

**American Community Survey
Fiscal Year 2014 Content Review
Median County-Level
Coefficients of Variation of Key
Estimates from ACS Data**

FINAL REPORT

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1 Introduction

The American Community Survey Office (ACSO) is conducting a review of the content on the American Community Survey (ACS). The ACS Content Review examines multiple facets of the ACS, reviewing key survey measures and conducting meetings with the survey's stakeholders and the general public.

One component of the ACS Content Review used the coefficient of variation (CV) to measure the sampling error associated with each question on the ACS questionnaire. The CV assesses how reliable an estimate is; it is one of the Census Bureau's statistical quality standard measures.

A CV of an estimate associated with a particular ACS question was calculated for each of the 3,143 counties (or county-level equivalents) in the United States. The median of these county-level CVs is reported in this paper.

These results will be combined with eighteen other metrics to inform a decision about the future of questions on the ACS. The nineteen metrics were designated in the ACS Content Review process as either being a 'cost' (i.e., the question has a high number of complaints from respondents to Census, or the question takes a relatively long time for the respondent to answer) or a 'benefit' (i.e., the question is used to provide estimates that are statutorily required or is used for establishing the frame of another federal survey). The CV results were considered in the 'benefit' category of the ACS Content Review; estimates with a small county-level median CV indicate that the sampling error is small relative to the estimate, and therefore the user can be more confident that the estimate is close to the population value.

This report directly supports the findings described in the American Community Survey (ACS) Fiscal Year 2014 Content Review Results Final Report. For more information on the ACS Content Review, see the Content Review web page:

http://www.census.gov/acs/www/about_the_survey/acs_content_review/

2 Methodology

2.1 Data Collection Mechanism/Tool

The ACS is an annual survey that provides current demographic, social, economic, and housing information about America's communities. There were 125 distinct questions identified on the ACS questionnaire for analysis in the Content Review. These included person-level questions such as age, relationship status, level of educational attainment, place of birth, and marital status. Housing-level questions included the type of building where the respondent resides, how many rooms exist in the home, and what type of fuel is used for heating. Subsequent discussion of the questions identifies them by number (as found on the paper questionnaire), with either a P or H prefix to designate whether the question is a person-level or housing-level question.

Each question on the ACS questionnaire was defined using one specific estimate which is generated from that question. For instance, the ACS asks each person to identify their sex. The percent of females was designated as the corresponding estimate of interest from the ACS question about a person's sex. That estimate (the percent of females) and the corresponding CV were calculated for each county (and county-level equivalent) in the United States. This research is only interested in the distribution of CVs across all 3,143 counties, not in the value of the estimates themselves.

The specific estimates that were used in this research were identified by Census Bureau subject matter experts as key estimates associated with each question, due to their importance either for legislative reasons or as one of the most interesting estimates to analysts. For example, the question on relationship status is used to create multiple estimates, such as how many people are the spouse of a householder, how many people are the children of the householder, how many people are the parent of the householder, etc. Only one measure was used from the relationship question in this research however; specifically, what percent of people in each county are the child of a householder.

For the ACS Content Review, a county-level CV was determined to be associated with each question. From the 3,143 counties, the median CV was identified for each question, resulting in 125 CVs, one each per question of interest on the ACS. The median CVs were grouped into one of three clusters: low, medium or high CVs. The ACS questions with the highest median CVs were the least beneficial, while the lowest median CVs were the most beneficial.

2.2 Universe

ACS questionnaires from the 2008-2012 5-year data collection were included in this research. Specifically, eligible returns were those received from January 1, 2008 until December 31, 2012. A small number of CVs had to be calculated using alternate years of collection, which will be discussed under Limitations in Section 3.2.

All returns from Puerto Rico were excluded. Questionnaires from Group Quarters were included in the person-level analysis as applicable; for instance, no question on relationship status is asked of persons in Group Quarters.

Completed returns are grouped by their county or county equivalent. For instance, parishes in Louisiana are treated as counties. All references to 'counties' in this documentation also includes these county equivalents.

2.3 Research Question(s) of Interest

The research questions of interest are:

- 1) What was the median county-level CV for each pre-identified estimate?
- 2) How do the median CVs compare to each other?

The CV was chosen as the measure of variability for the ACS Content Review project because CVs can be compared across all estimates, whether percentages or medians.

In the ACS Content Review analysis, it is considered a ‘benefit’ to have a low median county-level CV. Final estimates might not be reliable for data users if they have a high CV and thus a high sampling error.

2.4 Analysis Design

Estimates and their standard errors were calculated for each county in the United States. These statistics were used to find the coefficient of variation, whereby $CV_{\text{estimate}} = (\text{standard error}_{\text{estimate}}) / (\text{estimate})$.

Estimates are calculated using final ACS weights.

Some CVs were calculated using existing estimates that had been produced for derived products on American FactFinder. Other CVs were defined and calculated using ACS microdata or base tables since there was not a published estimate that could be directly tied to the question.

If a county had an estimate of zero percent, then the CV for that county was undefined, as the denominator in the CV formula equaled zero. For instance, there were no persons in Kalawao County, Hawaii with a relationship of child; the county had a population of 90 in the 2010 census and no persons under sixteen years of age can live there, due to special circumstances involving its former status as a leper’s colony. On the other hand, some counties had estimates of 100%; for instance, when all housing units in a county have a refrigerator. If an estimate is equal to either 0 or 100, then the standard error of the estimate is modeled (instead of the standard method using replicate weights). The CVs for estimates of 100% (and 0%) are considered unstable; thus, counties with estimates of 100% or 0% were excluded from this analysis. For each question, the number of counties included in the median calculation (that is, the number of counties with an estimate not equal to 0 or 100) is listed in the table of results in Section 4.

The SAS® PROC MEANS procedure found the median CVs. For the ACS Content Review, the median county-level data was to be grouped into three clusters of low, medium and high CVs. The SAS® PROC FASTCLUS procedure was used to perform the clustering. The cluster results are shown in Section 4 with the median CVs.

3 Assumptions and Limitations

All assumptions or limitations that apply to the production estimates also apply to this research, as mentioned in the documentation found at

http://www.census.gov/acs/www/data_documentation/documentation_main/

In addition, the following assumptions and limitations that are unique to this research are given below.

3.1 Assumptions

The definition of what constituted a question was determined in the larger ACS Content Review process.

There are instances where one estimate (and thus one CV) is derived from multiple ACS questions. For instance, ACS person-level questions 42, 43, and 44 are used jointly by analysts to define the concept of Industry of Employment. Question 42 asks what the name is of the person's employer. It was not feasible to have an estimate for this question that was applicable nation-wide. One estimate for industry and the corresponding CVs were calculated (specifically, percent of persons in educational services, health care, or social assistance). The median CV for that one estimate was attributed to all three ACS questions, P42, P43, and P44.

P45 and P46 were similarly combined, for the concept of Occupation.

Two ACS questions collect address information: P15b (residence one year ago) and P30 (place of work). All address components are collected for these questions, but one distinct component had to be chosen for the estimate of interest in this research. For P15b, subject matter experts identified the estimate of interest to focus on state of residence while the estimate of interest focused on county of employment for P30.

3.2 Limitations

Identifying a key estimate was necessary in order to attain one median CV to represent each ACS question. A different collection of estimates would have altered the clustering algorithm and possibly led to some estimates being in a different cluster than presented in this research.

If there was not a 5-year estimate available for a question, then 1-year or 3-year data was used instead. Standard errors were adjusted to simulate 5-year results.

- H9, H10, and H11: Computer and internet access
 - These questions were added to the ACS questionnaire in 2013. There is only one year of data collected for these estimates so far. CVs were calculated using the 1-year data instead of the 5-year data.
- P12: Field of Degree
 - This question was added to the ACS questionnaire in 2009. Since the 2009-2013 ACS 5-year data have not yet been released, a CV was calculated from the most recent three-year data (2010-2012).

For estimates close to zero, the CV may be unstable.

4 Results

In the following section, we answer the research questions that were posed in Section 2.3.

Table 1 shows the median county-level CV per question, sorted with the highest (least beneficial) CV cluster on top. The highest median county-level CV was 0.5301, on the question asking whether a person has Indian Health Service health insurance.

Table 1. Median County-Level Coefficient of Variation per ACS Question, Sorted by Median Value

ACS Question Number	Question Topic	Specific Estimate of Interest ¹	Number of Counties Included	Median County CV	Cluster
P16g	Indian Health Services insurance	Percent of the civilian non-institutionalized population who have Indian Health Service insurance	2460	0.5301	High
H16.2	Condo fee	Percent of owner-occupied housing units with a condo fee from \$100 to \$500 per month	2175	0.4286	High
H18a	Monthly rent	Percent of renter-occupied housing units (with cash rent) that pay rent of \$1000 to \$1249 per month	2291	0.4219	High
P29b	Any work for pay last week	Percent of persons 16 and older who did not work for pay at a job but did do some work for pay	3070	0.3537	High
P47f	Income from public assistance	Median public assistance income for persons 15 and over	3007	0.3491	High
P21c	Divorced in last year	Percent of women aged 15 or older who were divorced in the last 12 months	3019	0.3372	Medium
P21b	Widowed in last year	Percent of women aged 15 or older who were widowed in the last 12 months	3081	0.3131	Medium
P35c	Informed of recall to work	Of persons 16 and over who were not at work last week and not on layoff, percent who were informed of a recall	2880	0.3081	Medium

¹ More information about these terms (such as housing unit, civilian, and foreign-born) can be found in the ACS Subject Definitions documentation, located at http://www.census.gov/acs/www/Downloads/data_documentation/SubjectDefinitions/2013_ACSSubjectDefinitions.pdf

ACS Question Number	Question Topic	Specific Estimate of Interest ¹	Number of Counties Included	Median County CV	Cluster
P21a	Married in last year	Percent of women aged 15 or older who were married in the last 12 months	3099	0.2778	Medium
H11g	Internet subscription: Other internet service	Percent of households with other Internet service	2614	0.2555	Medium
P35b	Temporarily absent from work	Of persons 16 and over who were not at work last week and not on layoff, percent who were temporarily absent	3133	0.2408	Medium
P28b	VA disability rating	Percent of service-connected disability veterans with a rating of 10 or 20%	3067	0.2355	Medium
P47c	Income from interest	Median income from interest for persons 15 and over	3143	0.2329	Medium
P14c	English fluency	Of people aged 5 and older who speak Spanish at home, percent who speak English less than very well	3027	0.2289	Medium
P35a	Layoff	Of persons aged 16 and over who did not work last week, percent who are on layoff	3100	0.2032	Medium
P17b	Difficulty seeing	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have vision difficulty	3127	0.2030	Medium
P25c	Length of time grandparent caring for child	Percent of grandparents responsible for grandchildren who have been responsible for three years or more	2905	0.2025	Medium
P24	Given birth in last year	Births per 1,000 women ages 15 to 50	3130	0.2005	Medium
P18c	Difficulty dressing	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have self-care difficulty	3124	0.1958	Medium
P16e	TRICARE or military insurance	Percent of the civilian non-institutionalized population who have TRICARE or a military health insurance plan	3126	0.1957	Medium
P47b	Income from self-employment	Median income from self-employment for persons 15 and over	3140	0.1841	Medium
P25a	Presence of grandchildren	Percent of adults aged 30 or over who live with grandchildren	3109	0.1833	Medium

ACS Question Number	Question Topic	Specific Estimate of Interest ¹	Number of Counties Included	Median County CV	Cluster
H9c	Other computer (e.g., tablet)	Percent of households with an other computer	3008	0.1790	Medium
H11a	Internet subscription: Dial-up	Percent of households with dial-up Internet service	3032	0.1766	Medium
P28a	Presence of VA disability rating	Percent of veterans with a service-connected disability	3129	0.1715	Medium
H11d	Internet subscription: Fiber-optic internet service	Percent of households with fiber-optic Internet service	2994	0.1692	Medium
P17a	Difficulty hearing	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have hearing difficulty	3139	0.1652	Medium
P25b	Grandparent responsible for child	Percent of grandparents living with grandchildren who are responsible for most of their basic care	3038	0.1619	Medium
P8w	Year of naturalization write-in	Percent of naturalized foreign-born persons who were naturalized before 2000	2819	0.1584	Medium
P7	Place of birth	Percent of people who are foreign-born	3133	0.1472	Medium
P12	Undergraduate field of degree	Percent of people at least 25 years old with a bachelor's degree who have a degree in Business	3132	0.1431	Medium
P19	Difficulty doing errands	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have independent living difficulty	3133	0.1426	Medium
P18a	Difficulty remembering	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have cognitive difficulty	3141	0.1373	Medium
H23b	Second mortgage amount	Percent of owner-occupied housing units with a mortgage and with a second mortgage that have a second mortgage of \$100 to \$299 per month	3010	0.1366	Medium
P14b	Language at home	Percent of people aged 5 and older who speak Spanish at home	3125	0.1360	Medium

ACS Question Number	Question Topic	Specific Estimate of Interest ¹	Number of Counties Included	Median County CV	Cluster
P47h	Income from other sources	Median income from other sources for persons 15 and over	3141	0.1353	Medium
H11f	Internet subscription: Satellite	Percent of households with satellite Internet service	3105	0.1240	Low
P16f	Health insurance through VA	Percent of the civilian non-institutionalized population who have health insurance through the VA	3140	0.1219	Low
P8	Citizen	Percent of foreign-born persons who are not citizens	3040	0.1169	Low
P32	How many people in carpool	Percent of workers who carpooled to work	3139	0.1148	Low
P36	Actively looking for work	Percent of the population 16 and over who are actively looking for work	3137	0.1143	Low
P18b	Difficulty walking	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have ambulatory difficulty	3140	0.1098	Low
P14a	Foreign language at home	Percent of people aged 5 and older who speak a language other than English at home	3138	0.1055	Low
H19	Home value	Percent of owner-occupied housing units with a value of \$150,000 to \$199,999	3139	0.1040	Low
P15a	Moved in last year	Percent of people aged 1 or over who lived in a different house a year ago	3142	0.0962	Low
P37	Availability for labor force	Of persons 16 and over who were not at work last week and not on layoff, percent who were available for work	3141	0.0948	Low
H20	Real estate taxes	Percent of owner-occupied housing units with a mortgage that have taxes of \$800 to \$1,499 per year	3138	0.0943	Low
H24	Mobile home costs	Percent of owner-occupied mobile homes that have mobile home costs	3090	0.0941	Low
H2	Year residence was built	Percent of housing units that were built from 2000 to 2009	3141	0.0931	Low
H15	Food stamps	Percent of households that received food stamps or SNAP in the last 12 months	3137	0.0908	Low

ACS Question Number	Question Topic	Specific Estimate of Interest ¹	Number of Counties Included	Median County CV	Cluster
P33	Time of departure for work	Percent of workers, who did not work at home, leaving for work from 7:00am to 7:29am	3143	0.0900	Low
P47g	Income from retirement	Median income from retirement for persons 15 and over	3142	0.0889	Low
P27	Period of military service	Percent of persons who have been on active duty in the Armed Forces who are Vietnam veterans	3141	0.0883	Low
P22	Number of times married	Percent of females aged 15 and older who have been married exactly twice	3142	0.0744	Low
P47e	Income from Supplemental Security Income	Median income from Supplemental Security Income for persons 15 and over	3106	0.0710	Low
P16d	Medicaid	Percent of the civilian non-institutionalized population who have Medicaid	3143	0.0680	Low
P16b	Health insurance from insurance company	Percent of the civilian non-institutionalized population who have health insurance through an insurance company	3143	0.0668	Low
H11c	Internet subscription: Modem	Percent of households with cable modem Internet service	3120	0.0656	Low
H22b	Monthly mortgage payment	Percent of owner-occupied housing units (with a mortgage) with a mortgage of \$500 to \$999 per month	3138	0.0647	Low
P42-44	Industry of employment	Percent of workers in educational services, health care, or social assistance	3143	0.0645	Low
P13	Ancestry	Percent of people with German ancestry	3143	0.0639	Low
H14c	Cost of water for home	Percent of owner-occupied housing units with water and sewer costs between \$500 and \$1,000 in the last 12 months	3140	0.0637	Low
P26	Military service	Percent of civilians aged 18 and older who are veterans	3143	0.0634	Low
H7a	Number of rooms in house	Percent of housing units with exactly five rooms	3143	0.0619	Low

ACS Question Number	Question Topic	Specific Estimate of Interest ¹	Number of Counties Included	Median County CV	Cluster
H11b	Internet subscription: DSL	Percent of households with DSL Internet service	3141	0.0604	Low
H11e	Internet subscription: Broadband plan	Percent of households with mobile broadband Internet	3140	0.0603	Low
H22d	Mortgage includes insurance	Percent of owner-occupied housing units with a mortgage that have insurance included in the mortgage	3139	0.0565	Low
P45&46	Occupation	Percent of workers in management, business, science, or arts field	3143	0.0564	Low
P39b	Worked less than 50 weeks in past 12 months	Of people 16 and over who worked last week, percent who worked less than 50 weeks in the last 12 months	3141	0.0564	Low
H7b	Number of bedrooms in house	Percent of housing units with exactly two bedrooms	3143	0.0545	Low
P20	Marital status	Percent of females aged 15 and older who have never married	3142	0.0540	Low
H22c	Mortgage includes taxes	Percent of owner-occupied housing units with a mortgage that have taxes included in the mortgage	3138	0.0529	Low
H21	Home insurance	Percent of owner-occupied housing units with insurance of \$500 to \$999 per year	3141	0.0493	Low
P23	Year last married	Median duration of current marriage for married, spouse present females aged 15 years and over	3143	0.0455	Low
H13	Type of heating fuel	Percent of occupied housing units using utility gas	3135	0.0452	Low
H12	Number of vehicles	Percent of occupied housing units with exactly two vehicles available	3143	0.0451	Low
P10b	Current grade in school	Percent of the population aged 3 years and older and enrolled in school who are enrolled in grades 1-8	3141	0.0401	Low
P15b	State of residence one year ago	Of people aged 1 and over that lived in a different house a year ago, percent who lived in the same state	3137	0.0386	Low

ACS Question Number	Question Topic	Specific Estimate of Interest ¹	Number of Counties Included	Median County CV	Cluster
P47a	Amount of wages earned	Median amount of wages earned for persons 15 and over	3143	0.0378	Low
P34	Minutes from work to home	Mean travel time to work (in minutes) for workers 16 years and older who did not work at home	3143	0.0372	Low
H3	Date moved in	Percent of occupied housing units where the householder moved into unit from 2000 to 2009	3143	0.0368	Low
H14a	Cost of electricity	Percent of owner-occupied housing units with electricity costs between \$50 and \$150 last month	3143	0.0347	Low
H22a	Have mortgage	Percent of owner-occupied housing units with a mortgage	3141	0.0337	Low
H9b	Handheld	Percent of households with a handheld computer	3142	0.0336	Low
P16a	Health insurance through work	Percent of the civilian non-institutionalized population who have employer-based health insurance	3143	0.0332	Low
P48	Total person income	Median total person income for persons aged 15 and over	3143	0.0329	Low
P2	Relationship	Percent of persons in households that are a child of the householder (biological, adopted, or step)	3141	0.0305	Low
P47d	Amount received from Social Security	Median income from Social Security for persons 15 and over	3142	0.0302	Low
H10	Internet access	Percent of households with an internet subscription	3143	0.0261	Low
P16c	Medicare	Percent of the civilian non-institutionalized population who have Medicare	3143	0.0256	Low
P10a	Attended school recently	Percent of persons aged 3 and over who are enrolled in school	3142	0.0252	Low
P30	County of place of work	Percent of workers who worked in the county of their residence	3142	0.0252	Low

ACS Question Number	Question Topic	Specific Estimate of Interest ¹	Number of Counties Included	Median County CV	Cluster
P40	Hours worked per week	Percent of 16 to 64 year olds who worked 35 or more hours per week	3143	0.0244	Low
P29a	Worked last week	Percent of persons 16 and over who worked for pay at a job last week	3143	0.0243	Low
P39a	Worked 50+ weeks in past 12 months	Of people 16 and over who worked last week, percent who worked 50 or more weeks in the past year	3142	0.0242	Low
H4	Acreage	Percent of one-family housing units or mobile homes that are on less than one acre	3143	0.0237	Low
H9a	Laptop, Desktop	Percent of households with a laptop or desktop	3143	0.0226	Low
P41	Class of worker	Percent of workers who are private wage or salary workers	3143	0.0212	Low
H17	Tenure	Percent of housing units that are owner-occupied	3142	0.0203	Low
H14b	Cost of gas for home	Percent of owner-occupied housing units either with gas not used or at a cost between \$0 and \$100 per month	3142	0.0190	Low
H1	Type of structure	Percent of all housing units that are one-unit detached housing units	3143	0.0179	Low
P38	When last worked	Percent of 16 to 64 year olds who worked in the last 12 months	3143	0.0169	Low
H5	Sales from agriculture	Percent of one-family housing units or mobile homes on more than one acre of land that had no agricultural sales in the last 12 months	3106	0.0166	Low
P9	Year of entry to the U.S.	Percent of foreign-born persons who entered the country before 2010	2134	0.0165	Low
H23a	Second mortgage	Percent of owner-occupied housing units with a mortgage that have no home equity loan	3077	0.0159	Low
H14d	Cost of fuel for home	Percent of owner-occupied housing units with no heating fuel costs in the last 12 months	3141	0.0130	Low

ACS Question Number	Question Topic	Specific Estimate of Interest ¹	Number of Counties Included	Median County CV	Cluster
P11	Educational attainment	Percent of people aged 25 or older with a high school diploma (or higher degree)	3143	0.0121	Low
P31	Mode of transport to work	Percent of workers who took a car, truck or van to work	3143	0.0111	Low
P4	Age	Age dependency ratio	3143	0.0053	Low
H18b	Rent plus meals	Percent of renter-occupied housing units (with cash rent) with complete kitchen facilities that do not have meals included in rent	2112	0.0049	Low
H8g	Have telephone	Percent of owner-occupied housing units with phone service	3063	0.0045	Low
H6	Business on property	Percent of one-family housing units or mobile homes with no business on the property	3128	0.0039	Low
P3	Sex	Percent of all persons that are female	3143	0.0039	Low
P6	Race	Percent of all persons who are of one race	3110	0.0029	Low
H16.1	Condo status	Percent of owner-occupied housing units that are not a condo	2449	0.0026	Low
H8e	Have stove	Percent of occupied housing units with a stove or range	2950	0.0025	Low
H8a	Have running water	Percent of occupied housing units with hot and cold running water	2841	0.0020	Low
H8b	Have toilet	Percent of occupied housing units with a flush toilet	2710	0.0018	Low
H8c	Have bathtub	Percent of occupied housing units with a bathtub or shower	2726	0.0018	Low
H8f	Have refrigerator	Percent of occupied housing units with a refrigerator	2700	0.0018	Low
H8d	Have sink	Percent of occupied housing units with a sink with a faucet	2646	0.0016	Low
P5	Hispanic origin	Percent of all persons who are Hispanic	3116	0	Low

4 Summary

A total of five ACS questions were identified with the highest median county-level CV cluster. The five estimates associated with these questions were:

- Percent of persons with Indian Health Service insurance (P16g),
- Percent of condo fees from \$100 to \$500 (H16 write-in),
- Percent of housing units with rent from \$1000 to \$1,249 (H18a),
- Percent of persons sixteen and older who did not work for pay at a job but did do some work for pay (P29b), and
- Median amount of public assistance income (P47f)

These estimates were given the smallest benefit score for this metric in the ACS Content Review.

The middle cluster had 31 estimates, with CVs ranging from 0.3372 to 0.1353.

The remaining estimates were considered to have low CVs in this clustering. The estimates that were clustered into the low category had CVs ranging from 0.124 to 0. These estimates were given the highest benefit score for this metric in the ACS Content Review.

A median county-level CV of zero was assigned to question P5, Hispanic origin. Over half the counties have "controlled" estimates for the Hispanic population, which means the estimate was "controlled" to be equal or nearly equal to the independent population estimate of Hispanics in the ACS weighting process. Controlled estimates are assigned a standard error of zero, so their CV is zero as well.