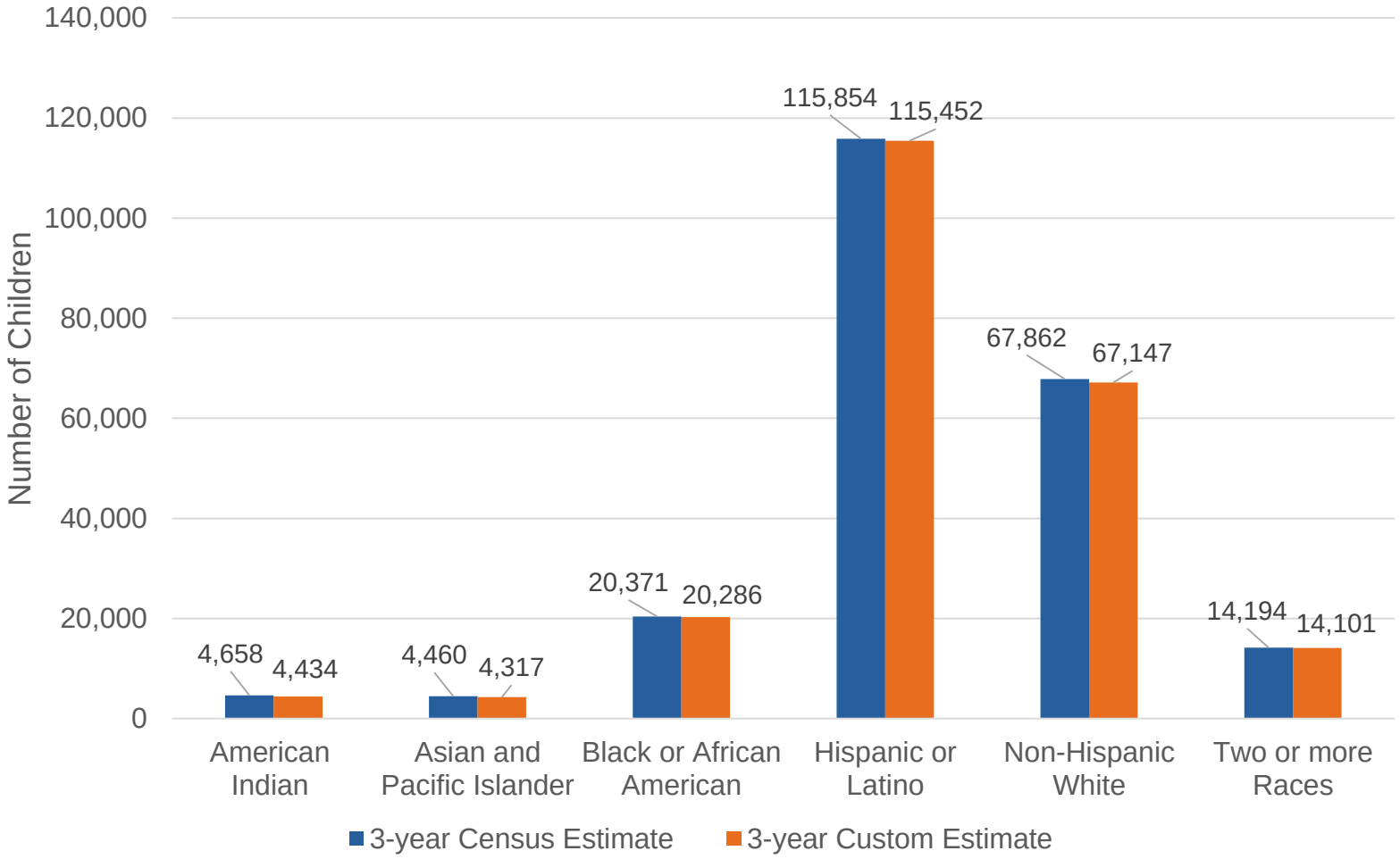
$$MOE_{my\_p} = \frac{\pm\sqrt{(MOE^{num}_{my\_ac})^2 - [\hat{p}^2 * (MOE^{denom}_{my\_ac})^2]}}{\hat{X}^{denom}_{my\_c}}$$

$$= \frac{\pm\sqrt{5{,}306^2 - (.373^2 * 7{,}951^2)}}{50{,}029 + 61{,}126 + 51{,}931}$$

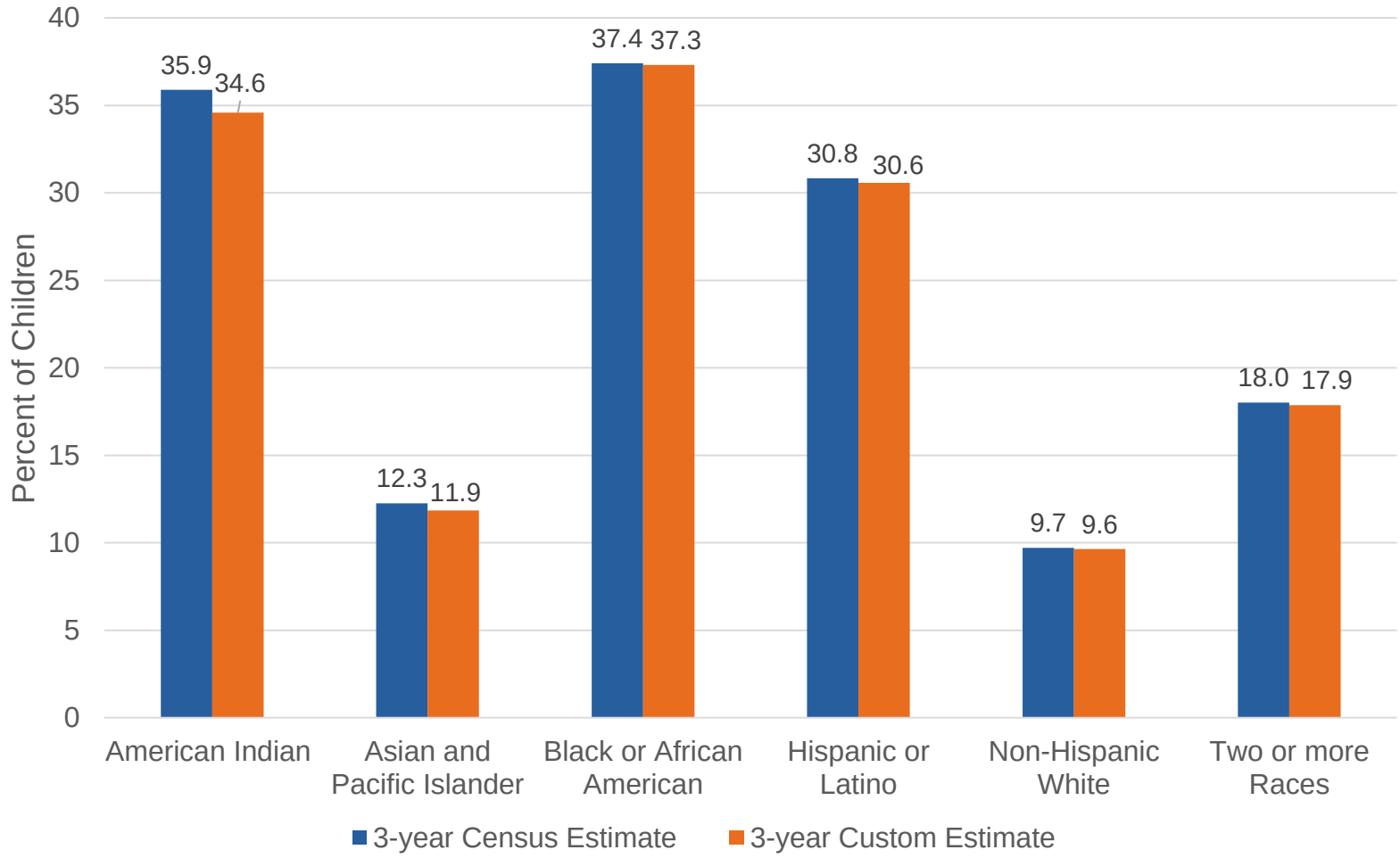
$$= \frac{\pm\sqrt{28{,}153{,}627}}{163{,}086}$$

$$= .027$$

Comparing Census and custom 3-year estimates of number of children in poverty in CO, 2011-13



Comparing Census and custom 3-year estimates of percent of children in poverty in CO, 2011-13



Accuracy

- Custom estimates are similar to estimates from multiyear tables in FactFinder BUT are not the same
  - Census Bureau reweighting methods

- Comparing estimate of child poverty all states and racial/ethnic groups
  - Custom estimates ranged from <.01% to 8% different than estimates from tables in Fact Finder
  - Larger differences for smaller geographies or subgroups

Reliability

Percent of children living in poverty in Colorado

	2013 1-year ACS			2011-2013 3-year data			Custom 2011-2013 estimates		
	Estimate	MOE	CV	Estimate	MOE	CV	Estimate	MOE	CV
American Indian	27.33	**9.14**	20.33	35.89	**5.39**	9.14	34.59	4.95	8.71
Asian and Pacific Islander	10.56	2.87	16.54	12.26	2.44	12.09	11.85	2.11	10.85
Black or African American	33.25	4.33	7.92	37.41	2.54	4.13	37.32	2.70	4.39
Hispanic or Latino	29.46	1.63	3.36	30.83	.92	1.82	30.57	.98	1.95
Non-Hispanic White	9.13	.73	4.86	9.71	.46	2.88	9.64	.43	2.72
Two or more Races	16.27	2.84	10.60	18.01	1.81	6.12	17.87	1.77	6.03

Final thoughts

- Balancing currency and precision for geographies with populations over 65,000
- Custom estimates are not directly comparable to 3-year Census estimates
- Be mindful of changes in geography or variables; dollar-denominated variables