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CENTER FOR ADMINISTRATIVE RECORDS RESEARCH AND APPLICATIONS
MEMORANDUM SERIES # 15-3

MEMORANDUM FOR ACS Research and Evaluation Advisory Group

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Subject: Preliminary Research for Replacing or Supplementing the Year Built 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 Year Built Question on the American Community Survey with Administrative Records". We conducted this evaluation to assess the potential for using commercial data on year built to replace or enhance the year built 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.

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Preliminary Research for Replacing or Supplementing the Year Built Question on the American Community Survey with Administrative Records

Bonnie Moore

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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 year built. 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 year built is a good candidate for removal with the use of external data sources in its place.

The housing section of the ACS contains a question on the year a housing unit was built. It reads: “About when was this building first built?” There are response options for ten year categories from 1940 through 1999, 1939 and earlier, and a fill-in box for 2000 or later.

The Center for Administrative Records Research and Applications (CARRA) purchased a commercial file from a third-party data aggregator (“the vendor”) containing national property information. The vendor file contains a variable for year built, which has potential for filling or enhancing the year built question on the American Community Survey (ACS). In 2012, 87.4 percent of ACS respondents provided a response for year built of their housing unit.

Linking on basic street address (BSA) results in more ACS units linking to valid vendor year built data than linking on Master Address File Identifier (MAFID). This is particularly pronounced for units with a vacancy status of “for rent,” units with a tenure status of “rented,” and for apartments.

When ACS response data are linked to vendor data solely by address, but not unit number, i.e., a Basic Street Address (BSA) linkage:

- Year built is available more frequently for occupied units, and less frequently for seasonal vacancies and vacancies due to migrant workers.
- Owned units link to year built at higher rates than units that are rented or where tenure is missing.
- Single family homes can be linked to year built with higher frequency than apartments. Mobile homes and other types of homes link at the lowest rates.
- Metropolitan areas link at higher rates than micropolitan areas, and rural areas link at the lowest rates.
- Many states, especially Nevada, Maryland, Connecticut, and Rhode Island link to valid year built data at high rates. Other states, such as Tennessee, Louisiana, and New Mexico, have hardly any links, and Vermont has none at all.

The agreement between year built category on the ACS and vendor files is 78.3 percent when linked using MAFID, and 76.0 percent when linked using BSA. We suspect that linking on BSA allows more multiunit buildings to be linked. However, these buildings are more often inhabited by people who are less familiar with the structure characteristics, which may cause the reduced agreement when linking on BSA.

When unedited 2012 ACS data linked to vendor data using BSA, the agreement rate for year built category is 89.0 for the 1939 and earlier category, 76.2 percent for 1980 – 1989, 82.1 percent for 1990 – 1999, and 88.3 percent for 2000 – 2012. The 1950's through 1970's have agreement rates from 66 to 73 percent, and 1940-1949 has an agreement rate of 48.2 percent.

Few records are linked where year built categories are in different categories. For instance, only 0.4 percent of ACS records with a year built category of 1939 or earlier link to a vendor record with year built of 2000 – 2012. Slightly more records link to adjacent decades. For example, 4.7 percent of ACS records with a year built category of 1939 or earlier link to a vendor record with a year built of 1940 – 1949. These disagreements in year built may be due to the vendor's inability to acquire accurate year built for older buildings, or to the ACS respondent's lack of knowledge of the actual year built, or some combination of the two.

In addition, vendor data could be used where ACS respondents failed to answer the year built question. ACS respondents failed to respond to the year built question 12.6 percent of the time. Vendor data can be used to fill 43.5 percent of missing ACS responses when linked by BSA, and 25.6 percent of missing responses when linked by MAFID.

1. 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, ACSO 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, ACSO 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 ACS contains the question on the year a housing unit was built. It reads: “About when was this building first built?” There are response categories for ten year categories from 1940 through 1999, 1939 and earlier, and a request for the exact year for years greater than 1999.

The ACS instruction guide provides the following information for this housing question: “Mark the box that corresponds to the year in which the original construction was completed, not the time of any later remodeling, additions, or conversions. If the building was first built in 2000 or later, enter the exact year it was built. If you live on a boat or in a mobile home, enter the year corresponding to the model year in which it was manufactured. If you do not know the year the building was first built, give your best estimate.”

This research compares 2012 ACS respondent-provided data to commercial data files purchased from a third-party data aggregator (hereafter referred to as “the vendor”) to analyze the potential for commercial data to replace or supplement the year built question on the ACS.

III. RESEARCH QUESTIONS

- 1) How many and what percentage of the ACS responses have a response to the year built question?

Figure 1: Year Built Question on ACS form

The image shows a screenshot of a survey question titled "2 About when was this building first built?". The question is followed by a list of response categories, each with an unchecked checkbox:

- 2000 or later – Specify year →
- 1990 to 1999
- 1980 to 1989
- 1970 to 1979
- 1960 to 1969
- 1950 to 1959
- 1940 to 1949
- 1939 or earlier

The "2000 or later" option includes a text input field with four empty boxes for digits. An arrow points from the text "Specify year" to this input field. A faint "MVA" watermark is visible in the bottom right corner of the form area.

- 2) What percentage of the vendor file is assigned a Master Address File Identifier (MAFID)?
- 3) When linking by MAFID or Basic Street Address (BSA), how many addresses are on both files? How many linked vendor addresses have a valid year built?
- 4) How does coverage vary by geography and housing characteristics?
- 5) For linked records, how often do the two sources agree? How does this vary for MAFID linkages vs. BSA linkages?
- 6) How well can vendor data be used for item non-response for the ACS year built question?

IV. METHODOLOGY

We used 2012 ACS data (edited and unedited) for this analysis, which was linked to vendor data from 2006 – 2010 by BSA and MAFID.

The vendor data has nationwide coverage for 2009, supplemented by sparse coverage for years 2006, 2007, 2008, and 2010. The Census Bureau had acquired the vendor file for previous research, which consists of a national file for 2009 as well as files matching to demographic survey sample for the other years. In a production environment, more timely data would be available for purchase.

In addition:

- The ACS data in this paper are estimates which are subject to error, both sampling and nonsampling. For more information please see:
http://www.census.gov/acs/www/data_documentation/documentation_main/
- The data are not weighted.
- Because the response to year built on the ACS is by year range and not specific year, we recoded the vendor data into the same ranges. Agreement between the two datasets occurs when both datasets have year built in the same range.
- Vendor data for year built are expected to remain stable over time, as the year a structure was built should not change unless the structure is replaced.
- The vendor data contain two variables for year built: year built and effective year built. Year built is the construction year of the original building and effective year built is the first year the building was assessed with its current components (e.g., number of bedrooms, bathrooms, or square footage). This research uses year built where available and effective year built otherwise.

One limitation of this research is the difference in reference period between the vendor data (2006-2010) and ACS (2012). In a production environment, more timely data would be available for purchase, though there will always be a lag. A limitation of lag between data sets is that there will be some loss of newly constructed units due to timing in acquisition of the data.

As discussed throughout the report, there are limitations that arise when linking files, namely that there are instances where records link when they should not and also where records do not link when they should. Both of these instances introduce error.

V. RESULTS

1. How many and what percent of the ACS responses have a response to the year built question?

2012 ACS respondents provided an answer to the year built question 87.4 percent of the time. Table 1 presents responses by decade for unedited and edited data.

Table 1: ACS responses by year built category

Characteristic	<i>Unedited</i>		<i>Edited</i>	
	Count	Percent	Count	Percent
Responded to Question	2,076,561	87.4	2,375,715	100.00
1939 or earlier	312,749	13.2	366,333	15.4
1940 to 1949	116,814	4.9	137,399	5.8
1950 to 1959	236,238	9.9	272,251	11.5
1960 to 1969	228,586	9.6	265,049	11.2
1970 to 1979	322,430	13.6	374,564	15.8
1980 to 1989	268,884	11.3	311,071	13.1
1990 to 1999	279,923	11.8	315,449	13.3
2000 to 2012	310,937	13.1	333,599	14.0
Missing	299,154	12.6	0	0.0
Total	2,375,715	100.0	2,375,715	100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited and edited data.

Note: Percentages may not sum to 100 due to rounding.

2. What percent of the vendor file was assigned a MAFID?

The Census Bureau's Person Identification Validation System (PVS) assigns unique linkage identifiers to federal, commercial, census, and survey data to facilitate linking across and within files. PVS uses probabilistic matching to assign a unique Census Bureau identifier for each address and person record as applicable (Wagner and Layne, 2014). However, not all addresses receive a unique identifier.

The Census Bureau assigns a MAFID to each unit within a multi-unit structure, but vendor data often reflect the structure address, not each individual unit or apartment. This discrepancy results in a reduced rate of assigning MAFID to vendor records, especially in multi-unit structures. MAFIDs were assigned to 63.4 percent of the vendor records used in this research.

3. When linking by MAFID or BSA, how many addresses are on both files? How many linked vendor addresses have a valid year built?

The 2012 ACS respondent data contains 2,375,715 records. Using MAFIDs, 59.0 percent of the ACS households link to one or more vendor records. Using BSAs, 75.8 percent of the ACS households link to one or more vendor records. However, linking on BSA sometimes results in a one-to-many match, where an ACS record links to several vendor records, and year built is not always consistent among the vendor records. 25,104 (1.4 percent) of the ACS records that link to vendor data via BSA result in multiple linkages with year built that is unequal. These records are not used in the subsequent analysis.

Although it only occurs in about one percent of records, sometimes records are able to link using MAFID but not BSA. This is an artifact of when these files were processed in CARRA. The vendor file was MAFmatched the year it was received, but BSA matched to the ACS file years later. If parts of the address have changed over time, the two addresses may not be able to be matched using BSA. As an example, if the zip code of a record had changed between 2009 when it appeared on the vendor record and 2012 when it appeared in ACS sample, it would not match using BSA because of how the matching process is programmed. However, because the vendor file was MAFmatched in 2009, it was able to receive a MAFID at that time, which was able to link to an ACS MAFID years later, because the zip code of the housing unit had been updated in the MAF. In a production environment, where the vendor file is more timely, this should happen less frequently.

Table 2: Vendor data linkage rates for MAFID and BSA links to ACS

		MAFID Linkage		
Frequency Table Percent		Yes	No	Total
BSA Linkage	Yes, one year	1,370,582 57.7	403,977 17.0	1,774,559 74.7
	Yes, but linked to multiple years	7,114 0.3	17,990 0.8	25,104 1.1
	No	23,835 1.0	552,217 23.2	576,052 24.2
	Total	1,401,531 59.0	974,174 41.0	2,375,715 100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Even when vendor records are able to be linked to ACS households via MAFID or BSA, they may not have a valid value for year built. Using all ACS records, Table 3 shows the number of records linked by MAFID or BSA, and the number of linked vendor records containing year built. Of the records linked via MAFID, 75.9 percent have valid year built. This rate decreases to 74.1 percent for BSA linkage. These counts and percentages are summarized in Table 3.

Table 3: Vendor records that linked to ACS and had a valid year built

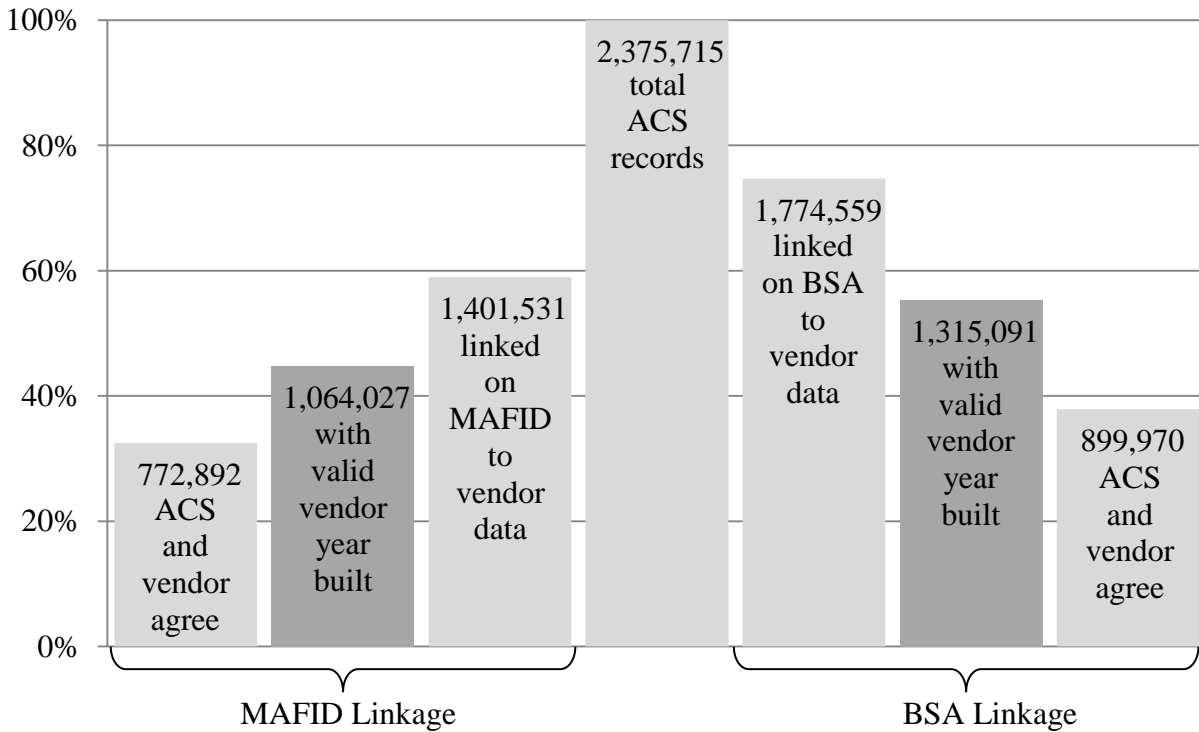
Linkage type	Vendor records linked to ACS	Linked vendor records with valid year built	Percent of linked vendor records with valid year built
MAFID linkage	1,401,531	1,064,027	75.9
BSA linkage	1,774,559	1,315,091	74.1

Source: U.S. Census Bureau, American Community Survey, 2012 1-year data and 2006 – 2010 vendor data.

Below,

Figure 2 depicts the total number of ACS records, the amount that linked to the vendor data, the amount that had a valid year built, and the amount where linked records had the same year built category. We begin with more than 2.3 million ACS records. When linking on MAFID, about 1.4 million ACS records are able to link to the vendor data. Linking on BSA, more than 1.7 million ACS records link to the vendor data. However, linking to the vendor data doesn't necessarily mean that there is a valid year built for the record. Linking on MAFID, about one million ACS records are able to link to a valid vendor year built. Linking on BSA, about 1.3 million ACS records are able to link to a valid vendor year built. Finally, once the data on both sides of the linkage have a valid value for year built, they can be compared. For MAFID linkages, 772,892 ACS records agree with the year built category in the vendor data. For BSA linkages, 899,970 ACS records agree with the year built category in the vendor data.

Figure 2: Unedited 2012 ACS records able to link to vendor data, link to vendor year built, and link to same year built category



Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.

4. How does vendor coverage vary by geography and housing characteristics?

Vendor data is being considered as a direct substitution for year built in ACS. The numbers discussed in this section reflect the percent of ACS records that link to a valid year built value on the vendor file. Linking on BSA allows for more ACS records to link to a valid year built.

Table 4: Vendor coverage by housing and geography characteristics

Characteristic	ACS record count	MAFID linked vendor data with year built available		BSA linked vendor data with year built available	
		Frequency	Percent of ACS	Frequency	Percent of ACS
Total	2,375,715	1,064,027	44.8	1,315,091	55.4
Vacancy Status					
Occupied	2,162,981	1,007,488	46.6	1,233,288	57.0
For rent	30,349	5,405	17.8	13,184	43.4

Characteristic	ACS record count	MAFID linked vendor data with year built available		BSA linked vendor data with year built available	
		Frequency	Percent of ACS	Frequency	Percent of ACS
Rented, not occupied	5,903	1,120	19.0	2,537	43.0
For sale only	16,720	7,580	45.3	8,926	53.4
Sold, not occupied	6,632	2,785	42.0	3,308	49.9
For seasonal, recreational, or occasional use	85,388	18,179	21.3	24,983	29.3
For migrant workers	560	59	10.5	103	18.4
Other vacant	67,182	21,411	31.9	28,762	42.8
Tenure					
Missing	212,734	56,539	26.6	81,803	38.5
Owned	1,529,248	860,343	56.3	944,233	61.7
Owned with a mortgage or loan	942,581	569,259	60.4	621,562	65.9
Owned free and clear	586,667	291,084	49.6	322,671	55.0
Rented	633,733	176,302	27.8	289,055	45.6
Renter occupied	588,702	131,271	22.3	270,204	45.9
Occupied without payment of rent	45,031	15,874	35.3	18,851	41.9
Units in Structure					
Mobile home	158,001	33,447	21.2	44,020	27.9
1, detached	1,607,437	911,560	56.7	984,381	61.2
1, attached	127,666	66,261	51.9	80,783	63.3
2	76,834	13,291	17.3	33,829	44.0
3 or 4	86,267	8,830	10.2	36,116	41.9
5 to 9	84,403	7,669	9.1	32,577	38.6
10 to 19	74,321	6,147	8.3	29,681	39.9
20 to 49	63,775	6,382	10.0	29,136	45.7
50 or more	95,230	10,275	10.8	44,038	46.2
Boat/RV/van/etc.	1,781	165	9.3	530	29.8
Metropolitan Statistical Area					
Metropolitan	1,768,438	905,992	51.2	1,130,265	63.9
Micropolitan	311,315	101,083	32.5	118,121	37.9
Other	295,962	56,952	19.2	66,705	22.5

Characteristic	ACS record count	MAFID linked vendor data with year built available		BSA linked vendor data with year built available	
		Frequency	Percent of ACS	Frequency	Percent of ACS
State					
Alabama	39,561	18,516	46.8	22,022	55.7
Alaska	9,703	1,744	18.0	2,572	26.5
Arizona	44,266	23,516	53.1	32,888	74.3
Arkansas	23,617	9,330	39.5	10,778	45.6
California	219,484	132,384	60.3	159,357	72.6
Colorado	38,041	21,667	57.0	28,182	74.1
Connecticut	24,177	15,531	64.2	19,572	81.0
Delaware	7,522	3,336	44.3	3,688	49.0
District of Columbia	4,719	1,621	34.4	3,697	78.3
Florida	122,723	72,612	59.2	97,362	79.3
Georgia	57,983	32,955	56.8	40,361	69.6
Hawaii	10,077	3,094	30.7	4,368	43.3
Idaho	11,832	4,259	36.0	5,061	42.8
Illinois	99,997	28,534	28.5	31,906	31.9
Indiana	50,489	21,976	43.5	26,078	51.7
Iowa	35,192	14,980	42.6	17,762	50.5
Kansas	27,833	17,799	63.9	21,787	78.3
Kentucky	35,863	9,126	25.4	10,384	29.0
Louisiana	32,686	615	1.9	691	2.1
Maine	18,484	1,482	8.0	1,883	10.2
Maryland	39,776	27,869	70.1	32,441	81.6
Massachusetts	44,270	24,505	55.4	33,789	76.3
Michigan	104,295	27,362	26.2	32,361	31.0
Minnesota	73,622	30,554	41.5	38,666	52.5
Mississippi	19,854	3,925	19.8	4,641	23.4
Missouri	52,260	22,156	42.4	25,449	48.7
Montana	11,955	4,379	36.6	5,618	47.0
Nebraska	21,541	12,080	56.1	14,169	65.8
Nevada	18,194	12,331	67.8	15,849	87.1
New Hampshire	11,522	2,520	21.9	3,189	27.7
New Jersey	58,454	23,733	40.6	29,962	51.3
New Mexico	16,689	1,014	6.1	1,253	7.5
New York	142,429	52,919	37.2	76,425	53.7
North Carolina	70,933	41,591	58.6	47,306	66.7
North Dakota	9,864	556	5.6	1,313	13.3
Ohio	92,924	60,191	64.8	70,275	75.6

Characteristic	ACS record count	MAFID linked vendor data with year built available		BSA linked vendor data with year built available	
		Frequency	Percent of ACS	Frequency	Percent of ACS
Oklahoma	47,023	21,231	45.2	25,469	54.2
Oregon	27,317	17,331	63.4	20,460	74.9
Pennsylvania	123,058	59,224	48.1	68,154	55.4
Rhode Island	6,980	4,241	60.8	5,640	80.8
South Carolina	33,921	14,765	43.5	17,270	50.9
South Dakota	10,209	1,783	17.5	2,222	21.8
Tennessee	45,460	662	1.5	761	1.7
Texas	150,406	81,125	53.9	101,985	67.8
Utah	18,746	9,536	50.9	11,579	61.8
Vermont	9,545	-	0.0	-	0.0
Virginia	55,488	32,906	59.3	38,110	68.7
Washington	47,970	26,877	56.0	35,373	73.7
West Virginia	16,345	3,213	19.7	3,741	22.9
Wisconsin	75,736	6,874	9.1	9,413	12.4
Wyoming	4,680	1,497	32.0	1,809	38.7

Source: U.S. Census Bureau, American Community Survey, 2012 1-year data and 2006 – 2010 vendor data.

Year built is available for 44.8 percent of ACS records when linking on MAFID, and 55.4 percent when linking on BSA.

Occupied ACS units link using BSA to vendor year built 57.0 percent of the time. Rates are 42.8 percent for other vacancy, 29.3 percent for seasonal vacancies, and 18.4 percent for vacancies due to migrant workers. The difference in coverage between linkage types is pronounced for rental units: Units for rent are linked to vendor year built 43.4 percent of the time when linked on BSA, but only 17.8 percent of the time when linked on MAFID.

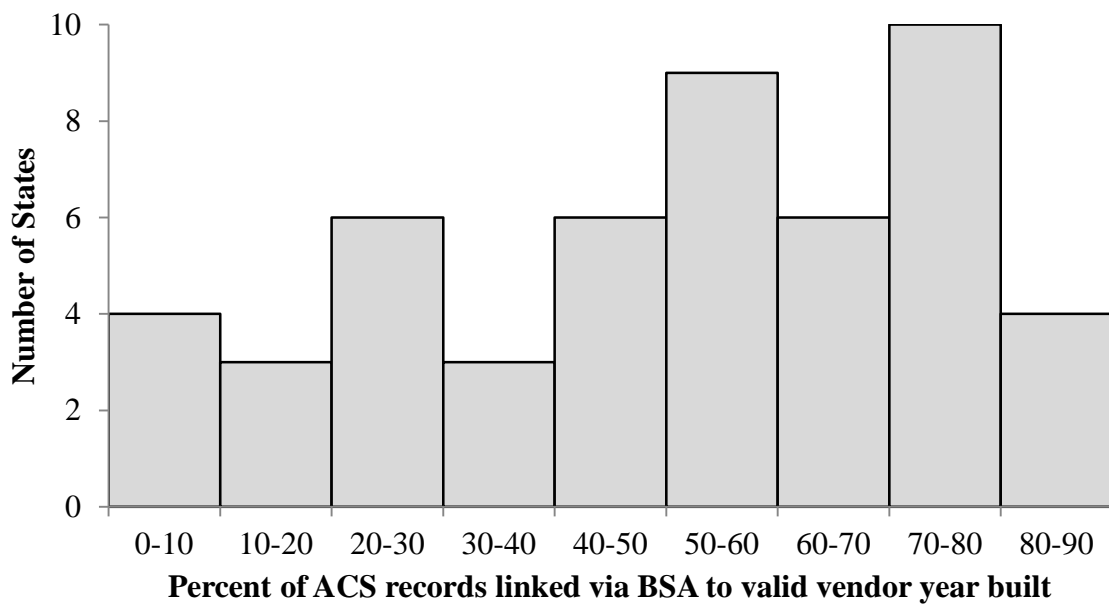
65.9 percent of units owned with a mortgage link on BSA to vendor year built. Rented units BSA link at 45.9 percent. When linked on MAFID, rented units only link to year built 22.3 percent of the time, though the linkage rate for owned with a mortgage units remains high at 60.4 percent.

Linking using BSA to vendor year built varies greatly across building type, ranging from 63.3 percent for attached single-family homes to 27.9 percent for mobile homes. Multi-unit structures link to vendor year built about 38 to 46 percent of the time. While linking on MAFID still results in a high rate of year built linkage for single-family homes, the linkage rate is dismal for multi-unit structures, ranging from 8.3 percent to 17.3 percent. We expect this low linkage rate for multi-unit structures with a single public deed/property tax record for the building.

Metropolitan areas link on BSA to vendor year built at 63.9 percent. 37.9 percent of micropolitan areas and 22.5 percent of rural areas are able to link on BSA to vendor year built. Linking on MAFID results in the same trend, but with lower rates.

BSA linkage to vendor year built on the vendor files varies substantially by state. Year built was virtually unavailable for Louisiana (2.1 percent), New Mexico (7.5 percent), and Tennessee (1.7 percent), and was completely unavailable for Vermont. Conversely, valid values were filled at rates of over 80 percent for Connecticut, Maryland, Nevada, and Rhode Island. Twenty-nine states link to year built for over 50 percent of ACS records, and only seven link at less than 20 percent. Figure 3 depicts a histogram of these rates.

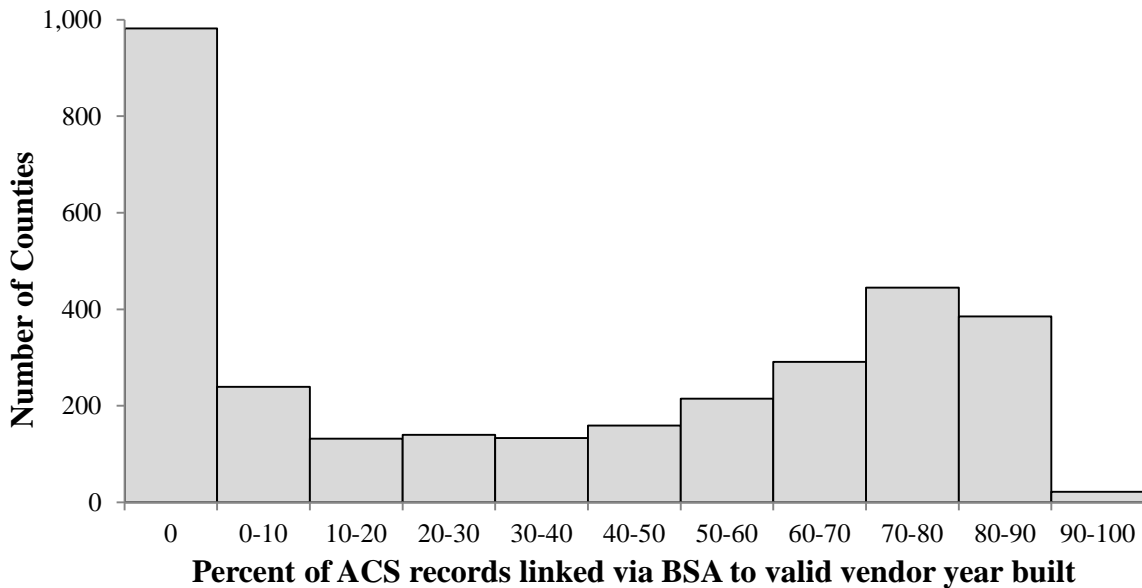
Figure 3: Count of states BSA linked to valid vendor data year built



Source: U.S. Census Bureau, American Community Survey, 2012 1-year data and 2006 – 2010 vendor data.

Year built data are typically obtained through property tax records, and are often available (or unavailable) at the county level. Figure 4 depicts the number of counties at each level of coverage. Coverage in this case means the number of 2012 ACS sample units in a county that are able to link to a valid year built from the vendor data. There are 1,221 counties with coverage of 0 to 10 percent, and 982 of those have zero coverage. At the higher coverage rates, 445 counties have coverage between 70 and 80 percent, 385 counties have coverage between 80 and 90 percent, and 22 counties have coverage over 90 percent.

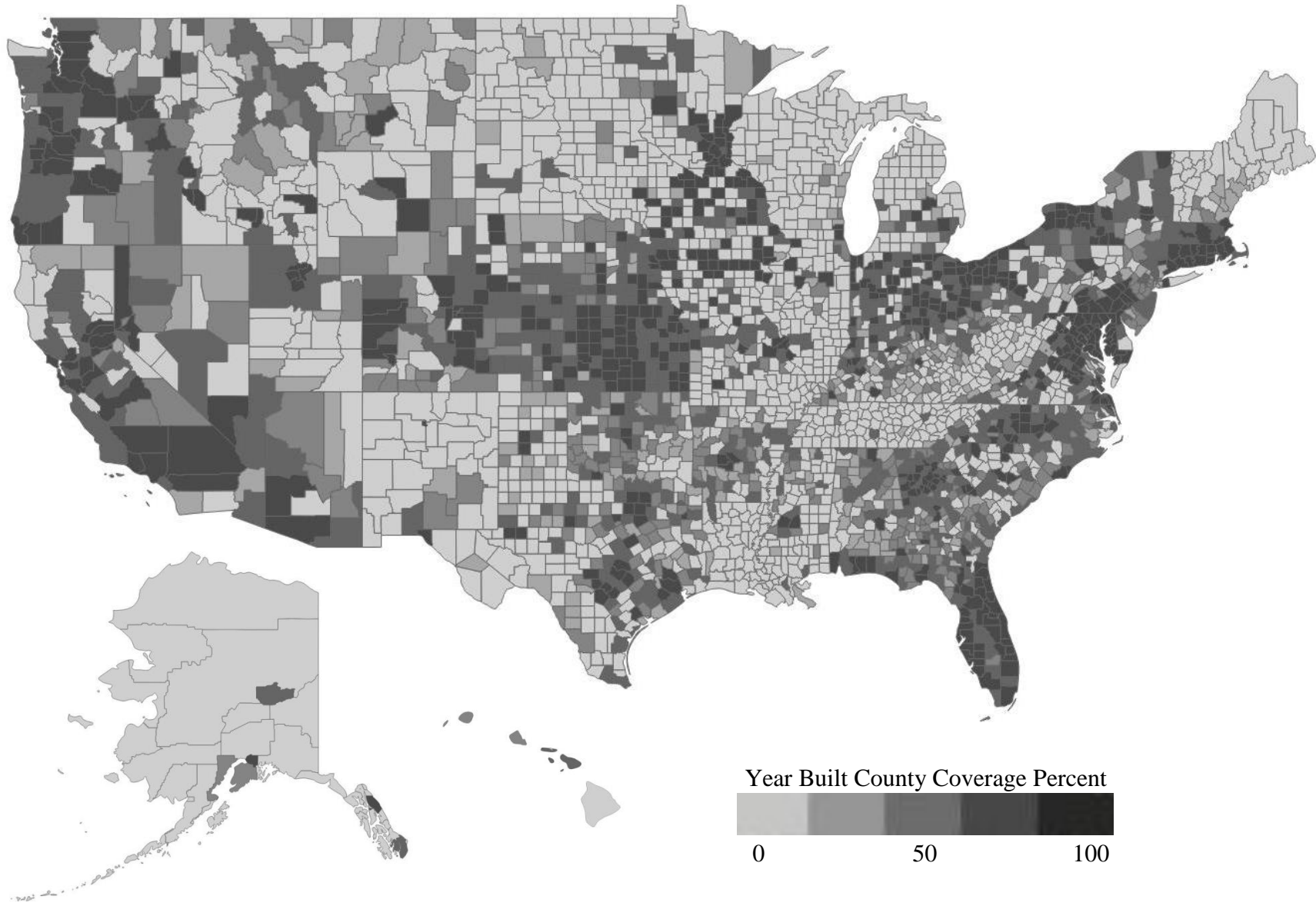
Figure 4: Count of counties BSA linked to valid vendor data year built



Source: U.S. Census Bureau, American Community Survey, 2012 1-year data and 2006 – 2010 vendor data.

When summed to a state level, some states appear to have very high or very low coverage. Looking deeper, we sometimes find that this coverage is not evenly distributed across the state. Figure 5 provides a geographical representation of this variation. High coverage states typically have a number of counties with high coverage, but may also include a handful with low coverage. The opposite is true of low coverage states, where there may be one or two counties with good coverage, and all others are very low. For example, Louisiana has 64 parishes. Of those, Bossier Parish has 66.6 percent coverage, St. Charles Parish has 75.6 percent coverage, and Plaquemines Parish has 21.9 percent coverage. The remaining 61 parishes have zero or near-zero coverage.

Figure 5: BSA Linked Vendor Year Built Coverage by County



Source: U.S. Census Bureau, American Community Survey, 2012 1-year data and 2006 – 2010 vendor data.

5. For linked records, how often are the data in the two sources in agreement? Does this vary for MAFID linkages vs. BSA linkages?

When unedited ACS data are linked to vendor data on MAFID, and both records have a valid year built, the year built category agrees for 78.3 percent of records. For BSA linkages between unedited ACS data and vendor data, where both records have a valid year built, the year built category agrees for 76.0 percent of records. Although the percent of records in agreement is lower for BSA linkage, the total number of records in agreement is higher.

Table 5: Year built category agreement between unedited ACS and vendor data

Characteristic	MAFID linkage		BSA linkage	
	Frequency	Percent	Frequency	Percent
Unedited ACS and vendor year built category agree	772,892	78.3	899,970	76.0
Unedited ACS and vendor year built category not in agreement	214,410	21.7	284,856	24.0
Total (Unedited ACS and vendor both have year built filled)	987,302	100.0	1,184,826	100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.

When the same data are subset to include only housing units owned with a mortgage or owned free and clear, the rate of agreement between unedited ACS year built and the vendor is about 81 percent for both types of linkages (see Table 6).

Table 6: Year built category agreement between unedited ACS and vendor data for housing units owned with a mortgage or owned free and clear

Characteristic	MAFID linkage		BSA linkage	
	Frequency	Percent	Frequency	Percent
Unedited ACS and vendor year built category agree	675,168	81.3	736,825	80.9
Unedited ACS and vendor year built category not in agreement	155,684	18.7	174,311	19.1
Total (Unedited ACS and vendor both have year built filled)	830,852	100.0	911,136	100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.

Subsetting the universe to housing units occupied by a renter or occupied without payment of rent, the rate of agreement between unedited ACS year built and the vendor is 58.9 percent when linked on MAFID and 56.4 percent when linked on BSA (see Table 7). The difference in agreement rates between owned and rented housing units is likely due to renters being less knowledgeable about the year their housing unit was built.

Table 7: Year built category agreement between unedited ACS and vendor data for housing units occupied by renters or occupied without payment of rent

Characteristic	MAFID linkage		BSA linkage	
	Frequency	Percent	Frequency	Percent
Unedited ACS and vendor year built category agree	67,052	58.9	120,064	56.4
Unedited ACS and vendor year built category not in agreement	46,700	41.1	92,712	43.6
Total (Unedited ACS and vendor both have year built filled)	113,752	100.0	212,776	100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.

Using edited ACS data, ACS responses that were previously missing have been imputed, and respondent-provided year built may have been edited. Comparing the year built category of edited ACS data to MAFID linked vendor records with year built filled, 75.2 percent of records have year built category in agreement. Records linked on BSA agree at a lower rate of 71.9 percent, but at a higher overall count of 944,900.

Table 8: Year built category agreement between edited ACS and vendor data

Characteristic	MAFID linkage		BSA linkage	
	Frequency	Percent	Frequency	Percent
Edited ACS and vendor year built category agree	800,280	75.2	944,900	71.9
Edited ACS and vendor year built category not in agreement	263,747	24.8	370,191	28.1
Total (Edited ACS and vendor both have year built filled)	1,064,027	100.0	1,315,091	100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

Subsetting the universe to units owned with a mortgage or owned free and clear, the ACS and vendor data have year built category in agreement for about 79 percent of the data (see Table 9).

Table 9: Year built category agreement between edited ACS and vendor data for housing units owned with a mortgage or owned free and clear

Characteristic	MAFID Percent		BSA Percent	
	Frequency	Rate	Frequency	Rate
Edited ACS and vendor year built category agree	686,059	79.7	748,911	79.3
Edited ACS and vendor year built category not in agreement	174,284	20.3	195,322	20.7
Total (Edited ACS and vendor both have year built filled)	860,343	100.0	944,233	100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

When the universe is subset to units occupied by a renter or occupied without payment of rent, the rate of agreement is 53.8 percent when linked using MAFID and 50.7 percent when linked using BSA. These rates are lower than those for owners, likely due to renters having less knowledge about the year their residence was built.

Table 10: Year built category agreement between edited ACS and vendor data for housing units occupied by renters or occupied without payment of rent

Characteristic	MAFID linkage		BSA linkage	
	Frequency	Percent	Frequency	Percent
Edited ACS and vendor year built category agree	79,215	53.8	146,408	50.7
Edited ACS and vendor year built category not in agreement	67,930	46.2	142,647	49.3
Total (Edited ACS and vendor both have year built filled)	147,145	100.0	289,055	100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

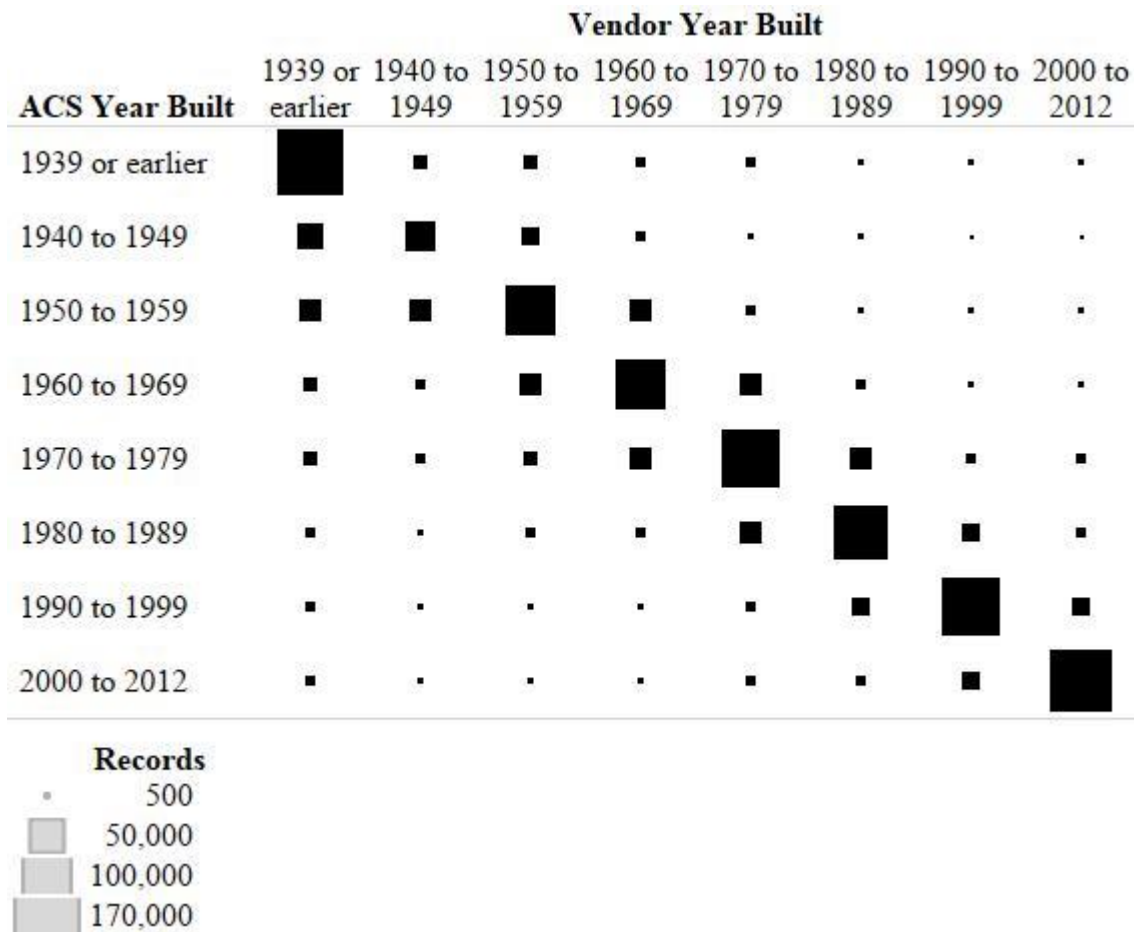
Appendix A presents comparisons of linked ACS and vendor data by year built category. Trends are similar for all the tables. MAFID linkage results in a higher agreement rate but lower overall count than BSA linkage, and unedited data agree at a higher rate than edited. Further discussion of these results focuses on unedited ACS data linked on BSA to vendor data (see Table 13b).

Agreement rates for year built categories are high for 1939 and earlier (89.0 percent), and the eighties (76.2 percent), nineties (82.1 percent), and 2000's (88.3 percent) (see Table 13b). The 1950's through 1970's have agreement rates around 70 percent, and 1940-1949 has the lowest

agreement rate at 48.2 percent. Few records link which have mis-matched year built categories. For instance, only 0.4 percent of records have an ACS year built of 1939 or earlier but a vendor year built in the 2000's. Slightly more linked records have year built categories that are adjacent. For example, 4.7 percent of records have an ACS year built of 1939 or earlier and a vendor year built of 1940-1949. In summary, most records have year built categories which agree, or are within one decade. Disagreement between the data sources may be due to inaccuracies in vendor data for older buildings, the ACS respondent's lack of knowledge of the actual year built, or some combination of these factors.

Figure 6, below, shows the agreement between edited 2012 ACS data linked using BSA to the vendor data. As discussed above, you can see that most data are in agreement, and data that do not agree tend to be within a decade of agreement.

Figure 6: Year Built Category Agreement Between Edited 2012 ACS BSA-Linked to Vendor Data



Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

6. How well can vendor data be used for item non-response for the ACS year built question?

Year built is missing for 299,154 (12.6 percent) of ACS responses. When linked on MAFID, vendor data can provide year built for 76,725 (25.6 percent) of these, and when linked on BSA, vendor data could provide year built for 130,265 (43.5 percent) of these. Linking to vendor data has the potential to enhance the imputation process for missing year built responses.

VI. FUTURE RESEARCH

Future research will consider how timely current-year vendor data files would be available for use, and will analyze ACS response data and third-party data from more recent years.

Future research will break year built from 2000 to 2015 into single years when comparing ACS response data to vendor data.

Vendor data has year built and effective year built. This report used effective year built when year built was unavailable. Future research will examine how these two variables compare, and whether effective year built should be used to supplement year built.

Linking vendor data to ACS using BSA sometimes results in multiple vendor records linking to one ACS record, and year built is not always equal among the records. Future research will explore methods to select the best year built in cases such as this.

Future research will pursue a matched-pairs analysis of agreement rates by tenure, within the same building. For example, select a rented unit and an owned unit within the same building, and analyze how well each response agrees with the vendor data. This could help increase the understanding of whether the agreement rates are low for renters due to the ACS respondent's lack of knowledge of the actual year built, or because the vendor has less accurate data for the types of buildings that are occupied by renters.

Future research will analyze agreement rates at a county level to determine where gaps exist within states, and to explore additional sources of data for the gaps.

Future research will simulate replacement of the year built question with vendor data to test the edit and imputation routines. We will compare the resulting edited vendor data to edited ACS respondent data.

VII. REFERENCES

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Wagner, D. and M. Layne. 2014. "The Person Identification Validation System (PVS):

Applying the Center for Administrative Records Research and Applications' (CARRA) Record Linkage Software.” Center for Administrative Records Research and Applications Working Paper No. 2014-01.

Table 11a: Agreement of ACS Year Built (2012, unedited) by vendor, MAFID linkage

ACS Year Built Category		Vendor Year Built Category								
		1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	Missing
1939 or earlier	118,043 63.0	6,811 3.6	3,759 2.0	1,489 0.8	1,032 0.6	758 0.4	598 0.3	587 0.3	54,423 29.0	187,500 13.4
1940 to 1949	14,862 19.4	29,919 39.0	9,553 12.4	2,274 3.0	794 1.0	431 0.6	237 0.3	259 0.3	18,472 24.1	76,801 5.5
1950 to 1959	10,030 5.9	12,532 7.4	92,364 54.8	13,567 8.0	2,845 1.7	980 0.6	482 0.3	408 0.2	35,474 21.0	168,682 12.0
1960 to 1969	4,152 2.8	3,325 2.2	14,371 9.7	79,355 53.6	10,208 6.9	2,187 1.5	687 0.5	464 0.3	33,386 22.5	148,135 10.6
1970 to 1979	2,433 1.2	1,359 0.7	4,190 2.1	12,211 6.3	111,395 57.1	12,180 6.2	1,851 0.9	702 0.4	48,890 25.0	195,211 13.9
1980 to 1989	1,268 0.8	565 0.3	1,276 0.8	1,985 1.2	10,750 6.6	101,704 62.7	9,470 5.8	993 0.6	34,109 21.0	162,120 11.6
1990 to 1999	992 0.6	386 0.2	682 0.4	717 0.4	1,663 0.9	8,070 4.5	116,495 65.5	6,704 3.8	42,256 23.7	177,965 12.7
2000 to 2012	1,544 0.8	575 0.3	935 0.5	773 0.4	1,177 0.6	1,343 0.7	7,934 4.4	123,617 67.8	44,393 24.4	182,291 13.0
Missing	20,368 19.8	7,615 7.4	12,052 11.7	8,439 8.2	9,502 9.2	8,266 8.0	6,138 6.0	4,345 4.2	26,101 25.4	102,826 7.3
Total	173,692 12.4	63,087 4.5	139,182 9.9	120,810 8.6	149,366 10.7	135,919 9.7	143,892 10.3	138,079 9.9	337,504 24.1	1,401,531 100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.
 Note: Percentages may not sum to 100 due to rounding.

Table 11b: Agreement of ACS Year Built (2012, unedited) by vendor, MAFID linkage, missing vendor data removed

ACS Year Built Category		Vendor Year Built Category								Total
		1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	
1939 or earlier	118,043 88.7	6,811 5.1	3,759 2.8	1,489 1.1	1,032 0.8	758 0.6	598 0.4	587 0.4	133,077 9.5	
1940 to 1949	14,862 25.5	29,919 51.3	9,553 16.4	2,274 3.9	794 1.4	431 0.7	237 0.4	259 0.4	58,329 4.2	
1950 to 1959	10,030 7.5	12,532 9.4	92,364 69.3	13,567 10.2	2,845 2.1	980 0.7	482 0.4	408 0.3	133,208 9.5	
1960 to 1969	4,152 3.6	3,325 2.9	14,371 12.5	79,355 69.2	10,208 8.9	2,187 1.9	687 0.6	464 0.4	114,749 8.2	
1970 to 1979	2,433 1.7	1,359 0.9	4,190 2.9	12,211 8.3	111,395 76.1	12,180 8.3	1,851 1.3	702 0.5	146,321 10.4	
1980 to 1989	1,268 1.0	565 0.4	1,276 1.0	1,985 1.6	10,750 8.4	101,704 79.4	9,470 7.4	993 0.8	128,011 9.1	
1990 to 1999	992 0.7	386 0.3	682 0.5	717 0.5	1,663 1.2	8,070 5.9	116,495 85.8	6,704 4.9	135,709 9.7	
2000 to 2012	1,544 1.1	575 0.4	935 0.7	773 0.6	1,177 0.9	1,343 1.0	7,934 5.8	123,617 89.6	137,898 9.8	
Missing	20,368 26.5	7,615 9.9	12,052 15.7	8,439 11.0	9,502 12.4	8,266 10.8	6,138 8.0	4,345 5.7	76,725 5.5	
Total	173,692 12.4	63,087 4.5	139,182 9.9	120,810 8.6	149,366 10.7	135,919 9.7	143,892 10.3	138,079 9.9	1,064,027 75.9	

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.
 Note: Percentages may not sum to 100 due to rounding.

Table 12a: Agreement of ACS Year Built (2012, edited) by vendor, MAFID linkage

ACS Year Built Category		Vendor Year Built Category								
		1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	Missing
1939 or earlier	127,547 61.3	8,340 4.0	5,229 2.5	2,299 1.1	1,709 0.8	1,252 0.6	1,015 0.5	957 0.5	59,771 28.7	208,119 14.9
1940 to 1949	17,563 20.4	31,535 36.6	10,922 12.7	2,818 3.3	1,133 1.3	691 0.8	413 0.5	446 0.5	20,622 23.9	86,143 6.2
1950 to 1959	13,088 7.0	14,490 7.8	96,988 52.2	15,100 8.1	3,752 2.0	1,541 0.8	902 0.5	770 0.4	39,210 21.1	185,841 13.3
1960 to 1969	5,904 3.7	4,253 2.6	16,317 10.1	81,913 50.7	11,591 7.2	2,862 1.8	1,117 0.7	860 0.5	36,655 22.7	161,472 11.5
1970 to 1979	3,796 1.8	1,998 0.9	5,376 2.5	13,701 6.5	114,738 54.3	13,942 6.6	2,824 1.3	1,377 0.7	53,489 25.3	211,241 15.1
1980 to 1989	2,104 1.2	958 0.5	1,933 1.1	2,734 1.6	12,246 7.0	104,764 60.1	10,685 6.1	1,777 1.0	37,186 21.3	174,387 12.4
1990 to 1999	1,654 0.9	691 0.4	1,134 0.6	1,202 0.6	2,575 1.4	9,085 4.8	118,761 63.1	7,858 4.2	45,208 24.0	188,168 13.4
2000 to 2012	2,036 1.1	822 0.4	1,283 0.7	1,043 0.6	1,622 0.9	1,782 1.0	8,175 4.4	124,034 66.6	45,363 24.4	186,160 13.3
Total	173,692 12.4	63,087 4.5	139,182 9.9	120,810 8.6	149,366 10.7	135,919 9.7	143,892 10.3	138,079 9.9	337,504 24.1	1,401,531 100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 12b: Agreement of ACS Year Built (2012, edited) by vendor, MAFID linkage, missing vendor data removed

		Vendor Year Built Category								Total
		1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	
ACS Year Built Category	Frequency	127,547	8,340	5,229	2,299	1,709	1,252	1,015	957	148,348
	Row percent	86.0	5.6	3.5	1.5	1.2	0.8	0.7	0.6	13.9
	1939 or earlier	17,563	31,535	10,922	2,818	1,133	691	413	446	65,521
	1940 to 1949	26.8	48.1	16.7	4.3	1.7	1.1	0.6	0.7	6.2
	1950 to 1959	13,088	14,490	96,988	15,100	3,752	1,541	902	770	146,631
	1960 to 1969	8.9	9.9	66.1	10.3	2.6	1.1	0.6	0.5	13.8
	1970 to 1979	5,904	4,253	16,317	81,913	11,591	2,862	1,117	860	124,817
	1980 to 1989	4.7	3.4	13.1	65.6	9.3	2.3	0.9	0.7	11.7
	1990 to 1999	3,796	1,998	5,376	13,701	114,738	13,942	2,824	1,377	157,752
	2000 to 2012	2.4	1.3	3.4	8.7	72.7	8.8	1.8	0.9	14.8
1980 to 1989	2,104	958	1,933	2,734	12,246	104,764	10,685	1,777	137,201	
1990 to 1999	1.5	0.7	1.4	2.0	8.9	76.4	7.8	1.3	12.9	
2000 to 2012	1,654	691	1,134	1,202	2,575	9,085	118,761	7,858	142,960	
	1.2	0.5	0.8	0.8	1.8	6.4	83.1	5.5	13.4	
2000 to 2012	2,036	822	1,283	1,043	1,622	1,782	8,175	124,034	140,797	
	1.4	0.6	0.9	0.7	1.2	1.3	5.8	88.1	13.2	
Total	173,692	63,087	139,182	120,810	149,366	135,919	143,892	138,079	1,064,027	
	16.3	5.9	13.1	11.4	14.0	12.8	13.5	13.0	100.0	

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 13a: Agreement of ACS Year Built (2012, unedited) by vendor, BSA linkage

ACS Year Built Category		Vendor Year Built Category								
		1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	Missing
1939 or earlier	149,537 61.7	7,861 3.2	4,559 1.9	2,178 0.9	1,454 0.6	1,016 0.4	730 0.3	719 0.3	74,243 30.6	242,297 13.7
1940 to 1949	18,986 20.5	32,768 35.4	10,825 11.7	3,062 3.3	1,169 1.3	596 0.6	284 0.3	319 0.3	24,518 26.5	92,527 5.2
1950 to 1959	13,372 6.8	13,891 7.1	100,297 51.2	16,628 8.5	4,031 2.1	1,476 0.8	594 0.3	551 0.3	44,908 22.9	195,748 11.0
1960 to 1969	6,128 3.4	3,982 2.2	16,560 9.2	90,841 50.6	13,703 7.6	3,441 1.9	1,036 0.6	840 0.5	43,118 24.0	179,649 10.1
1970 to 1979	3,998 1.7	1,818 0.8	5,432 2.2	16,705 6.9	129,016 53.3	17,009 7.0	2,941 1.2	1,799 0.7	63,203 26.1	241,921 13.6
1980 to 1989	2,136 1.1	803 0.4	1,826 0.9	3,440 1.7	14,550 7.2	118,388 58.9	12,120 6.0	2,174 1.1	45,456 22.6	200,893 11.3
1990 to 1999	1,659 0.8	514 0.2	968 0.5	1,399 0.7	2,974 1.4	11,060 5.2	130,170 61.6	9,835 4.7	52,710 24.9	211,289 11.9
2000 to 2012	2,302 1.0	747 0.3	1,226 0.5	1,227 0.5	1,867 0.8	2,150 0.9	10,186 4.5	148,953 65.1	60,189 26.3	228,847 12.9
Missing	34,884 19.2	9,831 5.4	16,366 9.0	16,653 9.2	18,209 10.0	16,415 9.0	9,992 5.5	7,915 4.4	51,123 28.2	181,388 10.2
Total	233,002 13.1	72,215 4.1	158,059 8.9	152,133 8.6	186,973 10.5	171,551 9.7	168,053 9.5	173,105 9.8	459,468 25.9	1,774,559 100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 13b: Agreement of ACS Year Built (2012, unedited) by vendor, BSA linkage, missing vendor data removed

ACS Year Built Category		Vendor Year Built Category								Total
		1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	
1939 or earlier	149,537 89.0	7,861 4.7	4,559 2.7	2,178 1.3	1,454 0.9	1,016 0.6	730 0.4	719 0.4	168,054 13.7	
1940 to 1949	18,986 27.9	32,768 48.2	10,825 15.9	3,062 4.5	1,169 1.7	596 0.9	284 0.4	319 0.5	68,009 5.2	
1950 to 1959	13,372 8.9	13,891 9.2	100,297 66.5	16,628 11.0	4,031 2.7	1,476 1.0	594 0.4	551 0.4	150,840 11.0	
1960 to 1969	6,128 4.5	3,982 2.9	16,560 12.1	90,841 66.5	13,703 10.0	3,441 2.5	1,036 0.8	840 0.6	136,531 10.1	
1970 to 1979	3,998 2.2	1,818 1.0	5,432 3.0	16,705 9.3	129,016 72.2	17,009 9.5	2,941 1.6	1,799 1.0	178,718 13.6	
1980 to 1989	2,136 1.4	803 0.5	1,826 1.2	3,440 2.2	14,550 9.4	118,388 76.2	12,120 7.8	2,174 1.4	155,437 11.3	
1990 to 1999	1,659 1.0	514 0.3	968 0.6	1,399 0.9	2,974 1.9	11,060 7.0	130,170 82.1	9,835 6.2	158,579 11.9	
2000 to 2012	2,302 1.4	747 0.4	1,226 0.7	1,227 0.7	1,867 1.1	2,150 1.3	10,186 6.0	148,953 88.3	168,658 12.9	
Missing	34,884 26.8	9,831 7.5	16,366 12.6	16,653 12.8	18,209 14.0	16,415 12.6	9,992 7.7	7,915 6.1	130,265 10.2	
Total	233,002 17.7	72,215 5.5	158,059 12.0	152,133 11.6	186,973 14.2	171,551 13.0	168,053 12.8	173,105 13.2	1,315,091 100.0	

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 14a: Agreement of ACS Year Built (2012, edited) by vendor, BSA linkage

ACS Year Built Category	Vendor Year Built Category									Total
	Frequency Row percent	1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	
1939 or earlier	165,769 59.4	9,811 3.5	6,700 2.4	3,870 1.4	2,782 1.0	1,979 0.7	1,397 0.5	1,404 0.5	85,200 30.5	278,912 15.7
1940 to 1949	23,078 21.6	34,674 32.4	12,546 11.7	4,135 3.9	1,770 1.7	1,057 1.0	548 0.5	588 0.6	28,497 26.7	106,893 6.0
1950 to 1959	18,014 8.1	16,268 7.4	105,849 47.9	19,252 8.7	5,536 2.5	2,480 1.1	1,211 0.5	1,090 0.5	51,334 23.2	221,034 12.5
1960 to 1969	9,238 4.6	5,188 2.6	19,239 9.5	95,252 47.0	16,385 8.1	4,881 2.4	1,730 0.9	1,469 0.7	49,348 24.3	202,730 11.4
1970 to 1979	6,658 2.4	2,770 1.0	7,296 2.7	19,916 7.3	135,230 49.8	20,540 7.6	4,486 1.7	2,915 1.1	71,959 26.5	271,770 15.3
1980 to 1989	3,850 1.7	1,396 0.6	2,917 1.3	5,257 2.3	17,612 7.9	123,992 55.3	14,064 6.3	3,442 1.5	51,760 23.1	224,290 12.6
1990 to 1999	2,938 1.3	973 0.4	1,682 0.7	2,444 1.1	4,735 2.1	13,242 5.8	133,611 58.2	11,674 5.1	58,217 25.4	229,516 12.9
2000 to 2012	3,457 1.4	1,135 0.5	1,830 0.8	2,007 0.8	2,923 1.2	3,380 1.4	11,006 4.6	150,523 62.9	63,153 26.4	239,414 13.5
Total	233,002 13.1	72,215 4.1	158,059 8.9	152,133 8.6	186,973 10.5	171,551 9.7	168,053 9.5	173,105 9.8	459,468 25.9	1,774,559 100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 14b: Agreement of ACS Year Built (2012, edited) by vendor, BSA linkage, missing vendor data removed

		Vendor Year Built Category								
ACS Year Built Category	Frequency Row percent	1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	Total
	1939 or earlier	165,769 85.6	9,811 5.1	6,700 3.5	3,870 2.0	2,782 1.4	1,979 1.0	1,397 0.7	1,404 0.7	193,712 14.7
	1940 to 1949	23,078 29.4	34,674 44.2	12,546 16.0	4,135 5.3	1,770 2.3	1,057 1.3	548 0.7	588 0.8	78,396 6.0
	1950 to 1959	18,014 10.6	16,268 9.6	105,849 62.4	19,252 11.3	5,536 3.3	2,480 1.5	1,211 0.7	1,090 0.6	169,700 12.9
	1960 to 1969	9,238 6.0	5,188 3.4	19,239 12.5	95,252 62.1	16,385 10.7	4,881 3.2	1,730 1.1	1,469 1.0	153,382 11.7
	1970 to 1979	6,658 3.3	2,770 1.4	7,296 3.7	19,916 10.0	135,230 67.7	20,540 10.3	4,486 2.2	2,915 1.5	199,811 15.2
	1980 to 1989	3,850 2.2	1,396 0.8	2,917 1.7	5,257 3.0	17,612 10.2	123,992 71.9	14,064 8.2	3,442 2.0	172,530 13.1
	1990 to 1999	2,938 1.7	973 0.6	1,682 1.0	2,444 1.4	4,735 2.8	13,242 7.7	133,611 78.0	11,674 6.8	171,299 13.0
	2000 to 2012	3,457 2.0	1,135 0.6	1,830 1.0	2,007 1.1	2,923 1.7	3,380 1.9	11,006 6.2	150,523 85.4	176,261 13.4
	Total	233,002 17.7	72,215 5.5	158,059 12.0	152,133 11.6	186,973 14.2	171,551 13.0	168,053 12.8	173,105 13.2	1,315,091 100

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 15a: Agreement of ACS Year Built (2012, unedited) by vendor, records that linked on BSA only (no MAFID linkage)

ACS Year Built Category		Vendor Year Built Category									
		Freq Row percent	1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	Missing
1939 or earlier		36,233 57.9	1,403 2.2	1,021 1.6	779 1.2	509 0.8	333 0.5	186 0.3	206 0.3	21,929 35.0	62,599
1940 to 1949		4,778 27.0	3,682 20.8	1,529 8.6	881 5.0	420 2.4	196 1.1	76 0.4	75 0.4	6,045 34.2	17,682
1950 to 1959		3,840 12.5	1,757 5.7	9,926 32.3	3,410 11.1	1,330 4.3	562 1.8	153 0.5	143 0.5	9,620 31.3	30,741
1960 to 1969		2,171 6.1	774 2.2	2,548 7.1	13,463 37.7	3,925 11.0	1,370 3.8	340 1.0	264 0.7	10,845 30.4	35,700
1970 to 1979		1,672 3.1	508 0.9	1,347 2.5	4,865 9.0	21,857 40.5	5,344 9.9	1,085 2.0	609 1.1	16,687 30.9	53,974
1980 to 1989		922 2.0	258 0.6	597 1.3	1,529 3.4	4,293 9.5	20,897 46.0	2,973 6.5	798 1.8	13,134 28.9	45,401
1990 to 1999		721 1.8	155 0.4	324 0.8	701 1.8	1,395 3.5	3,357 8.5	17,395 44.2	2,946 7.5	12,396 31.5	39,390
2000 to 2012		822 1.6	190 0.4	334 0.6	478 0.9	741 1.4	881 1.7	2,543 4.9	28,268 54.5	17,569 33.9	51,826
Missing		15,758 18.6	2,513 3.0	4,664 5.5	8,571 10.1	9,249 10.9	8,634 10.2	4,154 4.9	3,509 4.1	27,602 32.6	84,654
Total		66,917 15.9	11,240 2.7	22,290 5.3	34,677 8.2	43,719 10.4	41,574 9.9	28,905 6.9	36,818 8.7	135,827 32.2	421,967

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 15b: Agreement of ACS Year Built (2012, unedited) by vendor, records that linked on BSA only (no MAFID linkage), missing vendor data removed

ACS Year Built Category		Vendor Year Built Category								Total
		1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	
1939 or earlier	36,233 89.1	1,403 3.4	1,021 2.5	779 1.9	509 1.3	333 0.8	186 0.5	206 0.5	40,670	
1940 to 1949	4,778 41.1	3,682 31.6	1,529 13.1	881 7.6	420 3.6	196 1.7	76 0.7	75 0.6	11,637	
1950 to 1959	3,840 18.2	1,757 8.3	9,926 47.0	3,410 16.1	1,330 6.3	562 2.7	153 0.7	143 0.7	21,121	
1960 to 1969	2,171 8.7	774 3.1	2,548 10.3	13,463 54.2	3,925 15.8	1,370 5.5	340 1.4	264 1.1	24,855	
1970 to 1979	1,672 4.5	508 1.4	1,347 3.6	4,865 13.0	21,857 58.6	5,344 14.3	1,085 2.9	609 1.6	37,287	
1980 to 1989	922 2.9	258 0.8	597 1.9	1,529 4.7	4,293 13.3	20,897 64.8	2,973 9.2	798 2.5	32,267	
1990 to 1999	721 2.7	155 0.6	324 1.2	701 2.6	1,395 5.2	3,357 12.4	17,395 64.4	2,946 10.9	26,994	
2000 to 2012	822 2.4	190 0.6	334 1.0	478 1.4	741 2.2	881 2.6	2,543 7.4	28,268 82.5	34,257	
Missing	15,758 27.6	2,513 4.4	4,664 8.2	8,571 15.0	9,249 16.2	8,634 15.1	4,154 7.3	3,509 6.2	57,052	
Total	66,917 23.4	11,240 3.9	22,290 7.8	34,677 12.1	43,719 15.3	41,574 14.5	28,905 10.1	36,818 12.9	286,140	

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 16a: Agreement of ACS Year Built (2012, edited) by vendor, records that linked on BSA only (no MAFID linkage)

ACS Year Built Category		Vendor Year Built Category									
		Freq Row percent	1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012	Missing
1939 or earlier		43,573 54.5	1,896 2.4	1,740 2.2	1,722 2.2	1,192 1.5	832 1.0	453 0.6	535 0.7	28,015 35.0	79,958
1940 to 1949		6,330 27.4	4,026 17.4	1,937 8.4	1,435 6.2	696 3.0	412 1.8	172 0.7	160 0.7	7,907 34.3	23,075
1950 to 1959		5,594 14.2	2,240 5.7	10,967 27.8	4,548 11.5	1,981 5.0	1,037 2.6	365 0.9	332 0.8	12,423 31.5	39,487
1960 to 1969		3,621 7.8	1,097 2.4	3,345 7.2	15,405 33.4	5,295 11.5	2,169 4.7	626 1.4	493 1.1	14,112 30.6	46,163
1970 to 1979		3,048 4.4	839 1.2	2,057 3.0	6,644 9.7	24,910 36.2	7,197 10.5	1,714 2.5	1,003 1.5	21,365 31.1	68,777
1980 to 1989		1,855 3.2	478 0.8	1,043 1.8	2,637 4.6	5,956 10.4	23,634 41.1	3,766 6.6	1,252 2.2	16,832 29.3	57,453
1990 to 1999		1,372 2.9	319 0.7	605 1.3	1,289 2.7	2,299 4.8	4,589 9.5	18,665 38.8	3,631 7.6	15,322 31.9	48,091
2000 to 2012		1,524 2.6	345 0.6	596 1.0	997 1.7	1,390 2.4	1,704 2.9	3,144 5.3	29,412 49.9	19,851 33.7	58,963
Total		66,917 15.9	11,240 2.7	22,290 5.3	34,677 8.2	43,719 10.4	41,574 9.9	28,905 6.9	36,818 8.7	135,827 32.2	421,967

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 16b: Agreement of ACS Year Built (2012, edited) by vendor, records that linked on BSA only (no MAFID linkage), missing vendor data removed

ACS Year Built Category	Vendor Year Built Category								
	Freq Row percent	1939 or earlier	1940 to 1949	1950 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2012
1939 or earlier	43,573 83.9	1,896 3.7	1,740 3.3	1,722 3.3	1,192 2.3	832 1.6	453 0.9	535 1.0	28,015 53.9
1940 to 1949	6,330 41.7	4,026 26.5	1,937 12.8	1,435 9.5	696 4.6	412 2.7	172 1.1	160 1.1	7,907 52.1
1950 to 1959	5,594 20.7	2,240 8.3	10,967 40.5	4,548 16.8	1,981 7.3	1,037 3.8	365 1.3	332 1.2	12,423 45.9
1960 to 1969	3,621 11.3	1,097 3.4	3,345 10.4	15,405 48.1	5,295 16.5	2,169 6.8	626 2.0	493 1.5	14,112 44.0
1970 to 1979	3,048 6.4	839 1.8	2,057 4.3	6,644 14.0	24,910 52.5	7,197 15.2	1,714 3.6	1,003 2.1	21,365 45.1
1980 to 1989	1,855 4.6	478 1.2	1,043 2.6	2,637 6.5	5,956 14.7	23,634 58.2	3,766 9.3	1,252 3.1	16,832 41.4
1990 to 1999	1,372 4.2	319 1.0	605 1.8	1,289 3.9	2,299 7.0	4,589 14.0	18,665 57.0	3,631 11.1	15,322 46.8
2000 to 2012	1,524 3.9	345 0.9	596 1.5	997 2.5	1,390 3.6	1,704 4.4	3,144 8.0	29,412 75.2	19,851 50.8
Total	66,917 23.4	11,240 3.9	22,290 7.8	34,677 12.1	43,719 15.3	41,574 14.5	28,905 10.1	36,818 12.9	135,827 47.5

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 17: ACS Year Built (2012, unedited) by vendor, records that did not link to vendor

	Vendor Year Built	
	Missing	Total
1939 or earlier	62,650 11.4	62,650 11.4
1940 to 1949	22,331 4.0	22,331 4.0
1950 to 1959	36,815 6.7	36,815 6.7
1960 to 1969	44,751 8.1	44,751 8.1
1970 to 1979	73,245 13.3	73,245 13.3
1980 to 1989	61,363 11.1	61,363 11.1
1990 to 1999	62,568 11.3	62,568 11.3
2000 to 2012	76,820 13.9	76,820 13.9
Missing	111,674 20.2	111,674 20.2
Total	552,217 100.0	552,217 100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year unedited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.

Table 18: ACS Year Built (2012, edited) by vendor, records that did not link to vendor

	Vendor Year Built	
	Missing	Total
1939 or earlier	78,256 14.2	78,256 14.2
1940 to 1949	28,181 5.1	28,181 5.1
1950 to 1959	46,923 8.5	46,923 8.5
1960 to 1969	57,414 10.4	57,414 10.4
1970 to 1979	94,546 17.1	94,546 17.1
1980 to 1989	79,231 14.4	79,231 14.4
1990 to 1999	79,190 14.3	79,190 14.3
2000 to 2012	88,476 16.0	88,476 16.0
Total	552,217 100.0	552,217 100.0

Source: U.S. Census Bureau, American Community Survey, 2012 1-year edited data and 2006 – 2010 vendor data.

Note: Percentages may not sum to 100 due to rounding.