

**American Community Survey  
Fiscal Year 2014 Content Review  
Interquartile Ranges of  
County-Level ACS Data**

FINAL REPORT

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## **1 Introduction**

The American Community Survey Office (ACSO) is conducting a review of the content of 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 identified the interquartile range (IQR) of an estimate from each ACS question in order to measure and compare the spread of data across all counties. Statistically, the IQR measures the variety and dispersion of data. It does not measure survey error.

The IQR of an estimate associated with a particular ACS question was calculated for each of the 3,143 counties (or county equivalents) in the United States.

The IQR is one of nineteen metrics being used in the ACS Content Review. These results will be combined with the eighteen other metrics to inform a decision about the future of questions on the ACS. The nineteen metrics were designated 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 IQR results were considered in the 'benefit' category of the ACS Content Review. An estimate with a high IQR across the counties is more beneficial because it indicates that relatively large differences exist across the country on the topic; this suggests there is a need and benefit to asking the question regularly and in all areas.

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/](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) was calculated for each county (and county equivalent) in the United States and then ranked by size.

The interquartile range is the difference between the 75<sup>th</sup> percentile and the 25<sup>th</sup> percentile. A small IQR indicates that the counties are relatively similar in their responses to a given question. The larger the IQR, the more counties differ in respect to the given question.

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, the IQR for each of the 125 estimates associated with ACS questions was determined and then grouped into one of three clusters: low, medium or high IQRs. The estimates with the highest IQRs were the most beneficial, while the lowest IQRs were the least beneficial.

## **2.2 Universe**

ACS questionnaires from the 2008-2012 five-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 IQRs 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 since there is no reference person.

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 interquartile range of estimates for each question on the ACS questionnaire?
- 2) How do the interquartile ranges for each question compare to each other?

## **2.4 Analysis Design**

The 3,143 county-level estimates per ACS question were ordered and the interquartile range was determined, whereby  $IQR_{estimate} = 75^{th} \text{ percentile}_{estimate} - 25^{th} \text{ percentile}_{estimate}$ .

Estimates were calculated using final ACS weights.

Some IQRs were calculated using existing estimates that had been produced for derived products on American FactFinder. Other IQRs 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.

The SAS® PROC MEANS procedure calculated the estimates as well as the quartiles of the distribution. The IQR was then calculated from the quartiles. For the ACS Content Review, the county-level IQR results were to be grouped into three clusters of low, medium and high IQRs. The SAS® PROC FASTCLUS procedure was used to perform the clustering.

The initial clustering algorithm identified only two questions in the cluster with high county-level IQRs. The highest IQR, 40.66% on question H13, was an outlier among the distribution of IQRs (using the 1.5\*IQR method of identifying outliers). For purposes of the ACS Content Review, a decision was made to remove question H13 from clustering and recluster the results. The second clustering led to 13 questions being recognized as having beneficially high IQRs. The final results in Section 4 show these 13 questions in addition to question H13 classified in the high cluster.

### **3 Assumptions and Limitations**

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

[http://www.census.gov/acs/www/data\\_documentation/documentation\\_main/](http://www.census.gov/acs/www/data_documentation/documentation_main/). Notably, there is uncertainty with all the estimates, especially for smaller counties. The IQRs used in the Content Review, and listed in Tables 1 and 2, do not incorporate any measure of sampling error.

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 IQR) represents 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. Instead, one estimate for industry was calculated (specifically, percent of persons in educational services, health care, or social assistance). The county-level IQR 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 IQR 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.

The majority of estimates were percentages (such as the percent of females in a county). However, for some ACS questions, the most useful estimates are not percents. For example, question P34 asks how long it takes a person to get a work. The primary county-level estimate of interest from that question is “What was the mean time a person had to travel to get to work?” The IQR of mean travel time was identified but was not clustered with the IQRs of percentage estimates. The ACS questions with atypical estimates that were excluded from clustering are:

- P4 – age dependency ratio
- P23 –median duration of marriage for married females
- P34 – mean travel time to work
- P47a to P47h – median income amount
- P48 – median total income

In the ACS Content Review process, these questions were given the cluster value of 3, indicative of a neutral benefit score for this metric.

If there was not a 5-year estimate available for a question, then 1-year or 3-year data was used instead. Since there is increased sample variation in the 1-year and 3-year data, the IQRs from those datasets could be different than one found ultimately using 5-year data. However, IQRs are relatively stable compared to other measures of spread, so the impact of using 1-year and 3-year data should be minimal. The following questions did not have 5-year data available.

- 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. The estimates and subsequent IQRs were calculated using the 2013 1-year ACS 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, the estimates and IQR were calculated from the most recent three-year data (2010-2012).

## 4 Results

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

Table 1 shows the results in descending order of IQR. Both the ACS question number and a summary of the question content are listed, along with the resulting cluster used in the ACS Content Review.

**Table 1. County-Level Interquartile Range per ACS Question, Sorted by IQR, for Questions with Percent Estimates**

ACS Question Number	Question Topic	Specific Estimate of Interest <sup>1</sup>	Interquartile Range	Cluster
H13	Type of home heating fuel	Percent of occupied housing units using utility gas	40.06	High
H24	Mobile home costs	Percent of owner-occupied mobile homes that have mobile home costs	28.69	High
P30	Place of work - county code	Percent of workers who worked in the county of their residence	28.47	High
P8	Citizenship status	Percent of foreign-born persons who are not citizens	26.09	High
P8w	Year of naturalization write-in	Percent of naturalized foreign-born persons who were naturalized before 2000	25.66	High
H4	Acreage	Percent of one-family housing units or mobile homes that are on less than one acre	24.65	High
H11c	Modem	Percent of households with cable modem Internet service	24.44	High
H22c	Mortgage include real estate taxes	Percent of owner-occupied housing units with a mortgage that have taxes included in the mortgage	23.61	High
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	22.10	High
P24	Fertility	Births per 1,000 women ages 15 to 50	21.21	High
P25c	Length of time grandparent caring for child	Percent of grandparents responsible for grandchildren who have been responsible for three years or more	21.07	High
P25b	Grandparent responsible for child	Percent of grandparents living with grandchildren who are responsible for most of their basic care	20.74	High
H22d	Mortgage include insurance	Percent of owner-occupied housing units with a mortgage that have insurance included in the mortgage	20.43	High
P13	Ancestry	Percent of people with German ancestry	19.96	High
H14b	Cost of utilities (Gas)	Percent of owner-occupied housing units either with gas not used or at a cost between \$0 and \$100 per month	19.05	Medium

<sup>1</sup> 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](http://www.census.gov/acs/www/Downloads/data_documentation/SubjectDefinitions/2013_ACSSubjectDefinitions.pdf)

<b>ACS Question Number</b>	<b>Question Topic</b>	<b>Specific Estimate of Interest<sup>1</sup></b>	<b>Interquartile Range</b>	<b>Cluster</b>
H20	Taxes	Percent of owner-occupied housing units with a mortgage that have taxes of \$800 to \$1,499 per year	17.61	Medium
H22a	Mortgage	Percent of owner-occupied housing units with a mortgage	17.17	Medium
H9b	Handheld	Percent of households with a handheld computer	15.34	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	15.00	Medium
H5	Agriculture sales	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	14.89	Medium
P28b	VA disability rating	Percent of service-connected disability veterans with a rating of 10 or 20%	14.64	Medium
H10	Internet access	Percent of households with an Internet subscription	14.46	Medium
H14c	Cost of utilities (Water/Sewer)	Percent of owner-occupied housing units with water and sewer costs between \$500 and \$1,000 in the last 12 months	14.20	Medium
H9a	Laptop, desktop	Percent of households with a laptop or desktop	13.80	Medium
P16a	Health insurance through an employer	Percent of the civilian non-institutionalized population who have employer-based health insurance	13.74	Medium
H14a	Cost of utilities (Electricity)	Percent of owner-occupied housing units with electricity costs between \$50 and \$150 last month	13.41	Medium
H11e	Broadband plan	Percent of households with mobile broadband Internet service	13.11	Medium
H11b	DSL	Percent of households with DSL Internet service	13.10	Medium
H21	Insurance	Percent of owner-occupied housing units with insurance of \$500 to \$999 per year	13.09	Medium
H1	Building/Structure type and units	Percent of all housing units that are one-unit detached housing units	12.36	Medium
H14d	Cost of utilities (Heating Fuel)	Percent of owner-occupied housing units with no heating fuel costs in the last 12 months	12.16	Medium

<b>ACS Question Number</b>	<b>Question Topic</b>	<b>Specific Estimate of Interest<sup>1</sup></b>	<b>Interquartile Range</b>	<b>Cluster</b>
H22b	Mortgage amount	Percent of owner-occupied housing units (with a mortgage) with a mortgage of \$500 to \$999 per month	12.02	Medium
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	11.69	Medium
P38	Year last worked	Percent of 16 to 64 year olds who worked in the last 12 months	11.29	Medium
P29a	Worked last week	Percent of persons 16 and over who worked for pay at a job last week	10.93	Medium
H23a	Second mortgage	Percent of owner-occupied housing units with a mortgage that have no home equity loan	10.30	Medium
P11	Educational attainment	Percent of people aged 25 or older with a high school diploma (or higher degree)	9.78	Medium
P40	Hours worked last week	Percent of 16 to 64 year olds who worked 35 or more hours per week	9.27	Medium
H17	Tenure	Percent of housing units that are owner-occupied	9.21	Medium
P41	Class of worker	Percent of workers who are private wage or salary workers	9.00	Medium
P16d	Medicaid	Percent of the civilian non-institutionalized population who have Medicaid	8.44	Medium
H3	Date moved in	Percent of occupied housing units where the householder moved into unit from 2000 to 2009	8.27	Low
H15	SNAP/Food stamp benefits	Percent of households that received food stamps or SNAP in the last 12 months	8.17	Low
P21a	Married in last year	Percent of women aged 15 or older who were married in the last 12 months	8.14	Low
H19	Home value	Percent of owner-occupied housing units with a value of \$150,000 to \$199,999	8.10	Low
H2	Year built	Percent of housing units that were built from 2000 to 2009	8.07	Low
P20	Marital status	Percent of females aged 15 and older who have never married	8.01	Low
P45, P46	Occupation	Percent of workers in management, business, science, or arts field	7.68	Low
P14a	Language other than English	Percent of people aged 5 and older who speak a language other than English at home	7.44	Low

<b>ACS Question Number</b>	<b>Question Topic</b>	<b>Specific Estimate of Interest<sup>1</sup></b>	<b>Interquartile Range</b>	<b>Cluster</b>
P12	Undergraduate field of degree	Percent of people at least 25 years old with a bachelor's degree who have a degree in Business	7.41	Low
H7a	Number of rooms	Percent of housing units with exactly five rooms	7.05	Low
P28a	Presence of VA disability rating	Percent of veterans with a service-connected disability	6.71	Low
P5	Hispanic origin	Percent of all persons who are Hispanic	6.70	Low
P10b	Grade level	Percent of the population aged 3 years and older and enrolled in school who are enrolled in grades 1-8	6.45	Low
P27	Period of service	Percent of persons who have been on active duty in the Armed Forces who are Vietnam veterans	6.44	Low
P21c	Divorced in last year	Percent of women aged 15 or older who were divorced in the last 12 months	6.29	Low
H7b	Number of bedrooms	Percent of housing units with exactly two bedrooms	6.24	Low
P31	How get to work	Percent of workers who took a car, truck or van to work	6.11	Low
P39a	50+ weeks	Of people 16 and over who worked last week, percent who worked 50 or more weeks in the past year	6.11	Low
P16c	Medicare	Percent of the civilian non-institutionalized population who have Medicare	5.96	Low
P16b	Health insurance from an insurance company	Percent of the civilian non-institutionalized population who have health insurance through an insurance company	5.90	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	5.85	Low
H11f	Satellite	Percent of households with satellite Internet service	5.65	Low
P39b	Number of weeks	Of people 16 and over who worked last week, percent who worked less than 50 weeks in the last 12 months	5.44	Low
P42 – P44	Industry	Percent of workers in educational services, health care, or social assistance	5.43	Low
P22	Times married	Percent of females aged 15 and older who have been married exactly twice	5.34	Low
P15a	Moved in last year	Percent of people aged 1 and over who lived in a different house a year ago	5.33	Low

<b>ACS Question Number</b>	<b>Question Topic</b>	<b>Specific Estimate of Interest<sup>1</sup></b>	<b>Interquartile Range</b>	<b>Cluster</b>
P36	Actively looking for work	Percent of the population 16 and over who are actively looking for work	5.32	Low
P21b	Widowed in last year	Percent of women aged 15 or older who were widowed in the last 12 months	5.19	Low
P10a	School enrollment	Percent of persons aged 3 and over who are enrolled in school	5.06	Low
H18a	Rent amount	Percent of renter-occupied housing units (with cash rent) that pay rent of \$1000 to \$1249 per month	5.00	Low
P14b	Language	Percent of people aged 5 and older who speak Spanish at home	4.87	Low
H12	Number of vehicles available	Percent of occupied housing units with exactly two vehicles available	4.73	Low
P2	Relationship	Percent of persons in households that are a child of the householder (biological, adopted, or step)	4.48	Low
H11d	Fiber-optic internet service	Percent of households with fiber-optic Internet service	4.43	Low
P9	Year of entry	Percent of foreign-born persons who entered the country before 2010	4.33	Low
P7	Place of birth	Percent of people who are foreign-born	4.26	Low
P18b	Walking/climbing difficulty	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have ambulatory difficulty	4.25	Low
P33	Time of departure for work	Percent of workers, who did not work at home, leaving for work from 7:00am to 7:29am	3.96	Low
P32	How many in carpool	Percent of workers who carpooled to work	3.58	Low
H9c	Other computer (e.g., tablet)	Percent of households with an other computer	3.17	Low
P26	Veteran status	Percent of civilians aged 18 and older who are veterans	3.14	Low
P18a	Cognitive difficulty	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have cognitive difficulty	2.83	Low
P19	Outside home difficulty	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have independent living difficulty	2.56	Low
P14c	How well speak English	Of people aged 5 and older who speak Spanish at home, percent who speak English less than very well	2.36	Low

<b>ACS Question Number</b>	<b>Question Topic</b>	<b>Specific Estimate of Interest<sup>1</sup></b>	<b>Interquartile Range</b>	<b>Cluster</b>
P25a	Grandparents living with grandchildren	Percent of adults aged 30 or over who live with grandchildren	2.27	Low
P35a	Layoff	Of persons aged 16 and over who did not work last week, percent who are on layoff	2.26	Low
H11a	Dial-up	Percent of households with dial-up Internet service	2.25	Low
P17a	Deaf/Difficulty hearing	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have hearing difficulty	1.72	Low
P3	Sex	Percent of all persons that are female	1.64	Low
P17b	Blind/Difficulty seeing	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have vision difficulty	1.62	Low
H18b	Rent include meals	Percent of renter-occupied housing units (with cash rent) with complete kitchen facilities that do not have meals included in rent	1.58	Low
P35b	Temporarily absent from work	Of persons aged 16 and over who were not at work last week and not on layoff, percent who were temporarily absent	1.57	Low
H16.1	Condo status	Percent of owner-occupied housing units that are not a condo	1.53	Low
P16e	TRICARE or military plan	Percent of the civilian non-institutionalized population who have TRICARE or a military health insurance plan	1.53	Low
P16f	Health insurance through VA	Percent of the civilian non-institutionalized population who have health insurance through the VA	1.52	Low
P18c	Dressing/Bathing difficulty	Percent of the civilian non-institutionalized population aged 18 to 64 year olds who have self-care difficulty	1.50	Low
H11g	Other internet service	Percent of households with other internet service	1.37	Low
P6	Race	Percent of all persons who are of one race	1.36	Low
H8g	Telephone service available	Percent of owner-occupied housing units with phone service	1.21	Low
H6	Business/Medical office	Percent of one-family housing units or mobile homes with no business on the property	1.07	Low

ACS Question Number	Question Topic	Specific Estimate of Interest <sup>1</sup>	Interquartile Range	Cluster
H16.2	Condo fee	Percent of owner-occupied housing units with a condo fee from \$100 to \$500 per month	1.04	Low
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 last week	0.70	Low
H8e	Stove or range	Percent of occupied housing units with a stove or range	0.60	Low
H8a	Hot/Cold water	Percent of occupied housing units with hot and cold running water	0.54	Low
H8f	Refrigerator	Percent of occupied housing units with a refrigerator	0.48	Low
H8b	Flush toilet	Percent of occupied housing units with a flush toilet	0.46	Low
H8c	Bathtub/Shower	Percent of occupied housing units with a bathtub or shower	0.45	Low
H8d	Sink with faucet	Percent of occupied housing units with a sink with a faucet	0.42	Low
P16g	Indian Health Services insurance	Percent of the civilian non-institutionalized population who have Indian Health Service insurance	0.25	Low

Table 2 presents the IQRs for the ACS questions that were defined in the ACS Content Review with an estimate that was not a percent. The estimate is identified in the middle column and the IQR is identified in the right column. All of these questions received a cluster value of 3 in the Content Review, considered a neutral benefit score, as a result of their unorthodox estimates.

**Table 2. County-Level Interquartile Range per ACS Question, Sorted by Question Number, for Questions without Percent Estimates**

ACS Question Number	Question Topic	Specific Estimate of Interest	Interquartile Range
P4	Age	Age dependency ratio	<b>11.41</b>
P23	Year last married	Median duration of current marriage for married, spouse present females aged 15 years and over	<b>4.3 years</b>
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	<b>7.20 minutes</b>
P47a	Income from wages	Median amount of wages earned for persons 15 and over	<b>\$5,347</b>
P47b	Income from self-employment	Median income from self-employment for persons 15 and over	<b>\$4,916</b>
P47c	Income from interest	Median income from interest for persons 15 and over	<b>\$1,004</b>

<b>ACS Question Number</b>	<b>Question Topic</b>	<b>Specific Estimate of Interest</b>	<b>Interquartile Range</b>
P47d	Income from Social Security	Median income from Social Security for persons 15 and over	<b>\$1,573</b>
P47e	Income from Supplemental Security Income	Median income from Supplemental Security Income for persons 15 and over	<b>\$895</b>
P47f	Income from public assistance	Median income from public assistance for persons 15 and over	<b>\$1,142</b>
P47g	Income from retirement	Median income from retirement for persons 15 and over	<b>\$3,120</b>
P47h	Income from other sources	Median income from other sources for persons 15 and over	<b>\$1,374</b>
P48	Total person income	Median total person income for persons 15 and over	<b>\$5,672</b>

## 5 Summary

The ACS question with the highest interquartile range is H13, “Which fuel is used most for heating this housing unit?” The specific estimate used in this research was “What percent of housing units in each county use utility gas?” The county-level IQR for that estimate was 40.06%, which was a high outlier compared to the rest of the IQRs. Upon excluding H13 from the clustering due to its status as an outlier, 13 other questions were identified by the software as being in the high IQR cluster. Overall, the high IQR cluster had IQRs ranging from 40.06% to 19.96%.

There were 27 questions with percent estimates that were identified to be in the middle IQR cluster, ranging from IQRs of 19.05% to 8.44%. The remaining 69 questions with percent estimates had low IQRs, ranging from 8.27% to 0.25%.

There were 12 questions that had non-percent estimates, as shown in Table 2.