Margins of Error the ACS Way: Working with Variance Replicate Estimate Tables

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Motivation for Using the Variance Replicate Estimate (VRE) Tables

- Combining estimates published on data.census.gov:
 - Sum within a table
 - Sum across geographies
 - Both

	Census Tract 1, Aleutia	Census Tract 1, Aleutians East Borough, Alaska		Census Tract 1, Aleutians West Census Area, Alaska			
	Estimate	Margin of Error	Estimate	Margin of Error			
✓ Total:	3,338	****	975	+/-128			
✓ Male:	2,049	+/-100	627	+/-102			
Under 5 years	42	+/-12	28	+/-10			
5 to 9 years	74	+/-16	33	+/-10			



Motivation for Using the VRE Tables

Must approximate the margin of error (MOE) if using published tables
 Approximation formula for the MOE of a count estimate:

$$MOE(Est_1 + Est_2) = \sqrt{MOE(Est_1)^2 + MOE(Est_2)^2}$$

 The approximation formula does not (and cannot) account for correlation between estimates

MOE may be large and diverge from MOE calculated from microdata



VRE Tables to the Rescue!

 VRE Tables allow you to calculate the margin of error using the same replicate variance methodology as the ACS uses

$$Variance = \frac{4}{80} \sum_{i=1}^{80} (Var_Rep_i - Estimate)^2$$

- Not an approximation formula
 - Incorporates correlation between estimates
- May be used for any type of estimate
 - Counts, Percents, Means, Ratios, etc.

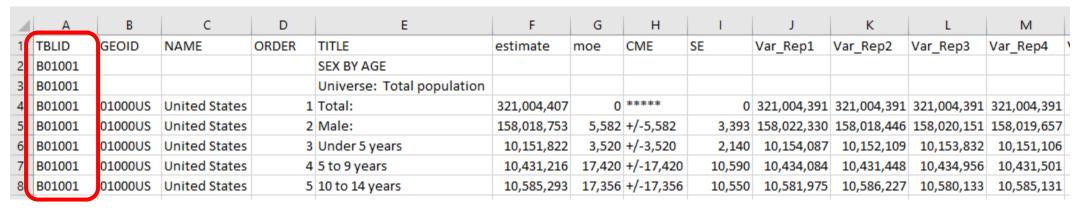


VRE Tables Publication Information

- Available for all 5-year periods from 2009-2014 through 2015-2019
 - Published in January after the 5-year release in December (same time as the 5-year PUMS)
 - Zipped .csv files
- Includes 113 detailed tables for 2015-2019
 - All tables sourcing ACS Data Profile count, percent, & ratio estimates, plus a few others
- Eleven summary levels:
 - Nation, state, county, county subdivision (MCD), tract, block group, place,
 AIAN area, metropolitan/micropolitan area, Congressional District, ZCTA



ACS VRE Table vs. Detailed Table





Comparison of the Sex by Age table (table ID B01001) at the national level

Variance Replicate Estimates (VRE) data is above

ACS detailed table data is on the left



ACS VRE Table vs. Detailed Table

4	Α	В	С	D	E	F	G	Н	1		V.	L	M
1	TBLID	GEOID	NAME	ORDER	TITLE	estimate	moe	CME	SE	Var_Rep1	Var_Rep2	Var_Rep3	Var_Rep4
2	B01001				SEX BY AGE								
3	B01001				Universe: Total population								
4	B01001	01000US	United States	1	Total:	321,004,407	0	****	C	321,004,391	321,004,391	321,004,391	321,004,391
5	B01001	01000US	United States	2	Male:	158,018,753	5,582	+/-5,582	3,393	158,022,330	158,018,446	158,020,151	158,019,657
6	B01001	01000US	United States	3	Under 5 years	10,151,822	3,520	+/-3,520	2,140	10,154,087	10,152,109	10,153,832	10,151,106
7	B01001	01000US	United States	4	5 to 9 years	10,431,216	17,420	+/-17,420	10,590	10,434,084	10,431,448	10,434,956	10,431,501
8	B01001	01000US	United States	5	10 to 14 years	10,585,293	17,356	+/-17,356	10,550	10,581,975	10,586,227	10,580,133	10,585,131

SEX BY AGE Survey/Program: American Community Survey TableID: B01001	Product: 2017: ACS 5-Year Estimates Detailed Tables Universe: Total population United States			
	Estimate	Margin of Error		
➤ Total:	321,004,407	****		
✓ Male:	158,018,753	+/-5,582		
Under 5 years	10,151,822	+/-3,520		
5 to 9 years	10,431,216	+/-17,420		
10 to 14 years	10,585,293	+/-17,356		

VRE table includes 80 variance replicate estimates, Var_Rep#

They are used to calculate the margin of error

Only 4 are shown here



Useful Links for VRE Tables

"Calculating Margins of Error the ACS Way" webinar

https://www.census.gov/data/academy/webinars/2020/calculating-margins-of-error-acs.html

Variance Replicate Estimate Tables Documentation

https://www.census.gov/programs-surveys/acs/technical-documentation/variance-tables.html

Variance Replicate Estimate Tables Data

https://www.census.gov/programs-surveys/acs/data/variance-tables.html



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