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CENTER FOR ADMINISTRATIVE RECORDS REASEARCH AND APPLICATIONS MEMORANDUM SERIES # 15-2

MEMORANDUM FOR	ACS Research and Evaluation Advisory Group
From:	Amy O'Hara *(signed Amy O'Hara)* Chief, Center for Administrative Records Research and Applications (CARRA)
Prepared by:	Bonnie Moore *(signed Bonnie Moore)* Survey Applications Branch, Center for Administrative Records Research and Applications (CARRA)
Subject:	Preliminary Research for Replacing or Supplementing the Phone Service Question on the American Community Survey with Administrative Records

Attached is the Center for Administrative Records Research and Applications (CARRA) Research and Evaluation report, "Preliminary Research for Replacing or Supplementing the Phone Service Question on the American Community Survey with Administrative Records". We conducted this evaluation to assess the potential for using the CARRA Contact Frame to replace or supplement the phone service question on the American Community Survey. If you have any questions about this report, please contact Bonnie Moore at 301-763-7585 or Dave Sheppard at 301-763-9291.

Attachment

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Preliminary Research for Replacing or Supplementing the Phone Service Question on the American Community Survey with Administrative Records

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EXECUTIVE SUMMARY

As detailed in the report, Agility in Action: A Snapshot of Enhancements to the American Community Survey" (Census Bureau, 2015), the Census Bureau is investigating ways to reduce the difficulty and length of the American Community Survey (ACS) using administrative records to address concerns about the burden survey participation places on respondents. One of the questions on the ACS we are investigating is phone service. This research will begin the determination of whether there are administrative record sources with data of sufficient coverage and quality that would allow the question on the ACS to be removed. Alternatively, we may find that there are administrative record sources sufficient only to serve as a supplement to data provided by respondents to fill in missing responses or to enhance editing routines. A Census Bureau team will use this report and conduct additional research to make recommendations on whether each question is a good candidate for removal with the use of external data sources in its place.

The Center for Administrative Records Research and Applications (CARRA) Contact Frame (CF) is a frame of Master Address File Identifiers (MAFIDs) and phone numbers built from commercial files purchased from 2010 – 2015. The CF has the potential to be used as an administrative records source to replace or supplement the phone service question on the ACS. The CF was linked to unswapped 2012 ACS data by MAFID.

Using unweighted data, ACS respondents provide an answer to the phone service question 98.8 percent of the time, and 97.4 percent of those respondents report having phone service. When linked to the CF, ACS responses and the CF agree for 88.4 percent of households. However, the CF correctly identifies only 19.8 percent of the households that report not having phone service in the housing unit.

If the CF replaced missing responses, 97.3 percent of ACS households would be determined to be in service, and 2.7 percent out of service.

ACS responses and the CF align at nominally greater percentages as householder age increases (71.9 percent for 15-19 year old householders to 90.8 percent for 70+ year old householders). Data align 88.8 percent of the time for non-Hispanic or Latino householders and 84.4 percent of the time for Hispanic or Latino householders. Households occupied by owners with mortgages have data in agreement 92.8 percent of the time, while households occupied by renters have data in agreement 80.1 percent of the time. Many of these trends are likely associated with a respondent's length of occupancy; the longer a respondent is in a household, the more time companies have to gather and sell their data. Metropolitan areas have data agreement at 89.5 percent, micropolitan areas at 87.0 percent, and other areas at 82.6 percent. Most states exhibit data agreement rates from 80 percent to 92 percent, with the exception of some states such as

Alaska (49.5 percent) and Hawaii, Montana, New Mexico, and West Virginia (74 percent to 76 percent).

I. BACKGROUND

Stemming from concerns about the burden that American Community Survey (ACS) participation places on respondents, the Census Bureau is looking for ways to reduce the difficulty and length of the survey with administrative records. We have identified sources of both federal and commercial data that may potentially alleviate the need to ask certain questions altogether or for a subset of the ACS sample. Work is underway to acquire new sources and assess the quality of the matching and coverage of these sources. Data from other agencies are under review to potentially replace ACS content, including the Internal Revenue Service to provide income information and the Social Security Administration for pension and disability information. The American Community Survey Office (ACSO) is consulting with stakeholders, including Congress, regarding the appropriateness of direct substitution.

Recently, the ACSO contracted with the National Opinion Research Center (NORC) to report on the availability of data sources, as well as the potential issues with those sources, as candidates for replacing/supplementing data currently collected by the ACS. Using this report (Ruggles, 2015) as well as their experience, the Center for Administrative Records Research and Applications (CARRA) identified several topics for further study based on the availability of data and likelihood of successful matching and analysis. These topics include:

- Year built
- Part of Condominium
- Tenure
- Property value
- Real estate taxes
- Have mortgage/mortgage amount
- Second mortgage/HELOC and payment
- Income in the past 12 months
- Residence one year ago
- Number of rooms/bedrooms
- Facilities
- Fuel type
- Acreage

For each topic, CARRA will acquire and match the administrative records to survey data, provide a report or memo describing the quality and coverage of the data source, and compare the administrative record value to ACS self-reported and imputed responses. CARRA will document the linked file and put the research extract in the Data Management System (DMS) for future research.

This research is intended to be a first look at the various topics to document the coverage, quality, and availability of external data sources for potential ACS integration. This research will enable ACS to evaluate the potential of the replacement data sources, identify challenges, and

provide direction for further research. It is an exploratory investigation of the feasibility of replacing ACS data with administrative records.

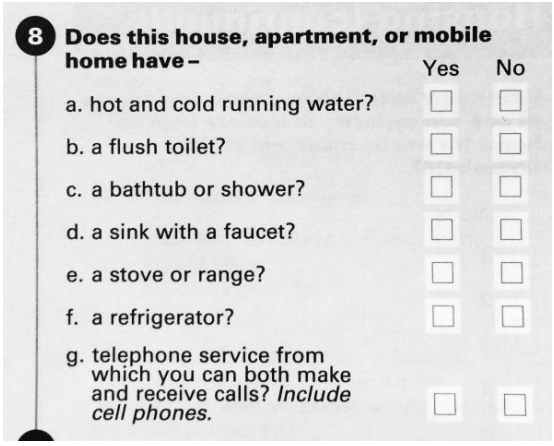
Next, we will create teams for each ACS topic identified as a potential candidate for records usage based on the results from the first phase of research. Each team will include statistical researchers, subject matter experts, and data processors that together can identify and research issues related to records usage.

The teams will make recommendations on whether each question is a good candidate for removal with the use of external data sources in its place. This recommendation will be based on an assessment of the implications of implementing such a change, considering data quality, reliability, alignment of reference periods, break in series, and the limitations of the data source affecting the suitability for use. The team will document and evaluate various options for integrating the records. For instance, for some topics, records may be better suited in assisting with imputation whereas for other topics the records may be used for direct substitution of a survey question (for all or a subset of the ACS respondent pool).

Moreover, we will gauge reactions to our intention to use external data sources from data users, stakeholders, and the public. We will review current ACS mail materials to ensure proper transparency, as well as publically share our vision in public forums such as the ACS Data Users Conference, meetings of the Association of Public Data Users (APDU), the Population Association of America (PAA), the Joint Statistical Meetings (JSM), the American Association of Public Opinion Research (AAPOR), and other public venues.

II. INTRODUCTION

The housing section of the American Community Survey (ACS) contains a question on phone service. It reads "Does this house, apartment, or mobile home have telephone service from which you can both make and receive calls? *Include cell phones*." with a choice of "yes" or "no".[1]


8 **Does this house, apartment, or mobile home have –**

	Yes	No
a. hot and cold running water?	☐	☐
b. a flush toilet?	☐	☐
c. a bathtub or shower?	☐	☐
d. a sink with a faucet?	☐	☐
e. a stove or range?	☐	☐
f. a refrigerator?	☐	☐
g. telephone service from which you can both make and receive calls? *Include cell phones.*	☐	☐

The ACS guide accompanying the paper questionnaire provides the following information for housing question 8g: "Mark "Yes" to "telephone service ..." if (1) there is a telephone in

[1] The ACS collects data using the Internet, mail, telephone, and personal visit. The phone service question is not asked in telephone interviews; the assumption is those households have phone service.

working order, and someone receives service at this house, apartment, or mobile home; or (2) if someone has a cell phone from which you can both make and receive calls. If service has been discontinued because of nonpayment or any other reason, mark the "No" box."

This research compares the ACS respondent-provided data to the Contact Frame (CF) to analyze the potential for the CF to replace or supplement the phone service question on the ACS. The CF is built from commercial databases purchased from 2010 – 2015 from a total of five vendors. It is comprised of over 530 million Master Address File Identifier (MAFID)/phone number combinations and 130 million unique MAFIDs from the commercial databases, and contains both landline and cell phone numbers. The sources and methods for how companies compile the information are proprietary, but we believe information is often mined from sources such as credit applications and utility bills. MAFID/phone number combinations are never removed from the frame, but information on the vintage of the file(s) on which the phone numbers were found is maintained.

MAFIDs only appear in the CF when linked to one or more phone numbers, and for this study, we consider a MAFID with one or more phone numbers in the CF to have phone service, and MAFIDs that are not in the CF to not have phone service. A determination is made for every ACS record because it is either in the frame (indicating phone service) or not in the frame (indicating no phone service).

However, there are some limitations to the assumption that presence in the CF means a household has phone service. The MAFID may not be associated with the phone number, either currently or at the time it was provided. The MAFID may have had phone service in one of the earlier years but not currently. The information could have been incorrect, the owner could have moved or canceled their phone service, or the billing address may not be where the phone service was used. Likewise, the absence of a phone number associated with a MAFID in the CF only indicates that none of our vendors acquired a phone number for the address, and not that they necessarily do not have phone service.

This research uses unedited and edited unswapped and unweighted ACS data from 2012, which consists of over 2 million responding households, shown in Table 1. In the unedited data, almost 98.8 percent responded to the phone service question[2]. Of these, 97.4 percent reported having phone service. In the edited data, 97.4 percent of respondents report having phone service.

[2] ACS households responding by telephone are counted as having answered "yes".

Table 1: ACS phone service

	Unedited		*Edited*	
	Count	Percent	Count	Percent
ACS Respondents	**2,162,981**	**100.0**	**2,162,981**	**100.0**
Responded to Question	2,136,593	98.8	2,162,981	100.0
Phone service	2,080,703	*97.4	2,106,300	97.4
No phone service	55,890	*2.6	56,681	2.6
Missing	26,388	1.2	-	-

* Percentage is of households reporting phone service
Source: American Community Survey 2012 unedited and edited unswapped data

III. RESEARCH QUESTIONS

1) How often do the ACS phone service response data and CF agree?
2) How do these rates of agreement vary by sex, age, race, and tenure of householder, and metropolitan statistical area and state?

IV. METHODOLOGY

We use the 2012 ACS data for this analysis, which is linked using MAFID to the May 2015 vintage of the CF, which includes data from 2010 to 2015.

- The data in this paper are subject to error, both sampling and nonsampling. For more information please see: http://www.census.gov/acs/www/data_documentation/documentation_main/
- We included only occupied housing units, not vacant housing units, because data on phone service includes only occupied housing units.
- All demographic and geographic ACS data are edited. Responses to the phone service question on the ACS are unedited or edited, as described.
- The data are not weighted, and tests for statistical significance were not performed.
- The 3-year difference in vintage between the ACS data and the CF may be considered a limitation.

V. RESULTS

Unedited Data

In Table 2, we see 96.2 percent of ACS households report having phone service, and 90.0 percent of ACS respondent MAFIDs link to one or more phone numbers in the CF. The CF would determine 23,104 of 26,388 (87.6 percent) of ACS cases with missing responses to have phone service.

Table 2: Unedited ACS phone service responses (2012) by 2015 CF (shaded cells indicate agreement between data sources)

		Contact Frame		
	Frequency *Row percent* *Table percent*	Phone service	No phone service	Total
ACS Response	Phone service	1,877,788 90.2 86.8	202,915 9.8 9.4	2,080,703 100.0 96.2
	No phone service	44,813 80.2 2.1	11,077 19.8 0.5	55,890 100.0 2.6
	Missing	23,104 87.6 1.1	3,284 12.4 0.2	26,388 100.0 1.2
	Total	1,945,705 90.0	217,276 10.0	2,162,981 100.0

Source: 2012 edited unswapped American Community Survey with unedited phone service responses data and 2015 Contact Frame

Table 3 shows the same information with the missing responses removed. In that table, the marginals show that 90.0 percent of ACS households were linked to at least one phone number in the CF. Comparing the ACS response to the CF, data agreement (i.e., has phone service in both datasets or does not have phone service in both datasets), shown by the shaded cells, occurs 88.4 percent (87.9 percent + 0.5 percent) of the time. The datasets are not in agreement for 11.6 percent (2.1 percent + 9.5 percent) of the responses.

Notably, this table shows that a large number of households (205,915, 9.5 percent) with phone service as reported in the ACS are not on the CF. Also, the CF identifies only 11,077 of the 55,890 households (19.8 percent) that report not having phone service in the ACS.

Table 3: Unedited ACS phone service responses (2012, missing ACS phone service responses removed) by 2015 CF (shaded cells indicate agreement between data sources)

		Contact Frame		
	Frequency *Row percent* *Table percent*	Phone Service	No phone service	Total
ACS Response	Phone service	1,877,788 90.2 87.9	202,915 9.8 9.5	2,080,703 100.0 97.4
	No phone service	44,813 80.2 2.1	11,077 19.8 0.5	55,890 100.0 2.6
	Total	1,922,601 90.0	213,992 10.0	2,136,593 100.0

Source: 2012 edited unswapped American Community Survey with unedited phone service responses data and 2015 Contact Frame

Table A-1 in Appendix A shows the metrics in Table 3 for unedited data by the householder demographic characteristics of sex, age, race, and ethnicity, and by metropolitan statistical area (MSA) and state. ACS responses and the CF align at nominally greater percentages as householder age increases (71.9 percent for 15-19 years old to 90.8 percent for 70+ years old). This is likely due to low coverage of young people in the CF (Wemmerus and Tordella, 2015). The agreement rate is 89.2 percent for white alone householders, 87.3 percent for black alone householders and 70.8 percent for American Indian and Alaska Native (AIAN) alone householders. Data align 88.8 percent of the time for non-Hispanic or Latino householders and 84.4 percent of the time for Hispanic or Latino householders. Households occupied by owners with mortgages have data in agreement 92.8 percent of the time, while households occupied by renters have data in agreement 80.1 percent of the time.

We suspect than many of these trends are potentially associated with a respondent's length of occupancy; the longer a respondent is in a household, the more time companies have to gather their data.

Metropolitan areas have data agreement at 89.5 percent, micropolitan areas at 87.0 percent, and other areas at 82.6 percent. Most states exhibit data agreement rates from 80 percent to 92 percent, with the exception of some states such as Alaska (49.5 percent) and Hawaii, Montana, New Mexico, and West Virginia (74 percent to 76 percent). These states are known to have low coverage in the CF (Wemmerus and Tordella, 2015).

Edited Data

This research also compared the CF to edited 2012 ACS data (see Table 4). During the ACS editing and imputation process, missing responses are filled, but non-missing responses are not edited. As shown in Table 4, the edited data show phone service at 97.4 percent of ACS respondent households. Edited ACS data agree with the CF 88.4 percent (87.9 percent + 0.5 percent) of the time, similar to the unedited non-missing ACS data.

Table 4: Edited ACS phone service responses (2012) by 2015 CF (shaded cells indicate agreement between data sources)

		Contact Frame		
	Frequency *Row percent* *Table percent*	Phone service	No phone service	Total
ACS Response	Phone service	1,900,223 90.2 87.9	206,077 9.8 9.5	2,106,300 100.0 97.4
	No phone service	45,482 80.2 2.1	11,199 19.8 0.5	56,681 100.0 2.6
	Total	1,945,705 90.0	217,276 10.0	2,162,981 100.0

Source: 2012 edited unswapped American Community Survey data and 2015 Contact Frame

If the CF were used instead of editing and imputation to replace missing responses, 97.3 percent of ACS households would be determined to be in service, and 2.7 percent out of service, very similar results to what is seen after current editing and imputation steps are executed.

The metrics shown in Table 4 are presented by the demographic characteristics of sex, age, race, ethnicity, MSA, and state in Table B-1 in Appendix B. Rates of agreement are slightly higher than those seen in the unedited data, but trends are very similar.

VI. CONCLUSIONS AND FUTURE RESEARCH

This research shows that while the determination of whether a household has phone service from the CF is in agreement with the ACS response over 90 percent of the time, it is only in agreement for ACS households reporting no phone service about 20 percent of the time.

It may be useful to investigate using the CF to help provide data for the 1.2 percent of addresses that did not provide an answer to the phone service question.

Future research should consider more granular analysis of this source. For example:

- MAFID/phone number combinations are never deleted from the CF, but it is possible to determine the delivery date of every file the pair appeared on. Future research will examine the impact of using only records that would have been available as of each interview.
- MAFID/phone number combinations are scored using an algorithm based on a truth deck. Future research will examine the impact of removing records with low scores.
- The CF has the ability to distinguish between landline and cell phone numbers. Future research will examine the agreement rates of these two different types of numbers.
- Future research may further refine demographic categories.
- CARRA continuously updates the CF with new deliveries of commercial data, and will soon begin to add respondent-provided data as well as other administrative data sources. Respondent data from the 2020 Census will add considerable coverage to the CF. In a few years, this analysis will be replicated using an updated frame.
- These analyses consider only third party data to which we were able to append a MAFID. Future research will attempt to include commercial data without a MAFID using a Basic Street Address (BSA) link or an exact match link, and might yield different results.

VII. REFERENCES

Census Bureau (2015) "Agility in Action: A Snapshot of Enhancements to the American Community Survey", http://www.census.gov/programs-surveys/acs/operations-and-administration/2015-16-survey-enhancements/agility-in-action.html

Ruggles, P. (2015) "Review of Administrative Data Sources Relevant to the American Community Survey", Prepared for the U.S. Census Bureau, January 31.

Wemmerus, N. and Tordella, S. (2015) "Evaluation of 2010 Census Telephone Numbers in the Contact Frame." Decision Demographics Summary Report.

Table A-1: Unedited ACS phone service responses (2012, missing ACS phone service responses removed) by 2015 CF for householder subpopulations and geographic areas (shaded cells—Yes/Yes and No/No--indicate agreement between data sources)

	Count	% of Total	ACS Phone Service		CF Phone Service		ACS Phone Service/CF Phone Service			
			Yes	No	Yes	No	Yes/Yes	No/No	Yes/No	No/Yes
Total	2,136,593	100	97.4	2.6	90.0	10.0	87.9	0.5	9.5	2.1
Sex of householder										
Male	1,147,499	53.7	97.2	2.8	90.3	9.7	88.1	0.6	9.1	2.2
Female	989,094	46.3	97.6	2.5	89.6	10.4	87.6	0.4	9.9	2.0
Age of householder										
15-19	5,431	0.3	93.6	6.4	75.1	24.9	70.3	1.6	23.3	4.8
20-24	63,430	3.0	94.2	5.9	78.3	21.7	73.8	1.4	20.3	4.5
25-29	120,932	5.7	95.0	5.0	83.0	17.0	79.0	1.1	16.0	3.9
30-34	148,593	7.0	96.3	3.7	86.9	13.1	83.8	0.7	12.4	3.1
35-39	152,637	7.1	96.9	3.1	89.5	10.6	86.9	0.5	10.0	2.5
40-44	179,960	8.4	97.2	2.8	90.8	9.2	88.5	0.5	8.7	2.3
45-49	202,830	9.5	97.1	2.9	91.3	8.7	88.9	0.5	8.2	2.4
50-54	232,579	10.9	97.2	2.8	91.4	8.6	89.1	0.5	8.1	2.3
55-59	231,905	10.9	97.4	2.6	91.3	8.7	89.3	0.5	8.2	2.1
60-64	215,778	10.1	98.0	2.0	91.6	8.4	90.0	0.4	8.0	1.6
65-69	179,473	8.4	98.4	1.6	91.5	8.5	90.3	0.3	8.2	1.2
70+	403,045	18.9	98.8	1.2	91.3	8.7	90.4	0.4	8.4	0.9
Race of householder										
White alone	1,753,231	82.1	97.6	2.4	90.7	9.3	88.7	0.5	8.8	2.0
Black alone	212,882	10.0	96.7	3.4	89.5	10.5	86.7	0.6	9.9	2.8
American Indian and Alaska Native alone	32,171	1.5	94.6	5.4	71.0	29.0	68.2	2.6	26.4	2.9
Asian alone	81,867	3.8	97.4	2.6	86.5	13.5	84.6	0.7	12.8	2.0
Native Hawaiian and Other Pacific Islander alone	3,511	0.2	96.4	3.6	83.2	16.8	80.5	0.9	15.9	2.7
Two or More Races and Some Other Race	52,931	2.5	96.3	3.8	84.7	15.4	81.7	0.8	14.5	3.0
Ethnicity of householder										
Hispanic or Latino	207,115	9.7	96.4	3.6	86.6	13.4	83.7	0.7	12.7	2.9
Not Hispanic or Latino	1,929,478	90.3	97.5	2.5	90.4	9.7	88.3	0.5	9.2	2.0
Tenure										
Owned with a mortgage or loan	933,223	43.7	98.3	1.7	94.1	5.9	92.6	0.2	5.7	1.5
Owned free and clear	579,192	27.1	98.2	1.8	91.2	8.8	89.8	0.4	8.4	1.4
Renter occupied	579,784	27.1	95.2	4.8	82.7	17.3	79.0	1.1	16.2	3.7
Occupied without payment of rent	44,394	2.1	95.1	4.9	83.0	17.0	79.6	1.5	15.5	3.4

	Count	% of Total	ACS Phone Service		CF Phone Service		ACS Phone Service/CF Phone Service			
			Yes	No	Yes	No	Yes/Yes	No/No	Yes/No	No/Yes
Metropolitan Statistical Area										
Metropolitan	1,626,862	76.1	97.4	2.6	91.2	8.8	89.1	0.4	8.4	2.1
Micropolitan	270,122	12.6	97.2	2.8	88.4	11.6	86.3	0.7	10.9	2.1
Other	239,609	11.2	97.3	2.8	83.6	16.4	81.7	0.9	15.5	1.9
State										
Alabama	34,980	1.6	97.0	3.0	91.5	8.5	89.0	0.5	8.0	2.5
Alaska	7,193	0.3	97.8	2.2	48.9	51.1	48.1	1.4	49.7	0.8
Arizona	38,401	1.8	96.4	3.7	85.0	15.0	82.6	1.2	13.8	2.5
Arkansas	21,065	1.0	96.2	3.8	88.4	11.6	85.4	0.7	10.9	3.1
California	204,475	9.6	97.8	2.2	90.9	9.1	89.1	0.4	8.7	1.8
Colorado	34,729	1.6	97.4	2.6	91.4	8.6	89.3	0.4	8.2	2.2
Connecticut	22,582	1.1	98.6	1.4	92.5	7.5	91.4	0.3	7.2	1.1
Delaware	6,403	0.3	97.8	2.2	93.5	6.5	91.6	0.3	6.3	1.9
District of Columbia	4,297	0.2	96.7	3.3	87.8	12.2	85.0	0.6	11.7	2.8
Florida	105,767	5.0	96.6	3.5	92.9	7.2	89.9	0.5	6.7	3.0
Georgia	51,725	2.4	96.4	3.6	90.6	9.4	87.7	0.7	8.7	3.0
Hawaii	8,935	0.4	97.2	2.8	75.1	24.9	73.4	1.1	23.8	1.7
Idaho	10,355	0.5	97.0	3.0	86.6	13.4	84.1	0.5	12.9	2.4
Illinois	92,774	4.3	97.5	2.5	89.9	10.1	87.8	0.5	9.7	2.1
Indiana	46,475	2.2	96.7	3.3	93.1	6.9	90.4	0.5	6.4	2.8
Iowa	33,031	1.6	97.6	2.4	94.9	5.1	93.0	0.4	4.7	2.0
Kansas	25,640	1.2	97.2	2.8	93.5	6.5	91.0	0.4	6.2	2.4
Kentucky	32,847	1.5	96.8	3.2	90.9	9.2	88.3	0.6	8.5	2.6
Louisiana	29,124	1.4	97.2	2.8	91.9	8.1	89.5	0.4	7.7	2.4
Maine	14,023	0.7	98.2	1.8	83.0	17.0	81.7	0.6	16.5	1.2
Maryland	36,832	1.7	97.9	2.1	94.2	5.8	92.4	0.3	5.5	1.8
Massachusetts	40,731	1.9	98.3	1.7	89.6	10.4	88.3	0.3	10.1	1.3
Michigan	90,279	4.2	97.0	3.0	94.9	5.1	92.3	0.4	4.8	2.6
Minnesota	66,015	3.1	98.0	2.0	93.5	6.5	91.9	0.4	6.1	1.7
Mississippi	17,609	0.8	97.0	3.0	89.1	10.9	86.7	0.6	10.3	2.4
Missouri	47,055	2.2	97.0	3.1	91.1	8.9	88.6	0.5	8.4	2.5
Montana	10,087	0.5	97.6	2.5	76.7	23.3	75.2	0.9	22.3	1.5
Nebraska	19,962	0.9	97.8	2.2	91.4	8.7	89.5	0.4	8.3	1.9
Nevada	16,115	0.8	97.2	2.8	86.7	13.3	84.5	0.6	12.7	2.2
New Hampshire	9,910	0.5	98.1	2.0	88.2	11.8	86.7	0.4	11.4	1.5
New Jersey	53,410	2.5	98.3	1.7	88.3	11.7	87.0	0.5	11.3	1.2
New Mexico	14,091	0.7	95.6	4.4	74.0	26.0	71.9	2.3	23.7	2.2
New York	128,203	6.0	97.7	2.4	82.0	18.1	80.3	0.7	17.4	1.7
North Carolina	62,598	2.9	97.5	2.5	91.5	8.5	89.4	0.5	8.1	2.1
North Dakota	8,788	0.4	98.1	1.9	84.3	15.8	82.8	0.5	15.3	1.5
Ohio	85,513	4.0	97.2	2.8	94.4	5.7	91.9	0.4	5.2	2.4
Oklahoma	40,065	1.9	97.4	2.6	82.7	17.3	80.8	0.7	16.6	1.9
Oregon	25,157	1.2	97.4	2.6	90.1	9.9	88.1	0.5	9.4	2.1
Pennsylvania	111,231	5.2	98.0	2.0	91.2	8.8	89.7	0.5	8.3	1.5
Rhode Island	6,394	0.3	97.9	2.1	88.2	11.8	86.6	0.5	11.3	1.6
South Carolina	29,642	1.4	97.2	2.8	92.1	7.9	89.8	0.5	7.4	2.3
South Dakota	9,177	0.4	97.5	2.5	83.7	16.3	81.9	0.7	15.6	1.8
Tennessee	41,317	1.9	97.2	2.8	93.6	6.5	91.1	0.4	6.1	2.4

	Count	% of Total	ACS Phone Service		CF Phone Service		ACS Phone Service/CF Phone Service			
			Yes	No	Yes	No	Yes/Yes	No/No	Yes/No	No/Yes
State (continued)										
Texas	135,699	6.4	97.0	3.0	89.2	10.8	86.7	0.5	10.3	2.5
Utah	17,094	0.8	97.3	2.7	89.0	11.0	86.9	0.6	10.4	2.1
Vermont	7,804	0.4	98.5	1.5	79.3	20.7	78.3	0.5	20.2	1.0
Virginia	51,500	2.4	97.7	2.3	91.7	8.3	89.8	0.4	7.9	1.9
Washington	44,250	2.1	97.5	2.5	89.8	10.2	87.8	0.5	9.7	2.0
West Virginia	14,196	0.7	96.7	3.4	76.0	24.0	74.3	1.6	22.4	1.7
Wisconsin	66,920	3.1	97.7	2.4	93.5	6.5	91.6	0.5	6.0	1.9
Wyoming	4,128	0.2	97.7	2.3	83.8	16.2	82.2	0.7	15.5	1.6

Source: 2012 edited unswapped American Community Survey with unedited phone service responses data and 2015 Contact Frame

Table B-1: Edited ACS phone service responses (2012) by 2015 CF for householder subpopulations and geographic areas (shaded cells—Yes/Yes and No/No—indicate agreement between data sources)

	Count	% of Total	ACS Phone Service		CF Phone Service		ACS Phone Service/CF Phone Service			
			Yes	No	Yes	No	Yes/Yes	No/No	Yes/No	No/Yes
Total	2,162,981	100	97.4	2.6	90.0	10.1	87.9	0.5	9.5	2.1
Sex of householder										
Male	1,162,005	53.7	97.2	2.8	90.3	9.7	88.1	0.6	9.2	2.2
Female	1,000,976	46.3	97.5	2.5	89.6	10.4	87.6	0.4	10.0	2.0
Age of householder										
15-19	5,520	0.3	93.7	6.3	75.1	24.9	70.3	1.6	23.3	4.7
20-24	63,918	3.0	94.2	5.8	78.3	21.7	73.9	1.4	20.3	4.4
25-29	121,784	5.6	95.0	5.0	83.0	17.1	79.0	1.1	16.0	3.9
30-34	149,641	6.9	96.3	3.7	86.9	13.1	83.8	0.7	12.4	3.0
35-39	153,823	7.1	96.9	3.1	89.4	10.6	86.9	0.5	10.0	2.6
40-44	181,619	8.4	97.2	2.8	90.8	9.2	88.4	0.5	8.7	2.3
45-49	204,928	9.5	97.1	2.9	91.3	8.7	88.9	0.5	8.2	2.4
50-54	235,339	10.9	97.2	2.8	91.4	8.6	89.1	0.5	8.1	2.3
55-59	234,740	10.9	97.4	2.6	91.3	8.7	89.2	0.5	8.2	2.1
60-64	218,585	10.1	98.0	2.1	91.6	8.4	89.9	0.4	8.0	1.7
65-69	182,048	8.4	98.4	1.6	91.4	8.6	90.2	0.4	8.2	1.3
70+	411,036	19.0	98.8	1.2	91.2	8.8	90.3	0.4	8.5	0.9
Race of householder										
White alone	1,773,019	82.0	97.6	2.4	90.7	9.3	88.7	0.5	8.8	2.0
Black alone	217,183	10.0	96.6	3.4	89.4	10.6	86.7	0.6	10.0	2.8
American Indian and Alaska Native alone	32,537	1.5	94.6	5.4	71.2	28.9	68.3	2.6	26.3	2.8
Asian alone	83,031	3.8	97.4	2.6	86.5	13.5	84.5	0.7	12.9	2.0
Native Hawaiian and Other Pacific Islander alone	3,570	0.2	96.4	3.6	83.1	16.9	80.5	0.9	15.9	2.7
Two or More Races and Some Other Race	53,641	2.5	96.2	3.8	84.6	15.4	81.7	0.8	14.6	3.0
Ethnicity of householder										
Hispanic or Latino	210,434	9.7	96.4	3.6	86.6	13.4	83.7	0.7	12.7	2.9
Not Hispanic or Latino	1,952,547	90.3	97.5	2.5	90.3	9.7	88.3	0.5	9.2	2.0
Tenure										
Owned with a mortgage or loan	942,581	43.6	98.3	1.7	94.1	5.9	92.6	0.2	5.7	1.5
Owned free and clear	586,667	27.1	98.2	1.8	91.2	8.8	89.8	0.4	8.4	1.4
Renter occupied	588,702	27.2	95.2	4.8	82.7	17.3	79.0	1.1	16.3	3.7
Occupied without payment of rent	45,031	2.1	95.1	4.9	83.0	17.0	79.7	1.5	15.5	3.4

	Count	% of Total	ACS Phone Service		CF Phone Service		ACS Phone Service/CF Phone Service			
			Yes	No	Yes	No	Yes/Yes	No/No	Yes/No	No/Yes
Metropolitan Statistical Area										
Metropolitan	1,647,338	76.2	97.4	2.6	91.1	8.9	89.0	0.4	8.4	2.1
Micropolitan	273,311	12.6	97.2	2.8	88.4	11.6	86.3	0.7	10.9	2.1
Other	242,332	11.2	97.2	2.8	83.6	16.4	81.7	0.9	15.5	1.9
State										
Alabama	35,589	1.7	97.0	3.0	91.4	8.6	88.9	0.5	8.1	2.5
Alaska	7,231	0.3	97.8	2.2	49.0	51.0	48.2	1.4	49.6	0.8
Arizona	38,828	1.8	96.3	3.7	85.0	15.0	82.5	1.2	13.8	2.5
Arkansas	21,332	1.0	96.2	3.8	88.5	11.5	85.4	0.7	10.9	3.1
California	206,957	9.6	97.8	2.2	90.9	9.1	89.1	0.4	8.7	1.8
Colorado	35,085	1.6	97.4	2.6	91.4	8.6	89.3	0.4	8.2	2.2
Connecticut	22,842	1.1	98.6	1.4	92.5	7.5	91.4	0.3	7.2	1.2
Delaware	6,475	0.3	97.8	2.2	93.5	6.5	91.6	0.3	6.2	1.9
District of Columbia	4,367	0.2	96.6	3.4	87.6	12.4	84.8	0.6	11.8	2.8
Florida	107,487	5.0	96.5	3.5	92.8	7.2	89.8	0.5	6.7	3.0
Georgia	52,534	2.4	96.4	3.6	90.6	9.4	87.6	0.7	8.7	3.0
Hawaii	9,024	0.4	97.2	2.8	75.1	24.9	73.5	1.1	23.8	1.7
Idaho	10,467	0.5	97.0	3.0	86.6	13.4	84.2	0.5	12.9	2.4
Illinois	93,842	4.3	97.5	2.6	89.8	10.2	87.7	0.5	9.7	2.1
Indiana	46,959	2.2	96.7	3.3	93.1	6.9	90.3	0.5	6.4	2.7
Iowa	33,359	1.5	97.6	2.4	94.9	5.1	92.9	0.4	4.7	2.0
Kansas	25,927	1.2	97.2	2.8	93.4	6.6	91.0	0.4	6.2	2.5
Kentucky	33,248	1.5	96.8	3.2	90.8	9.2	88.2	0.6	8.6	2.6
Louisiana	29,485	1.4	97.2	2.8	91.9	8.1	89.5	0.4	7.7	2.4
Maine	14,136	0.7	98.2	1.8	82.9	17.1	81.7	0.6	16.5	1.2
Maryland	37,343	1.7	97.9	2.1	94.2	5.8	92.4	0.3	5.5	1.8
Massachusetts	41,311	1.9	98.3	1.7	89.5	10.5	88.2	0.3	10.2	1.3
Michigan	91,441	4.2	97.0	3.0	94.9	5.1	92.2	0.3	4.8	2.6
Minnesota	66,714	3.1	98.0	2.0	93.5	6.5	91.8	0.4	6.2	1.7
Mississippi	17,854	0.8	97.0	3.0	89.1	10.9	86.7	0.6	10.3	2.4
Missouri	47,654	2.2	97.0	3.0	91.1	8.9	88.5	0.5	8.4	2.5
Montana	10,179	0.5	97.6	2.5	76.7	23.3	75.2	0.9	22.4	1.5
Nebraska	20,150	0.9	97.8	2.3	91.3	8.7	89.4	0.4	8.3	1.9
Nevada	16,309	0.8	97.2	2.9	86.7	13.3	84.4	0.6	12.7	2.2
New Hampshire	10,000	0.5	98.1	1.9	88.2	11.8	86.7	0.4	11.4	1.5
New Jersey	54,045	2.5	98.3	1.7	88.2	11.8	86.9	0.5	11.4	1.3
New Mexico	14,216	0.7	95.6	4.4	74.1	25.9	71.9	2.3	23.6	2.2
New York	130,019	6.0	97.6	2.4	81.9	18.1	80.2	0.7	17.5	1.7
North Carolina	63,419	2.9	97.5	2.5	91.5	8.5	89.4	0.4	8.1	2.1
North Dakota	8,857	0.4	98.1	1.9	84.3	15.7	82.8	0.5	15.3	1.5
Ohio	86,549	4.0	97.2	2.8	94.3	5.7	91.9	0.4	5.3	2.4
Oklahoma	40,524	1.9	97.4	2.6	82.7	17.3	80.8	0.7	16.6	1.9
Oregon	25,457	1.2	97.4	2.6	90.2	9.9	88.1	0.5	9.4	2.1
Pennsylvania	112,562	5.2	98.0	2.0	91.1	8.9	89.6	0.5	8.4	1.5
Rhode Island	6,461	0.3	97.9	2.1	88.2	11.8	86.6	0.5	11.3	1.6
South Carolina	30,097	1.4	97.2	2.9	92.0	8.0	89.6	0.5	7.5	2.4
South Dakota	9,250	0.4	97.5	2.5	83.8	16.2	82.0	0.7	15.6	1.8
Tennessee	41,883	1.9	97.2	2.8	93.5	6.5	91.1	0.4	6.1	2.4

	Count	% of Total	ACS Phone Service		CF Phone Service		ACS Phone Service/CF Phone Service			
			Yes	No	Yes	No	Yes/Yes	No/No	Yes/No	No/Yes
State (continued)										
Texas	137,507	6.4	97.0	3.0	89.2	10.8	86.7	0.5	10.3	2.5
Utah	17,231	0.8	97.3	2.7	89.0	11.0	86.9	0.6	10.4	2.1
Vermont	7,867	0.4	98.5	1.5	79.3	20.7	78.3	0.5	20.2	1.0
Virginia	52,079	2.4	97.7	2.3	91.6	8.4	89.7	0.4	8.0	1.9
Washington	44,745	2.1	97.5	2.5	89.8	10.2	87.8	0.5	9.8	2.0
West Virginia	14,332	0.7	96.7	3.3	76.0	24.0	74.3	1.6	22.4	1.7
Wisconsin	67,582	3.1	97.7	2.3	93.5	6.5	91.6	0.5	6.1	1.9
Wyoming	4,170	0.2	97.7	2.3	83.8	16.2	82.2	0.7	15.5	1.6

Source: 2012 edited unswapped American Community Survey data and 2015 Contact Frame