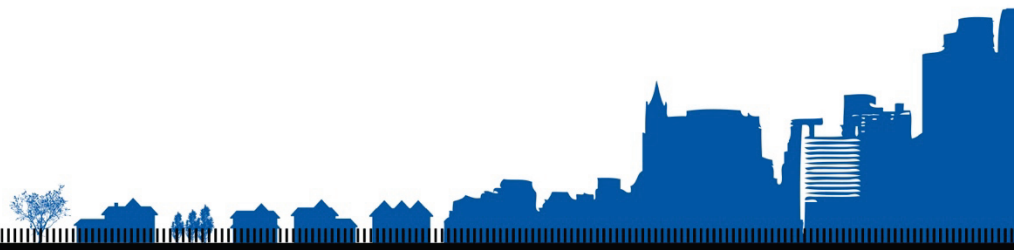
# American Housing Survey

## Components of Inventory Change: 2015–2017



U.S. Department of Housing and Urban Development | Office of Policy Development and Research

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## Components of Inventory Change: 2015–2017

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# Foreword

The U.S. Department of Housing and Urban Development is pleased to present the 2015–2017 Components of Inventory Change (CINCH) report. This report, the 16th in a series that stretches back to 1985–1987, documents the changes in the Nation's housing stock during a 2-year period. It is based on the American Housing Survey (AHS), the most comprehensive data collection on housing conditions in the United States. The AHS uses a longitudinal sample design, which means that housing units remain in the sample and are revisited every 2 years. Thus, the survey is uniquely able to track additions, losses, and changes to housing units.

The total housing stock increased by 2.6 million units during 2015–2017. In addition to documenting this overall positive net change, the report provides greater detail on the units and building types that both entered or were lost to the overall housing stock. In addition, many units that stayed in the stock changed their characteristics. For example, 20 percent changed tenure, from owner-occupied to rental or rental to owner-occupied. Although inadequate-quality units left the stock at a higher rate than adequate, three-fourths of those that remained were restored to adequate quality. Only the AHS can track these kinds of changes.

The tables in this report take a bi-directional approach, that is they include both "forward-looking" and "backward-looking" tables. The "forward-looking" tables begin with the 2015 housing stock and document what their status was in 2017. These tables include losses from the stock, either permanently or (potentially) temporarily. The "backward-looking" tables track the sources of the stock as it existed in 2017. Most of these units already existed in 2015, but some were additions—from new construction, the return of temporary losses, and other sources. Both sets of tables divide the stock into 96 overlapping categories so that one can examine the characteristics of units that left, joined, or changed at higher or lower rates.

The CINCH reports reflect the core function of the Department's Office of Policy Development and Research to "collect and analyze national housing market data." HUD's PD&R contributes to the Nation's statistical infrastructure by producing high-quality, comprehensive, and unbiased data for use by all analysts of housing in the United States.

Seth D. Appleton
Assistant Secretary for Policy Development and Research
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# Executive Summary

In 2015, the U.S. housing stock consisted of 134,790,000 housing units; by 2017, this stock had grown to 137,403,000 units. This Components of Inventory Change (CINCH) study explains how this increase came about and examines accompanying changes in the housing stock.

Three things happened to the 2015 housing stock in the period between the 2015 American Housing Survey (AHS) and the 2017 survey: Some housing units left the stock, some units remained in the housing stock but underwent changes, and some units were added to the stock. None of these processes are as simple as they sound. CINCH measures all three groups and further examines the ways in which units flow out of and into the housing stock. It also identifies subsets of the housing stock that had unusually high levels of losses or additions and subsets where a high proportion of those that stayed in the stock were no longer in the same subset in 2015 as in 2017.

## Losses to the 2015 Stock and Additions to the 2017 Stock

By 2017, the 2015 housing stock had suffered the loss of 2,093,700 units. Total losses were divided almost evenly between temporary losses (1,084,400 units) and permanent losses (1,009,300 units). A housing unit is considered to be a temporary loss if it might return to the housing stock at a later date; a permanent loss is a unit that cannot return to the housing stock in its current form. Important examples of temporary losses are 2015 residential units that were used for business or storage in 2017 (141,900 units), mobile home sites that were occupied in 2015 but vacant in 2017 (101,900 sites), 2015 residential units used for institutional housing in 2017 (128,500 units), 2015 units where occupancy is prohibited in 2017 (65,200 units), and 2015 units where the interior is exposed to the elements in 2017 (182,300 units). Although such temporary losses may eventually leave the stock permanently, they are conceptually recoverable.

Examples of permanent losses are 2015 units that were demolished or destroyed by fire or natural disaster by 2017 (325,200 units), 2015 mobile homes not on lots that moved by 2017 (145,500 units), 2015 units split into multiple units (53,300 units), and 2015 units merged with other units (68,900 units). None of these units can be recovered in the same form as the original 2015 unit; hence, they are considered permanent losses.

The largest category of temporary losses were units lost in ways “not otherwise classified,” with a loss of 364,000 units. Similarly, there were two undefined permanent loss categories that account for 410,200 unit losses.

The 2017 housing stock benefited from the addition of 3,655,800 units that entered the housing stock after 2015. These additions fall into three classes: new construction (2,102,700 units); units that were considered temporary losses in 2015 but were recovered by 2017 (1,050,300 units): and units added after 2015 by means other than new construction (502,800 units). There is a large “not otherwise classified” component (500,700 units).

The CINCH number for 2017 overestimates new construction due to changes to the AHS that began in 2015. The second major source of additions (recovered units) includes units that were used in 2015 for business commercial storage (106,500 units), mobile homes that moved to sites unoccupied in 2015 (108,800 sites), units that were used in 2015 as institutional housing (132,000

units), units where occupancy had been prohibited (74,900 units), and units with the interior exposed to the elements in 2015 (127,400 units). CINCH is forced to estimate the third source, non-new construction additions (502,800 units), by classifying additions to the 2017 AHS sample that were built before 2017 as other additions. This groups includes older mobile homes that moved between 2015 and 2017 and new units resulting from the splitting or merging of older units.

Subtracting the losses from the 2015 stock and adding the 2017 additions results in a discrepancy of 1,051,000 units less than the 2017 housing stock. Section 2 explains why discrepancies occur in CINCH accounting; Exhibit 3-1 shows that these adjustments have varied substantially in absolute and percentage terms over the last seven CINCH studies. This adjustment is the second largest over the seven CINCH studies.

## Putting 2015–2017 Growth into Historical Perspective

Exhibit 3-1 compares the 2015–2017 growth to six previous CINCH analyses, dating back to 2001.[1] The analysis of exhibit 3-1 found that:

- The impact of the financial crisis, which began in 2006, and the recession is shown in the slower growth of the 2007–2009 and 2009–2011 periods.
- Growth between 2015 and 2017 was typical for the 2001–2017 period; of the seven periods, this period experienced the third highest growth at 2,613,000 units.
- The period of normal growth from 2015–2017 follows abnormally low growth from 2011 to 2013 (413,000 units); the gross flow into and out of the housing stock during the 2011–2013 period (3.4 million units) was small by historical standards.[2] The average gross flow over the seven periods was 5.8 million.
- The growth and gross flow numbers suggests that the housing market hit a slow spot during the 2011–2013 period and that the 2015–2017 period was a return to normality.

## Market Segments with Unusually High or Low Losses and Additions

Appendix B lists loss and addition rates for 135 overlapping segments of the housing market, along with their t-statistics. Here are some noteworthy loss and addition differences:

- Occupied units have lower loss rates and addition rates. Vacant units and seasonal units have much higher loss rates and addition rates.
- There is no meaningful variation in loss rates and addition rates by metropolitan status/non-metropolitan status or Census Division.
- Loss rates increase as the age of the unit increases.
- Smaller units have higher loss rates, but also higher addition rates.
- By two different measures of unit quality, poorer units have higher loss and addition rates.

[1]There is no CINCH covering the 2013–2015 period because the U.S. Census Bureau drew a new AHS sample in 2015; because of this, it was impossible to track 2013 sample units into 2015.
[2]Gross flow equals the sum of the absolute values of losses and additions, taken separately.

- Loss rates and addition rates show little variation across market segments defined by the age, race, and ethnicity of householders; household type; or the presence or absence of children in the household. This means that the displacement resulting from losses appears not to be concentrated on some households more than others.
- Owner-occupied units have lower loss and addition rates than all housing; renter-occupied units have higher loss and addition rates.
- Loss rates for both renter-occupied and owner-occupied housing are highest for the least expensive housing. Additional rates are highest for the most expensive renter-occupied and owner-occupied housing.

## Market Segments Where Unit or Household Characteristics Changed Between 2015 and 2017

In addition to measuring losses and additions and spotlighting the different ways in which units can leave and enter the housing stock, CINCH analysis shows that units in the stock can change characteristics between 2015 and 2017. Appendix B reports the percentage of 2015 units that were in a different segment in 2017 by market segment, and the percentage of units in 2017 that came from a different segment in 2015. The most interesting changes are reported here. The behavior of units in a particular segment does not change much between survey years. The numbers are so highly correlated that for any given segment, the percentage of 2015 units that are different in 2017 is almost the same as the percentage of 2017 units that were different in 2015.

Readers should interpret these results carefully, as not demonstrating the same characteristic may have multiple explanations. For example, not being renter-occupied may mean that a unit is owner-occupied, but it could also be vacant or seasonal. The information on characteristics comes from interviews, and respondents may make mistakes in their answers.

- Occupied units were stable between survey years. Approximately 60 percent of vacant units and 50 percent of seasonal units had changed in the previous or following survey year.
- Although approximately 12 percent of severely inadequate units in 2015 left the stock, approximately 75 percent of the remaining severely inadequate units transitioned to either adequate or moderately inadequate in 2017. Among units with problems, the number of problems noted saw changes in at least 75 percent of units in the other year. For both measures of quality, the 2015–2017 experience shows that, if a unit remains in the stock, problems will be fixed and are not longstanding.
- Groups defined by the demographic characteristics of the occupant household seem to be relatively stable between surveys. None of the changes observed seem unusually high, given that households move and household composition changes over time.
- Approximately 20 percent of renter-occupied units were either owner-occupied, vacant, or seasonal in the other year.

# Components of Inventory Change: 2015–2017

## Section 1: Introduction

In 2015, the U.S. housing stock consisted of 134,790,000 housing units; by 2017, the stock had grown to 137,403.000 units. This paper explains how this increase came about and examines the accompanying changes in the housing stock.

Since 1973, the U.S. Department of Housing and Urban Development (HUD) and the U.S. Census Bureau have conducted a periodic survey of the U.S. housing stock called the American Housing Survey (AHS). In 2015, the U.S. Census Bureau drew a new sample of approximately 80,000 housing units to be interviewed at 2-year intervals. Starting in 2017, new units are added to the AHS every 2 years to account for new construction or other additions to the housing stock. The consistent tracking of the same housing units makes it possible to provide a detailed picture of how the American housing stock evolves.

For years, HUD has sponsored Components of Inventory Change (CINCH) studies to detail the survey-to-survey changes in the American housing stock. This paper continues the CINCH series by describing how the housing stock evolved between 2015 and 2017; it is organized as follows:[3]

- Section 2 examines the changes in the housing stock between 2015 and 2017 in terms of losses to the housing stock through demolitions or other methods and additions to the stock through new construction and other methods.
- Section 3 compares the pattern of changes between 2015 and 2017 to the pattern of changes in previous 2-year periods, dating back to 2001.
- Section 4 identifies the components of the housing stock that experienced unusually high losses and those that experience unusually large gains between 2015 and 2017.
- Section 5 highlights groups of units that remained in the housing stock between 2015 and 2017 but experienced unusually high changes in characteristics.

The paper concludes with three appendices:

- Appendix A contains the four forward-looking tables and the four backward-looking tables found in previous reports.
- Appendix B reports loss rates, additions rates, and change rates computed from the data in Appendix A and used in Sections 4 and 5 of this report.
- Appendix C explains how this CINCH differs from previous CINCH studies as a result of the redesign of the AHS in 2015.

[3]For previous CINCH studies, see http://www.huduser.org/portal/datasets/cinch.html.

Two other papers accompany this report. *Rental Market Dynamics: 2015–2017* uses the CINCH methodology to study how rental market evolved between 2015 and 2017 with a special focus on affordable rental housing.[4] *Weighting for CINCH and Rental Dynamics* documents how the authors devised special weights for these analyses.[5] The second section of this paper lays out the methodology behind CINCH analysis and, in particular, explains why special weights are needed.

[4]Eggers, F. J., & Moumen, F. (June 2020). *Rental Market Dynamics: 2015–2017*. Found at https://www.huduser.gov/portal/datasets/cinch.html.

[5]Eggers, F. J., & Moumen, F. (April 2020). *Weighting for CINCH and Rental Dynamics.* Econometrica, Inc. and SP Group LLC, prepared for HUD. Found at https://www.huduser.gov/portal/datasets/cinch.html.

# Section 2: Flows Out of and Into the Housing Stock

Three things happened to the 2015 housing stock in the period between the 2015 AHS and the 2017 survey: Some housing units left the stock, some units remained in the housing stock but underwent changes, and some units were added to the stock. None of these processes are as simple as they sound. This section measures all three groups and examines the ways in which units flow out of and into the housing stock. Section 5 looks at various changes that occurred to units that were in both the 2015 and 2017 housing stocks.

The housing stock consists of all occupied dwellings and those units available for occupancy. "Units" include not just buildings or parts of buildings, but other places where people live on a regular basis, such as boats, recreational vehicles (RVs), tents, and even caves and railroad cars. Unoccupied units include vacant dwellings offered for sale or rent, second homes, vacation homes, and places used for shelter on a seasonal basis. Beach properties and ski cabins fall under seasonal use, but so do dwellings for migrant labor workforces. The AHS does not survey college dormitories, prisons, group living facilities, or nursing homes; these occupied places are not part of the housing stock as measured by the AHS.

## Losses

The AHS classifies losses as temporary or permanent. A housing unit is considered to be a temporary loss if it might return to the housing stock at a later date; a permanent loss is a unit that cannot return to the housing stock in its current form. Examples of temporary losses include mobile home sites that have become vacant or houses used for business purposes, such as dentist offices or tax preparer offices.[6] Examples of permanent losses are units destroyed by fire or natural disaster, a house's relocation, a mobile home moved to a different site, or the reconfiguring of a single unit into multiple units or the combining of multiple units into one. For a unit to be considered a loss in 2017, it must have been in the housing stock in 2015.

Exhibit 2-1 lists nine kinds of temporary losses and seven kinds of permanent losses; together they account for the loss of 2,093,700 units. Total losses are divided almost evenly between temporary losses (1,084,400 units) and permanent losses (1,009,300 losses).

Most people thinking about units lost to the stock might expect them to be lost through natural disasters such as fires and tornadoes or the demolishing of dilapidated structures or old units to make way for newer units. This category accounts for the largest number of losses to the housing stock (325,200 units), but only represents 15.5 percent of all losses and slightly less than a third of all permanent losses. Exhibit 2-1 shows that unit losses may have many explanations.

[6]If the dentist or taxpayer lives in the unit, it is considered a unit in the stock with an attached office.

**Exhibit 2-1. Losses Between 2015 and 2017 (Rounded to the Nearest Hundred)**

| AHS Code[7] | Temporary Losses | |
|---|---|---|
| **Temporary Losses** | | |
| 10 | Permit granted; construction not started | 14,400 |
| 11 | Under construction, not ready | 86,200 |
| 12 | Permanent or temporary business or commercial storage | 141,900 |
| 13 | Unoccupied site for mobile home or tent | 101,900 |
| 14 | Other unit, including nonstaff, or converted to institutional unit[8] | 128,500 |
| 15 | Occupancy prohibited | 65,200 |
| 16 | Interior exposed to the elements | 182,300 |
| 17 | Not classified above, structure type is not boat, RV, tent, cave, or railroad car | 161,900 |
| 18 | Not classified above, structure type is boat, RV, tent, cave, or railroad car | 202,100 |
| | **Subtotal** | **1,084,400** |
| **Permanent Losses** | | |
| 30 | Demolished or disaster loss | 325,200 |
| 31 | House or mobile home moved | 145,500 |
| 32 | Unit eliminated in structural conversion | 53,300 |
| 33 | Merged, not in current sample | 68,900 |
| 36 | Permit abandoned | 6,200 |
| 37 | Not classified above | 98,500 |
| 42 | Unit does not exist or unit is out of scope | 311,700 |
| | **Subtotal** | **1,009,300** |
| **Total Losses** | | **2,093,700** |

The first two categories (construction not started and under construction) contain sample cases that had addresses in 2015 and therefore were eligible for sample selection but were not completed units in 2015; these units remained uncompleted in 2017. Combined, these categories account for 4.7 percent of losses. Categories 12 and 14 (temporary business use and institutional unit) consist of units used as housing units in 2015 that were used for business or commercial purposes or as institutional housing in 2017. Combined, these categories account for 12.9 percent of all losses. Categories 15 and 16 denote units that have become uninhabitable and account for 11.8 percent of all losses. The final two categories suggest that many temporary losses may not be recovered and may in time become permanent losses.

There are three categories for "not classified above" listed in exhibit 2-1, including codes 17 and 18 under temporary losses, and code 37 under permanent losses. Combined, these catch-all codes account for 22.1 percent of all losses.

[7]The AHS uses a variable, NOINTXX, which reports why a case was not interviewed in a particular survey. The numbers in this column are the values that NOINTXX takes if the loss is for the reason listed in the center column.
[8]The U.S. Census Bureau AHS Items book for 2015 lists 15 classes of units that fall into this group, including correctional institutions, hospitals, military quarters, emergency shelters, dormitories, religious group quarters, and more. The term "nonstaff" is not explained.

The treatment of mobile homes necessitates further explanation: The AHS does not follow a mobile home if it is moved from one location to another. If a mobile home is moved, the AHS treats the move as a loss to the housing stock. If the mobile home was moved from a site prepared for a mobile home, the loss is considered temporary; another mobile home might move into that same site—that is, that same address. (The AHS uses addresses to draw its sample.) If the move is not from a prepared site, the loss is considered permanent. From the perspective of economic theory, a housing unit is the union of land and capital; when a mobile home (or a house) is moved from its site, the union is broken and the "original" housing unit is gone, even though the capital and land still exist separately. Mobile home losses (both temporary and permanent) represent 19.3 percent of all losses.

This same logic explains categories 32 and 33 (mergers and conversions). In AHS terminology, a merger occurs when two or more units are physically converted into a single unit. If one of the merger units was in the AHS sample, the U.S. Census Bureau considers it permanently lost and stops following that unit. A conversion consists of making a single unit into multiple units. If the original unit was in the AHS sample, the U.S. Census Bureau considers it permanently lost and stops following it. If, in the process of a merger or conversion, new addresses are created, it is possible that the U.S. Census Bureau will include one or more of these addresses among the new cases added to the AHS sample in the future. If so, the added unit would have a new control number and would not be linked in any way to its previous incarnation.

There are two unexpected findings in exhibit 2-1. Category 42 (unit does not exist or unit is out of scope) is a new reason added in 2015 for a unit not being interviewed. Originally, the authors planned not to include this group among losses but discovered that 142 of the 182 sample cases in this category were interviewed in 2015. Among those units not interviewed, only four had a code indicating the unit could not be found. For this reason, these cases were included; they are counted as part of the permanent loss grouping because the AHS uses a permanent loss code for them. The second unexpected finding involves category 18 (not classified above, structure type is boat, RV, tent, cave, or railroad car). The number of losses (202,100) seems very high for such a class of atypical dwellings. The U.S. Census Bureau's Table Creator indicates that there were only 69,000 atypical dwellings of this class in 2015.

Despite these puzzles, exhibit 2-1 demonstrates that there are many ways in which units leave the housing stock. This knowledge is an important product of CINCH analysis. With respect to losses, the most important CINCH product are counts of losses by type. The AHS is the only source that makes it possible to count losses, but special weights are needed for accurate counting.[9]

## Additions

Using the AHS, CINCH analysis can produce a precise measurement of additions to the stock between surveys; measurement by source is less precise and not complete. Between 2015 and 2017, 3,655,800 housing units were added to the housing stock. Exhibit 2-2 presents the information available on additions by source.

[9]To learn more about the need for special weights, see *Weighting for CINCH and Rental Dynamics*.

**Exhibit 2-2. Additions Between 2015 and 2017 (Rounded to the Nearest Hundred)**

| Method for Finding[10] | Additions by Source | |
|---|---|---|
| **New Construction** | | |
| New Sample | Newly sampled units, built in 2010 or later | 1,963,900 |
| 10 & 11 | Uncompleted units in 2015 | 138,800 |
| | **Subtotal** | **2,102,700** |
| **Recovered Units Temporarily Lost in 2015** | | |
| 12 | Permanent or temporary business or commercial storage | 106,500 |
| 13 | Unoccupied site for mobile home or tent | 108,800 |
| 14 | Other unit, including nonstaff, or converted to institutional unit | 132,000 |
| 15 | Occupancy prohibited | 74,900 |
| 16 | Interior exposed to the elements | 127,400 |
| 17 | Not classified above, structure type is not boat, RV, tent, cave, or railroad car | 229,600 |
| 18 | Not classified above, structure type is boat, RV, tent, cave, or railroad car | 271,100 |
| | **Subtotal** | **1,050,300** |
| **Other Additions** | | |
| New Sample | Newly sampled units, built before 2010 | 502,800 |
| | **Subtotal** | **502,800** |
| **Total Additions** | | **3,655,800** |

The first column in exhibit 2-2 tells how CINCH analysis identifies and estimates the various sources. Between the 2015 and 2017 AHS, the U.S. Census Bureau increased the sample size by adding 1,748 units drawn from new addresses added to its Master Address File. The AHS treats new addresses as entirely new units, though (as discussed briefly in Appendix B) there are ways in which a new address may not have a corresponding new unit. These new addresses are seen in two places in exhibit 2-2: Under New Construction, 1,969,300 newly constructed units are accounted for, while 502,800 newly sampled units are found under Other Additions.

To distinguish newly constructed units from units added in other ways, CINCH analysis must rely on the AHS variable for year built, YRBUILT. Unfortunately, the U.S. Census Bureau does not allow public users of AHS data to know the actual year built as reported by respondents; instead, the public use file (PUF) presents data on year built in multiple year categories, the most recent being "2010 or later." Exhibit 2-2 counts 1,969,300 units that were new addresses in 2017 and built in 2010 or later; these units are considered to be new construction.

[10]The numbers in this column are NOINTXX values (see footnote 5) assigned to sample cases in 2015. Because we are looking for units that were temporarily lost in 2015, we use NOINT15 to identify these sample cases in exhibit 2-2, whereas for exhibit 2-1 we use NOINT17 to identify units that became temporary losses in 2017.

Units identified as new addresses that were built before 2010 are labeled as Other Additions in CINCH analysis. These units may enter the housing stock in many different ways: A 2015 mobile home that moved to a new address in 2017 would be counted as a new unit in 2017. A 2015 unit converted into two units in 2017 would be counted as two new units in 2017. A 2017 unit created by merging two 2015 units would be counted as a single new unit in 2017. In concept, these examples are the opposite of permanent loss categories 31, 32, and 33 from exhibit 2-1. Because the AHS does not follow units lost in these ways from one survey to another, it cannot associate losses to gains in these cases. The AHS for 2015 onward does not try to measure other additions by type.

Exhibit 2-2 identifies 138,800 units that were in some stage of the construction process in 2015, which were completed by 2017. Combined, these two sources of newly constructed units result in the estimation that new construction added 2,102,700 units to the housing stock between the 2015 survey and the 2017 survey.

The U.S. Census Bureau fields other surveys that have provided extensive information on residential construction. The Survey of Construction reported that 1,536,000 newly constructed units were completed in 2016 and 2017, while the Mobile Home Shipments survey counted 105,500 newly manufactured mobile homes that were sold and put in place for residential use in 2016 and 2017. Taken together, these surveys indicate that 1,641,500 new residential units were added to the housing stock in 2016 and 2017. Although the definitions of "added to the stock" are different between the AHS and these other U.S. Census Bureau surveys and the time periods do not overlap precisely with the AHS, the other surveys suggest that the technique used in CINCH overstates new construction at the expense of other additions. The overestimate of new construction is estimated to be approximately 25–30 percent.

In 2015, a new AHS sample was drawn. The U.S. Census Bureau selected cases thought to be residential from its master Address File. When interviewing for the 2015 AHS survey started, the U.S. Census Bureau learned that some of these units were not being used for residential purposes, but were potentially residential units; these units were considered temporary losses and assigned codes from 10–18 in exhibit 2-1. The U.S. Census Bureau followed these units from the 2015 survey to the 2017 survey and, as anticipated, found that a large number had become residential. In total, these temporary losses in 2015 resulted in 1,189.100 new units, of which 138,800 units were counted as new construction and 1,050,300 as recovered losses (see exhibit 2-2).

The AHS was able to assign definite ways in which units moved from temporary losses into the housing stock to 549,600 units of the 1,050,100 recovered losses that were not new construction (loss codes 12–16). For example, 106,500 units had been used in 2015 as permanent or temporary business or commercial storage. The remaining 500,700 were "not classified above" temporary losses in 2015.

CINCH improves understanding of the dynamics of the housing stock in two ways: Using the AHS, CINCH analysis produces the only estimate of total additions and calls attention to the various ways that units can be added to the stock. Unfortunately, its estimates of the addition categories are imprecise.

## Units in Both Housing Stocks

Most AHS sample cases in the 2015 housing stock were also in the 2017 housing stock. CINCH analysis uses the nongrammatical term "SAMES" for these units. An important subgroup of units in both housing stocks is sample cases that were interviewed in both 2015 and 2017; members of this group are labeled as "INTSAME."

CINCH considers this group for two reasons. First, while remaining in the stock, many of these units underwent important changes between 2015 and 2017. Second, the counting of these units is a key part of understanding how the 2015 housing stock evolved into the 2017 housing stock. Section 5 examines the extent to which these units underwent changes; the focus here is on the counting of units in both housing stocks.

CINCH consists of two separate analyses: a forward-looking analysis that looks at what happened to the 2015 housing stock by 2017, and a backward-looking analysis the looks at where the 2017 stock came from with reference to 2015. The key steps in the forward-looking CINCH are to (1) identify all units in the AHS sample that were in the 2015 housing stock; (2) classify those units as either losses or still in the stock in 2017; (3) attach weights to those units; and (4) adjust the weights so that the sum of losses and units in both years exactly equals the U.S. Census Bureau's estimate of the 2015 housing stock.[11]

A similar procedure is used for backward-looking CINCH: (1) identify all units in the AHS sample that were in the 2017 housing stock; (2) classify those units as either additions or units in both housing stocks; (3) attach weights to those units; and (4) adjust the weights so that the sum of additions and units in both housing stocks exactly equals the U.S. Census Bureau's estimate of the 2017 housing stock.

Units in both housing stocks appear in the fourth step of both the forward-looking analysis and the backward-looking analysis; there is no guarantee that the weighed count of these units in forward-looking Step 4 will exactly equal the weighted count of these same units in backward-looking Step 4. In fact, they have always differed in practice, despite the fact the same sample units are in both years.

Exhibit 2-3 provides the weighted counts of units in both housing stocks in 2015 and 2017.

**Exhibit 2-3. Weighted Counts of Units in Both Housing Stocks (Rounded to Nearest Hundred)**

| Survey | Count |
|---|---|
| 2017 | 133,747,200 |
| 2015 | 132,696,300 |
| **Difference** | **1,051,000** |

[11]CINCH includes all sample units in the housing stock, both those interviewed and those not interviewed (due to refusals, for example). The weight variable in the PUF (WEIGHT) cannot be used in step 4 because the AHS assigns a value of 0 to WEIGHT for units that are not interviewed. Instead, CINCH uses what the U.S. Census Bureau refers to as the "pure" weight, which is the inverse of the probability of selection. The pure weight is found on the Sample Case History file, PWT15 and PWT17, respectively.

The difference (1,051,000) recorded in exhibit 2-3 is the "error" in CINCH's attempt to track the evolution of the stock from 2015 to 2017.[12] Based on the U.S. Census Bureau's estimate of the 2015 housing stock (134,790,000 units), this adjustment to weights equals 0.8 percent. When measured against the total gross flows between 2015 and 2017 (all losses + all additions), this is an adjustment of 18.3 percent.

## Tracking the Housing Stock From 2015 to 2017

Exhibit 2-4 draws together all the information in the preceding subsections to show how the housing stock evolved.

**Exhibit 2-4. Flows Out of and Into the Housing Stock Between 2015 and 2017 (Rounded to the Nearest Hundred)**

| Housing Type | Major Flows | Component Flows |
|---|---|---|
| 2015 Housing Stock | 134,790,000 | |
| Losses | 2,093,700 | |
| Temporary Losses | | 1,084,400 |
| Permanent Losses | | 1,009,300 |
| 2015 Units to 2017 | 132,696,300 | |
| Change in Weights | 1,051,000 | |
| 2017 Units From 2015 | 133,747,200 | |
| Additions | 3,655,800 | |
| New Construction | | 2,102,700 |
| Other New Additions | | 1,050,300 |
| Recovery of Temporary Losses | | 502,800 |
| 2017 Housing Stock | 137,403,000 | |

The American housing stock grew by 2,613,000 units between 2015 and 2017. This was the result of a gross flow of 5,749,500 units—2,093,700 units flowed out of the stock, whereas 3,655,800 flowed into the stock. There was a 1,051,000 adjustment in the weighted count of the 80,843 sample cases that were in the housing stock in both years.

[12]"Error" is appropriate in the sense that the needed adjustment would be close to zero if the original sample selection and weighting had been perfect, non-response introduced no biases, and the sample added in 2017 accurately reflected all additions to the stock and was appropriately weighted. To put this error in perspective, the AHS weight variable also changes between surveys. If the 2015 and 2017 AHS weight variables were applied to these same 58,475 cases, the difference between the two estimates would be 7,040,000.

# Section 3: Changes to the Housing Stock Between 2001 and 2017

The CINCH study of the changes between 2011 and 2013 contained a comparison with previous CINCH analyses dating back to 2001. That report linked both the magnitude and the mechanism of change to fluctuations in the economy during that period.[13]

Appendix C discusses how the 2015 redesign of the AHS altered, in important ways, how CINCH analysis is carried out. Despite these differences, it is worth trying to put the changes between 2015 and 2017 into the context of earlier changes. Exhibit 3-1 puts the historical data from the earlier study into the format of exhibit 2-4. There was no CINCH analysis covering the 2013–2015 period: 2013 was the last year of the AHS sample that was drawn in 1985, and it was not possible to track those 2013 sample units into 2015.

The growth between 2015 and 2017 was typical for the 2001–2017 period; of the seven periods shown in exhibit 3-1, 2015–2017 demonstrated the third highest growth at 2,613,000 units. Growth varied greatly over the 16-year period, from a low of 413,000 to a high of 3,827,000. The latter occurred just before the financial crisis, which began in 2006, and the ensuing severe recession.[14] The impact of the financial crisis and the recession is shown in the slower growth of the 2007–2009 and 2009–2011 periods.

The 2011–2013 experience is not consistent with the preceding pattern; despite an improving economy, the housing stock grew by an anemic 413,000. The Gross Flows line in exhibit 3-1 reports the absolute value of all flows into and out of the housing stock during each of the seven periods, excluding the impact of the change in AHS weights between surveys. Gross flows were at their lowest (3,404,700) in the 2011–2013 period, suggesting that the housing market was weak during this period. New construction was at its lowest during the 2011–2013 period.

Gross flows displayed the same trend as net additions, rising from 6.3 million units in the 2001–2003 period to a high of 7.5 million units in the 2005–2007 period, then declining sharply to a low in the 2011–2013 period. Throughout the16-year period, gross flows were substantially larger than the change in the housing stock (net additions plus the change in weights). Both the increase in the housing stock and gross flows recovered in the 2015–2017 period.

Units added through new construction peaked at 3.6 million units in the 2003–2005 period and then declined steadily to fewer than 1.2 million units in the 2011–2013 period. New construction began to decline in the 2005–2007 period, as the financial crisis began before the recession.

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[13]Eggers, F. J. & Moumen, F. (April 2016). *Components of Inventory Change:2011–2013;* prepared for the U.S. Department of Housing & Urban Development by Econometrica, Inc. See in particular pages 10–13. Found at https://www.huduser.gov/portal/datasets/cinch.html.

[14]The National Bureau of Economic Research (NBER) breaks the 2001–2017 period into four economic cycles: a brief recession from a peak in March 2001 to a trough in November 2001, a vigorous economic expansion through a peak in December 2007; a severe recession ending in June 2009; and a recovery that was lackluster at first but gathered steam in 2017. As of May 15, 2020, the NBER has yet to designate the peak of the expansion that began in 2009 and has clearly ended amid the pandemic crisis.

**Exhibit 3-1. Flows Out of and Into the Housing Stock (Rounded to Nearest Hundred)**

| Period | 2001–2003 | 2003–2005 | 2005–2007 | 2007–2009 | 2009–2011 | 2011–2013 | 2015–2017 |
|---|---|---|---|---|---|---|---|
| Begin Year Housing Stock | 118,195,000 | 120,777,000 | 124,376,000 | 128,203,000 | 130,111,600 | 132,419,000 | 134,790,000 |
| Losses | 1,857,900 | 1,883,800 | 2,282,000 | 2,084,400 | 1,698,300 | 1,567,700 | 2,093,700 |
| Temporary Losses | 1,114,600 | 1,094,400 | 967,200 | 989,900 | 837,100 | 838,400 | 1,084,400 |
| Permanent Losses | 743,400 | 789,400 | 1,314,800 | 1,094,500 | 861,200 | 729,200 | 1,009,300 |
| Begin Year to End Year | 116,337,100 | 118,893,200 | 122,094,000 | 126,118,600 | 128,413,300 | 130,851,300 | 132,696,300 |
| Change in Weights* | -8,900 | 430,200 | 913,700 | 198,500 | 1,159,800 | 144,400 | 1,051,000 |
| End Year Units From Beginning Year | 116,328,200 | 119,323,400 | 123,007,700 | 126,317,100 | 129,573,100 | 130,995,700 | 133,747,200 |
| Additions | 4,449,000 | 5,053,000 | 5,195,000 | 3,795,000 | 2,846,000 | 1,837,000 | 3,655,800 |
| New Construction | 3,136,600 | 3,601,100 | 3,250,300 | 2,547,300 | 2,056,500 | 1,160,200 | 2,102,700 |
| Other New Additions | 1,021,400 | 1,056,400 | 1,515,900 | 818,500 | 380,600 | 291,300 | 1,050,300 |
| Recovery of Temporary Losses | 290,800 | 395,000 | 429,100 | 429,100 | 408,900 | 385,800 | 502,800 |
| End Year Housing Stock | 120,777,000 | 124,376,000 | 128,203,000 | 130,112,000 | 132,419,000 | 132,832,000 | 137,403,000 |
| Change | 2,582,000 | 3,599,000 | 3,827,000 | 1,909,000 | 2,307,400 | 413,000 | 2,613,000 |
| Gross Flows | 6,306,900 | 6,936,800 | 7,477,000 | 5,879,400 | 4,544,300 | 3,404,700 | 5,749,500 |
| Change in Weights/Gross Flows | -0.1% | 6.2% | 12.2% | 3.4% | 25.5% | 4.2% | 18.3% |

* Affected in 2001 by changes in the decennial counts used by the U.S. Census Bureau to adjust weights.

Because CINCH measures new construction differently beginning in 2015, the 2015–2017 estimate is not comparable to earlier estimates.

Losses slowed during the recession, suggesting that strong gross flows are a sign of a vigorous housing market, where new units replace old units. Losses also recovered in the 2015–2017 period.

The change in weights was highest in the 2011–2013 period (1,159,800); the 2015–2017 period had the second highest change in weights, both absolutely and as a percentage of gross flows. This "error" term varies greatly over the 16-year period. So far there is nothing to suggest that the changes in the AHS with the 1985 redesign had a deleterious effect on this adjustment.

# Section 4: Where Losses and Additions Were Large

The 2015 housing stock lost 1.6 percent of its units before 2017, whereas 2.7 percent of the 2017 housing stock were new additions since 2015. These are the average loss and addition rates for the overall stock. Loss and addition rates will vary across different components of the stock: For example, the loss rate for occupied housing units was 1.0 percent and the addition rate was 2.2 percent.

This section examines how loss and addition rates vary by different characteristics of the units or the households occupying them. Appendix A presents information on losses and additions for 135 overlapping segments of the housing market defined by factors such as structure type, year built, number of rooms, region, quality, tenure, and household and householder characteristics. Using these data, this section looks for segments of the housing stock where losses were most likely to occur, or which segments benefited most from additions.

This section compares the segment's experience to that of the overall housing stock for 93 of the 135 segments. For the remaining 42 segments, data on losses and additions are only available for occupied households, so comparisons are made to all occupied households. The comparison will attempt to identify segments with unusually high or low rates of losses or additions, or segments that are part of a group with high or low rates of losses or additions, such as small units.

Statistical tests were used to see if a segment's rate appeared to differ significantly from the comparison rate: For example, the loss rate among occupied units (1.0 percent) was nine standard deviations lower than the rate for all units (1.6 percent). The standard deviations were calculated using the formula for the difference between percentages. This is not the best test. Most of the segments are in related groups, such as housing units classified by number of bedrooms, so the percentages in the group are related—a chi-squared test would be more appropriate. Moreover, the tests are applied multiple times to the same group, further violating the requirements for the tests. Therefore, the t-statistics tests are considered merely indicative and not conclusive.

## Occupancy, Location, Structural Characteristics, and Size

Appendix A contains eight tables: four are forward-looking (that is, they look at losses from the 2015 stock), and four are backward-looking (looking at additions to the 2017 stock). Each group of four are lettered as A, B, C, and D. This section examines loss rates and addition rates by appendix table, starting with forward-looking and backward-looking Table A, which focuses on key unit characteristics, such as occupancy status, location, structural characteristics, and size. Appendix B lists loss and addition rates for all 135 overlapping segments, along with their t-statistics.

The first paragraph of this section noted that occupied units were less likely to leave the stock and also less likely to be new additions to the stock. Exhibit 4-1 looks at the three occupancy states: occupied, vacant, and seasonal. The U.S. Census Bureau classifies all second homes, including beach houses, ski chalets, and similar units, as a class of vacant units called Usual Residence Elsewhere (URE).

**Exhibit 4-1. Loss and Additional Rates by Occupancy Status**

| Segment | Loss Rate (%) | Addition Rate (%) |
|---|---|---|
| All housing units | 1.6 | 2.7 |
| Occupied units | 1.0* | 2.2* |
| Vacant units | 5.6* | 5.8* |
| Seasonal units | 6.9* | 7.2* |

* These percentages are statistically different from the all housing unit group at the 0.01 level.

The vacant and seasonal segments are more volatile than the occupied segment; loss rates are substantially higher in these two segments. Permanent losses account for 40–50 percent of the units lost in all three segments. The rate of additions is also substantially higher in the vacant and seasonal segments. The type of addition varies across the three segments: Two-thirds of additions are new construction among occupied units, compared to 34 percent among vacant units and 14 percent among seasonal units.

During the 2015–2017 period, locational differences did not have much of an impact on either loss or addition rates. The segments examined were central cities as a group, the remainder of the metropolitan areas, micropolitan areas, and the rest of the country; loss rates differed from the all housing unit rate by more than one percentage point only in areas outside the metropolitan and micropolitan areas (3.1 percent vs. 1.6 percent). The loss rates in Census regions and Divisions never varied by more than 0.7 percentage points (Division 6: AL, KY, MS, TN) from the national rate. In all the locational comparisons, permanent losses fell in the range of approximately 48–60 percent of the losses; the only exception to this was Division 8 (AZ, CO, ID, MT, NM, NV, UT, WY) where they accounted for 35.9 percent of the losses. There appeared to be no meaningful differences in addition rates by geography; they differ from the national rate by 1 percentage point in only two instances. The Division 7 (AR, LA, OK, TX) addition rate was 1.5 percentage points higher and the Division 1 (CT, ME, MA, NH, RI, VE) rate was 1.1 percentage points lower.[15]

Exhibit 4-2 reports the most interesting results by structure type. The traditional favorite structure type, the single-family detached home, has both a lower than average loss rates and a lower than average addition rate. The single-family detached home has a lower than average loss rate and an addition rate that is only slightly higher than average. Mobile homes and manufactured houses saw a high loss rate, but also a high addition rate. Multiunit structures had both higher loss and addition rates. The 2- to 4-unit structure type continues to lose popularity with a much higher than average loss rate and a much lower than average addition rate. Units in structures with 20 or more units have very high rates of addition; curiously, only 30 percent of the losses among these units were considered permanent.

[15]Because of the large sample sizes, some of the locational differences appeared to be significant, but none were considered meaningful.

**Exhibit 4-2. Loss and Additional Rates by Structure Type**

| Segment | Loss Rate (%) | Addition Rate (%) |
|---|---|---|
| All housing units | 1.6 | 2.7 |
| Single family, detached | 1.0* | 1.9* |
| Single family, attached | 1.3 | 2.9 |
| Mobile homes and manufactured housing (and some atypical units, such as boats and RVs) | 4.9* | 4.6* |
| All multiunit structures | 2.1* | 3.9* |
| Units in 2–4-unit structures | 2.8* | 2.1 |
| Units in structure with 20–49 units | 1.8 | 6.2* |
| Units in structure with 50 or more units | 2.5* | 7.9* |

* These percentages are statistically different from the all housing unit group at 0.01 level.

Losses and additions by the year units were built follow the expected pattern. The loss rates rise proportionally with how long ago the structure were built and 60 percent of all additions were concentrated among the group built in 2010 and later.

Both the forward-looking and backward-looking Table A in Appendix A segment the stock by two measures of unit size, the number of rooms and number of bedrooms. The loss rate and addition rate seem to vary with unit size; loss rates are high for small units and low for large units while addition rates are high for small units and low for large units. This is true whether size is measured by number of rooms or number of bedrooms. Exhibit 4-3 contains a selection of segments by both number of rooms and number of bedrooms.

**Exhibit 4-3. Loss and Additional Rates by Size of Unit**

| Segment | Loss Rate (%) | Addition Rate (%) |
|---|---|---|
| All housing units | 1.6 | 2.7 |
| Units with 1 room | 13.9* | 10.7* |
| Units with 2 rooms | 7.1* | 6.6* |
| Units with 3 rooms | 2.9* | 5.3* |
| Units with 6 or more rooms | 0.8* | 2.2* |
| Units with no or one bedroom | 3.5* | 5.0* |
| Units with 4 or more bedrooms | 0.7* | 2.9 |

* These percentages are statistically different from the all housing unit group at 0.01 level.

## Unit Quality

The AHS collects extensive data that can be used to assess the quality of a housing unit. Forward-looking and backward-looking Table B in Appendix B use this information to examine how unit quality relates to losses and additions. Exhibit 4-4 relates loss and addition rates to two summary measures of unit condition found in both Table Bs in Appendix A.

The first three rows in exhibit 4-4 are based on a variable called ADEQUACY that the U.S. Census Bureau created to classify AHS sample units based on information collected in the AHS. In 2015, 92 percent of all units were classified as adequate, 6 percent as moderately inadequate, and 2 percentage as severely inadequate; the percentages were almost identical in 2017. As expected, the poorer quality units had higher loss rates; the rate for severely inadequate units was approximately seven times the rate for all units. What was not expected was the relation between quality, as measured by the ADEQUACY variable, and the addition rate. The percentage of new units among units judged severely inadequate in 2017 was higher than the percentage among moderately inadequate unit, which, in turn, was higher than the percentage of new units among adequate units.

**Exhibit 4-4. Loss and Addition Rates by Unit Condition**

| Segment | Loss Rate (%) | Addition Rate (%) |
|---|---|---|
| All Housing Units | 1.6 | 2.7 |
| Adequate | 1.1* | 2.5 |
| Moderately Inadequate | 4.7* | 3.9* |
| Severely Inadequate | 11.9* | 6.4* |
| No problems | 1.2 | 3.0 |
| One problem | 1.1 | 2.0 |
| Two problems | 2.1 | 1.0* |
| Three problems | 3.7* | 2.3* |
| Four or more problems | 7.4* | 4.0* |

* These percentages are statistically different from the all housing unit group at 0.01 level.

Table B identifies 20 groups of units. Members of each group were classified by whether the unit suffered one of 20 problems; the unit was cold for 24 hours at least once last winter or the unit has holes in the roof are two such problems. To simplify the analysis, this report counted the number of times a unit experienced one of the 20 deficiencies. If a unit did not experience any of the 20 problems, then that unit belonged to the no problems group; if a unit experienced 3 of the 20 problems, then it belonged to the three problems group. The last five rows of exhibit 4-4 contain the loss rate and addition rates for all five groups created by counting deficiencies.

Similar to the ADEQUACY factor, the loss rate went up as the number of problems did. Only three of the comparisons between addition rates by number of problems and the addition rate of all units were significant. For these three, addition rates increased with the number of problems. ADEQUACY indicates whether a unit has serious deficiencies, while the counts of problems is simply that. Because of this, 124,208,500 units were considered adequate in 2015, whereas only 85,993,700 had no problems.

Units with a well and units with septic systems had loss and addition rates very similar to units with public water or public sewers respectively. Units with nontraditional water sources or with nontraditional wastewater disposal methods had much higher loss rates, but much higher addition rates as well.

## Householder and Household Characteristics

A debatable premise, though a reasonable one, is that members of groups with higher loss rates are less secure in their dwellings. The data in the forward-looking Table C in Appendix A can be used to see how loss rates vary with important householder and household characteristics. Although the policy interest is primarily in housing insecurity, corresponding addition rates can be computed using data from backward-looking Table C. Addition rates show who benefits from new additions.

No immediate policy concerns arise from comparing loss rates across different demographic cohorts. An examination of the loss rates for all 18 groups in forward-looking Table C shows little variation across these groups. The highest loss rate is 2.0 percent for the male householder, living alone category, which compares to 1.0 percent for all householders. The next highest (1.3 percent) applies to three groups: households with householders over 75 or older; households with Black householders; and nonfamily, female householder not living alone. Although all three groups deserve attention, their rates differ only slightly from the loss rate of all households and none of the differences are significant at the 0.01 level.

Although the attrition rates of these groups vary slightly more, the differences are still minor. The largest deviation occurs for households occupied by an Asian householder, at 4.3 percent vs. 2.2 percent for all households. Difference in addition rates has no housing insecurity implications.

## Tenure, Housing Costs, and Household Income

Table D in both the forward-looking and backward-looking sections of Appendix A focus on tenure and, within tenure, on housing costs and household income. Exhibit 4-5 reveals clear differences in loss and addition rates by tenure. Owner-occupied units in 2015 had a significantly lower loss rate than renter-occupied units. Addition rates were significantly higher among renter-occupied units in 2017 than owner-occupied units. All the differences in exhibit 4-5 are significant but small in magnitude.

**Exhibit 4-5. Loss and Additional Rates by Householder and Household Characteristics**

| Segment | Loss Rate (%) | Addition Rate (%) |
|---|---|---|
| All occupied housing units | 1.0 | 2.2 |
| Owner-occupied | 0.6* | 1.9* |
| Renter occupied | 1.5* | 2.7* |

* These percentages are statistically different from the all housing unit group at 0.01 level.

Loss rates for both renter-occupied and owner-occupied housing are highest for the least expensive housing. Addition rates are highest for the most expensive renter-occupied and owner-occupied housing. Because housing costs are closely related to household income, loss rates are highest and addition rates are lowest among the lowest income renters and owners. Exhibit 4-6 presents selected loss and addition rates for renter-occupied and owner-occupied properties by housing costs and household income.

## Exhibit 4-6. Selected Loss and Additional Rates by Housing Costs and Household Income

| Segment | Loss Rate (%) | Addition Rate (%) |
|---|---|---|
| All owner-occupied | 0.6 | 1.9 |
| Owner Monthly Housing Costs: Less than $500 | 1.5* | 1.2* |
| Owner Monthly Housing Costs: $2,000 or more | 0.4* | 4.1* |
| Owner Household Income: $0 to $29,999 | 1.3* | 1.2* |
| Owner Household Income: $100,000 or more | 0.3* | 3.2* |
| All renter-occupied | 1.5 | 2.7 |
| Renter Monthly Housing Costs: Less than $500 | 3.1* | 2.4 |
| Renter Monthly Housing Costs: $1500 or more | 1.3 | 4.6* |
| Renter Household Income: Less than $15,000 | 2.3* | 3.0 |
| Renter Household Income: $80,000 or more | 1.1 | 4.0* |

* These percentages are statistically different from the all housing unit group at 0.01 level.

# Section 5: Changes in Characteristics for Units in Both 2015 and 2017 Housing Stocks

CINCH analysis measures losses and additions and spotlights the different ways in which units can leave and enter the housing stock. CINCH analysis also shows that units in the stock in both years can change characteristics between 2015 and 2017. This section uses the data from the eight tables in Appendix A to call attention to the most interesting changes. The percentages of units that changed characteristics are found in Appendix B.

The reader should be aware of four features of this component of CINCH analysis.

- Information on unit or household characteristics in both years is available only for those units interviewed in both years. Although there were 80,843 sample units in the housing stock in both years the number interviewed in both years was 58,475.
- Group membership is defined by year. For example, the group of renter-occupied units in 2015 is not the same as the group of renter-occupied units in 2017. The forward-looking analysis takes the group of renter-occupied units in 2015 and determines how many of these units are not renter-occupied in 2017, whereas the backward-looking analysis takes the group of renter-occupied units in 2017 and determines how many of these units were not renter-occupied in 2015.
- Not having the same characteristic may mean many things. For example, not being renter-occupied can mean being owner-occupied, but can also mean being vacant or seasonal.
- The information on characteristics comes from interviews and respondents make mistakes. The data in forward-looking Table A say that 60.0 percent of the units with nine rooms had a different characteristic in 2017. The most likely explanation for this "change" in 5.5 million units is that respondents counted rooms differently in 2015 than they did in 2017.
- If alternative categories are different sizes—for example, renters vs. owners—then any shift across categories will appear larger for the smaller category. In the example, a shift of units from owners to renters will appear bigger for the renter category. (As previously noted, all shifts out of the owner category will not necessarily go to the renter category.)

For completeness, the tables in this section and in Appendix B report both the percentage of 2015 units that have different characteristics in 2017 and the percentage of 2017 units that had different characteristics in 2015. The two percentages are very highly correlated, however.[16]

## Occupancy, Location, Structural Characteristics, and Size

CINCH analysis recognizes that respondent error is always a possibility; therefore, it does not allow certain characteristics to change between surveys. The following features are presumed not to change from survey to survey: structure type, year built, stories in multiunit buildings, and

[16]A regression of the percentages from the backward-looking analysis on the percentages from the forward-looking analysis yielded the follow result: BL% = 0.025 + 0.94FL% and had an r-squared of 0.96.

location (metropolitan status and Census Division). The only characteristics in Table A that are allowed to change are occupancy status, number of rooms, and number of bedrooms.

Exhibit 5-1 shows the results for occupancy status. Occupied units tend to stay occupied. Since vacancy is an undesirable state for housing units, approximately 60 percent of vacant unit change status between surveys. The seasonal status is unstable, as half of seasonal units in one survey are not seasonal in the next.

**Exhibit 5-1. Changes in Characteristics Between 2015–2017: Occupancy Status**

| Market Segment | 2015 Units with Different Characteristics in 2017 (%) | 2017 Units with Different Characteristics in 2015 (%) |
|---|---|---|
| Occupied | 7.4 | 7.5 |
| Vacant | 61.4 | 61.4 |
| Seasonal | 51.7 | 52.1 |

Because getting an accurate count of rooms is difficult, this section ignores the changes in room counts between surveys, attributing the high percentages to respondent error.

Exhibit 5-2 presents the results for number of bedrooms. Deciding how to characterize a studio apartment as having one or no bedrooms is confusing, so the high percentages for the no bedroom group is likely attributed to respondent confusion. The "15 percent" estimates for other bedroom groups is likely the result of respondent confusion and actual changes in unit configuration. From the AHS perspective, a room may be classified as a den or a bedroom depending on how it is used.

**Exhibit 5-2. Changes in Characteristics Between 2015–2017: Number of Bedrooms**

| Market Segment | 2015 Units with Different Characteristics in 2017 (%) | 2017 Units with Different Characteristics in 2015 (%) |
|---|---|---|
| Bedrooms: None | 49.5 | 48.4 |
| Bedrooms: 1 | 15.6 | 15.6 |
| Bedrooms: 2 | 15.9 | 15.6 |
| Bedrooms: 3 | 14.5 | 14.2 |
| Bedrooms: 4 or more | 15.0 | 15.8 |

## Unit Quality

In Section 4.2 (Unit Quality), two metrics were used to assess the quality of a unit: the AHS ADEQUACY variable and a counting variable created in this report to simplify the analysis of a large number of AHS variables on various deficiencies. The first three rows of exhibit 5-3 relate to ADEQUACY. Between 2015 and 2017, approximately 5 percent of adequate units slipped into inadequacy. Exhibit 4-4 reported that approximately 5 percent of moderately inadequate units in 2015 left the stock; exhibit 5-3 shows that approximately 75 percent of the remaining moderately inadequate units became either adequate or severely inadequate in 2017. Similarly, while approximately 12 percent of severely inadequate units in 2015 left the stock, approximately 75 percent of the remaining severely inadequate units became either adequate or moderately

inadequate in 2017. For the most part, units inadequate by the HUD standard in one period either improve or get worse in the next period.

**Exhibit 5-3. Changes in Characteristics Between 2015–2017: Unit Condition**

| Market Segment | 2015 Units with Different Characteristics in 2017 (%) | 2017 Units with Different Characteristics in 2015 (%) |
|---|---|---|
| Adequate | 4.9 | 5.6 |
| Moderately inadequate | 77.1 | 73.0 |
| Severely inadequate | 74.2 | 76.5 |
| No problems | 26.9 | 28.3 |
| One problem | 74.9 | 74.7 |
| Two problems | 86.8 | 86.4 |
| Three problems | 89.7 | 87.8 |
| Four or more problems | 74.9 | 72.7 |

Using the number of problems measured, the story is similar. Only approximately one-quarter of units with no problems change to a different group in the other year. Among units with problems, three-quarters or more show a different count of problems in the other year. For both measures of quality, the 2015–2017 experience shows that problems get fixed and are not longstanding for units that remain in the stock. Previous CINCH studies have found the same.

## Householder and Household Characteristics

Groups defined by the demographic characteristics of the occupant household seem be to relatively stable between surveys. None of the changes observed in exhibit 5-4 seem unusually high, given that households move and household composition changes over time.

**Exhibit 5-4. Changes in Characteristics Between 2015–2017: Selected Groups by Householder and Household Characteristics**

| Market Segment | 2015 Units with Different Characteristics in 2017 (%) | 2017 Units with Different Characteristics in 2015 (%) |
|---|---|---|
| Under 65 | 6.6 | 3.9 |
| 65 to 74 | 29.9 | 33.6 |
| 75 or older | 23.3 | 26.6 |
| White alone | 11.0 | 10.3 |
| Black alone | 24.3 | 24.1 |
| Hispanics | 19.3 | 23.2 |
| Children: Some | 26.7 | 27.8 |
| Children: None | 8.8 | 8.6 |
| Married couple | 16.7 | 17.1 |
| Other family: Female householder, no husband | 39.6 | 39.7 |

## Tenure, Housing Costs, and Household Income

One expects household tenure to change over time, but changes in unit tenure would appear at first glance to be less common. A study of the 1985–2013 using AHS data, however, found that 50.2 million of the 155.6 million units that were in the housing stock at some point during that period were sometimes in the owner market and sometimes in the rental market.[17] Exhibit 5-5 presents the results for tenure of the unit.

**Exhibit 5-5. Changes in Characteristics Between 2015–2017: Tenure of Unit**

| Market Segment | 2015 Units with Different Characteristics in 2017 (%) | 2017 Units with Different Characteristics in 2015 (%) |
|---|---|---|
| Owner-occupied | 8.4 | 9.7 |
| Renter-occupied | 20.6 | 18.7 |

The rates of change for the market segments defined by tenure and housing costs or tenure and household income range from 33.7 percent (rental housing costing $1,500 or more per month) to 74.6 percent (rental household income: $50,000 to $79,999).

[17]Weicher, J., Eggers, F. J., & Moumen, F. (September 2018). *The Long-Term Dynamics of Affordable Rental Housing*. Washington DC: The Hudson Institute.

# Appendix A: CINCH Tables

## How to Read CINCH Tables

Rows and columns serve different purposes in CINCH tables. The rows identify classes of units to be analyzed. The columns trace those units either forward or backward.

The forward-looking tables track what happened to the 2015 housing stock by 2017. There are three basic dispositions of 2015 units:

- Units that continue to exist in 2017 with the same characteristics (or serving the same market).
- Units that continue to exist in 2017 but with different characteristics (or serving a different market).
- Units that were lost to the stock.

The backward-looking tables track where the 2017 housing stock came from in reference to 2015. There are three basic sources of 2017 units:

- Units that existed in 2015 with the same characteristics (or serving the same market).
- Units that existed in 2015 but with different characteristics (or serving a different market).
- Units that are additions to the housing stock.

Since the essence of the CINCH analysis is in the columns, we will explain the columns in detail.

## Columns Common to Both Forward-Looking and Backward-Looking Tables

The first columns contain row numbers, which are identical for the same tables in the forward-looking and backward-looking sets. Columns A and D set up the analysis and track units that exist in both periods.

- Column A specifies the characteristic that defines the subset of the stock that is being tracked forward or backward in a particular row. For example, row 2 of Table A focuses on occupied units; row 17 focuses on units built in 1970 through 1979.
- Column B gives the CINCH estimate of the number of units that satisfy two conditions: (1) being part of the housing stock in the relevant year (2015 for the forward-looking tables and 2017 for the backward-looking tables) and (2) satisfying the condition in column A. CINCH uses different weights from those used in the estimates on Table Creator.
- Column C is the CINCH estimate of the number of units from column B that (1) are also part of the housing stock in the *other* year and (2) continue to belong to the subset defined by column A. For example, column C of row 2 of forward-looking Table A estimates that 108,451,600 of the occupied units in 2015 were also occupied in 2017.
- Column D is the CINCH estimate of the number of units from column B that (1) are also part of the housing stock in the *other* year but (2) no longer belong to the subset defined by column A. Column D of row 2 indicates that 8,710,900 units that were occupied in 2015

are still part of the housing stock in 2017 but are no longer occupied. In some cases, the analysis will not allow a unit to change characteristics between the base year and the other year. Examples include type of structure, year built, and number of stories; these characteristics are considered impossible or unlikely to change; for these categories, the tables contain "NA" in column D.

## Columns Unique to Forward-Looking Tables

In forward-looking tables, columns E and F track what happened to units that were lost from 2015 to 2017.

- Column E is the CINCH estimate of the number of units from column B that are not in the 2017 housing stock because they were lost to the stock for reasons that potentially could allow the units to return to the stock in later years. Of occupied units in 2015, 585,300 were temporarily lost by 2017 (column E, row 2 of forward-looking Table A).
- Column F is the CINCH estimate of the number of units from column B that are not in the 2017 housing stock because they were lost for reasons that mean that the units can never return to the stock. Among occupied units, 541,400 units were permanent losses.

The columns form a closed system. Column B counts the number of units tracked; columns C through F account for all the possible outcomes. Therefore, column B minus the sum of columns C through F always equals zero, except for rounding.

## Columns Unique to Backward-Looking Tables

In backward-looking tables, columns E through G track where units came from that are part of the housing stock in 2017 but were not part of the 2015 housing stock.

- Column E is the CINCH estimate of the number of units from column B that were newly constructed. Units are classified as new construction if the unit was in the 2017 housing stock and (1) was added to the sample in 2017 and was built in 2010 or later or (2) had been a temporary loss in 2015 because construction had not been completed in 2015. Among occupied 2017 units, 1,812,200 units were newly constructed (backward-looking Table A, row 2, column E).
- Column F is the CINCH estimate of the number of units from column B that had been temporarily lost in 2015 but had been recovered by 2017. Among 2017 occupied units, 473,000 units fall into this column. Some examples of how a unit might be placed in column F are mobile homes that moved into vacant mobile home lots or units that had been used for business purposes in 2015.
- Column F is the CINCH estimate of the number of units from column B that were added to the AHS sample in 2017 and were built before 2010. The AHS contains no information on how these units came into the stock.

## Forward-Looking Table A: Housing Characteristics (Rounded to Hundreds of Housing Units)

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **Row** | **Characteristics** | **Present in 2015** | **Present in 2017 With Same Characteristics** | **Present in 2017 With Different Characteristics** | **Temporary Loss** | **Permanent Loss** |
| 1 | Housing Stock | 134,790,000 | 132,696,000 | 0 | 1,103,000 | 991,000 |
| **Occupancy Status** | | | | | | |
| 2 | Occupied | 118,289,200 | 108,451,600 | 8,710,900 | 585,300 | 541,400 |
| 3 | Occupancy Status: Vacant | 13,578,800 | 4,944,800 | 7,867,200 | 404,800 | 362,000 |
| 4 | Occupancy Status: Seasonal | 2,922,000 | 1,313,300 | 1,408,200 | 112,900 | 87,500 |
| **Structure Type** | | | | | | |
| 5 | Single-family, detached | 82,893,400 | 82,050,700 | NA | 450,900 | 391,800 |
| 6 | Single-family, attached | 9,933,900 | 9,807,200 | NA | 61,900 | 64,800 |
| 7 | 2- to 4-unit building | 10,463,200 | 10,174,000 | NA | 131,300 | 157,900 |
| 8 | 5- to 9-unit building | 6,139,900 | 6,033,300 | NA | 43,700 | 63,000 |
| 9 | 10- to 19-unit building | 5,664,000 | 5,607,400 | NA | 37,200 | 19,400 |
| 10 | 20- to 49-unit building | 4,759,600 | 4,671,700 | NA | 55,900 | 32,100 |
| 11 | 50-or-more-unit building | 6,191,500 | 6,037,200 | NA | 116,200 | 38,100 |
| 12 | Mobile home/manufactured/other | 8,744,300 | 8,314,500 | NA | 206,000 | 223,800 |
| **Year Built** | | | | | | |
| 13 | 2010 or later | 4,470,700 | 4,422,400 | NA | 24,600 | 23,700 |
| 14 | 2000–2009 | 18,891,500 | 18,653,100 | NA | 133,500 | 104,800 |
| 15 | 1990–1999 | 17,578,700 | 17,360,600 | NA | 136,900 | 81,100 |
| 16 | 1980–1989 | 18,747,000 | 18,529,800 | NA | 115,300 | 101,800 |
| 17 | 1970–1979 | 20,023,400 | 19,709,800 | NA | 175,700 | 138,000 |
| 18 | 1960–1969 | 14,603,600 | 14,356,600 | NA | 131,100 | 115,900 |
| 19 | 1950–1959 | 14,407,900 | 14,228,200 | NA | 113,700 | 66,000 |
| 19 | 1950–1959 | 6,860,300 | 6,712,800 | NA | 69,200 | 78,400 |
| 21 | 1930–1939 | 4,372,500 | 4,262,900 | NA | 38,000 | 71,600 |
| 22 | 1930–1939 | 5,318,100 | 5,163,800 | NA | 74,900 | 79,400 |
| 23 | 1919 or earlier | 9,516,200 | 9,296,000 | NA | 90,100 | 130,200 |

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2015 | Present in 2017 With Same Characteristics | Present in 2017 With Different Characteristics | Temporary Loss | Permanent Loss |
| **Number of Rooms** | | | | | | |
| 24 | 1 room | 671,900 | 241,100 | 337,200 | 66,600 | 27,000 |
| 25 | 2 rooms | 1,531,200 | 590,700 | 832,400 | 63,000 | 45,100 |
| 26 | 3 rooms | 11,213,700 | 7,488,200 | 3,403,600 | 165,500 | 156,400 |
| 27 | 4 rooms | 24,206,500 | 14,489,700 | 9,125,900 | 295,300 | 295,700 |
| 28 | 5 rooms | 30,417,600 | 16,076,300 | 13,890,600 | 248,700 | 202,000 |
| 29 | 6 rooms | 28,528,800 | 13,896,400 | 14,325,200 | 161,800 | 145,500 |
| 30 | 7 rooms | 18,649,100 | 8,123,100 | 10,395,900 | 64,000 | 66,100 |
| 31 | 8 rooms | 11,733,800 | 5,013,500 | 6,672,400 | 28,900 | 19,100 |
| 32 | 9 rooms | 5,480,800 | 2,182,900 | 3,269,900 | 7,500 | 20,500 |
| 33 | 10 rooms or more | 2,356,500 | 997,400 | 1,343,700 | 1,800 | 13,600 |
| **Number of Bedrooms** | | | | | | |
| 34 | Bedrooms: None | 1,148,200 | 546,700 | 535,800 | 29,300 | 36,300 |
| 35 | Bedrooms: 1 | 15,688,600 | 12,801,800 | 2,358,400 | 314,000 | 214,400 |
| 36 | Bedrooms: 2 | 35,895,500 | 29,556,900 | 5,601,200 | 365,300 | 372,100 |
| 37 | Bedrooms: 3 | 53,552,000 | 45,325,900 | 7,667,800 | 308,400 | 249,800 |
| 38 | Bedrooms: 4 or more | 28,505,800 | 24,058,200 | 4,243,200 | 86,000 | 118,400 |
| **Structures** | | | | | | |
| 39 | **Multiunit Structures** | 33,218,400 | 32,523,600 | NA | 384,300 | 310,500 |
| 40 | Stories: 1 | 4,069,000 | 3,954,200 | NA | 54,500 | 60,300 |
| 41 | Stories: 2 | 13,445,400 | 13,185,700 | NA | 125,200 | 134,500 |
| 42 | Stories: 3 | 8,955,500 | 8,773,600 | NA | 108,100 | 73,900 |
| 43 | Stories: 4 to 6 | 4,082,600 | 4,007,600 | NA | 52,500 | 22,400 |
| 44 | Stories: 7 or more | 2,665,900 | 2,602,500 | NA | 43,900 | 19,500 |

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2015 | Present in 2017 With Same Characteristics | Present in 2017 With Different Characteristics | Temporary Loss | Permanent Loss |
| **Census Region & Division** | | | | | | |
| 45 | Region: Northeast | 23,783,100 | 23,356,000 | NA | 219,500 | 207,600 |
| 46 | Division 1: CT, ME, MA, NH, RI, VE | 6,377,200 | 6,253,900 | NA | 61,500 | 61,800 |
| 47 | Division 2: NJ, NY, PA | 17,405,900 | 17,102,100 | NA | 158,000 | 145,800 |
| 48 | Region: Midwest | 29,552,500 | 29,131,300 | NA | 220,000 | 201,200 |
| 49 | Division 3: IL, IN, MI, OH, WI | 20,326,600 | 20,037,500 | NA | 157,500 | 131,600 |
| 50 | Division 4: IA, KS, MN, MO, ND, SD | 9,225,900 | 9,093,800 | NA | 62,500 | 69,600 |
| 51 | Region: South | 51,890,500 | 50,966,200 | NA | 477,300 | 447,000 |
| 52 | Division 5: DE, FL, GE, MD, NC, SC, VA, WV | 27,611,200 | 27,216,500 | NA | 215,900 | 178,800 |
| 53 | Division 6: AL, KY, MS, TN | 8,335,900 | 8,150,800 | NA | 71,400 | 113,700 |
| 54 | Division 7: AR, LA, OK, TX | 15,943,500 | 15,599,000 | NA | 190,100 | 154,400 |
| 55 | Region: West | 29,563,900 | 29,242,500 | NA | 186,200 | 135,200 |
| 56 | Division 8: AZ, CO, ID, MT, NM, NV, UT, WY | 9,812,600 | 9,672,800 | NA | 89,600 | 50,200 |
| 57 | Division 9: AK, CA, HI, OR, WA | 19,751,300 | 19,569,700 | NA | 96,600 | 85,000 |
| **Metropolitan Status** | | | | | | |
| 58 | Central city | 45,624,000 | 44,978,000 | NA | 330,000 | 315,000 |
| 59 | Metropolitan area, non-central city | 67,149,000 | 66,270,000 | NA | 486,000 | 392,000 |
| 60 | Micropolitan area | 11,226,000 | 10,986,000 | NA | 123,000 | 118,000 |
| 61 | Non-Micropolitan area | 10,792,000 | 10,462,000 | NA | 164,000 | 166,000 |

## Forward-Looking Table B: Housing Condition (Rounded to Hundreds of Housing Units)

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **Row** | **Characteristics** | **Present in 2015** | **Present in 2017 With Same Characteristics** | **Present in 2017 With Different Characteristics** | **Temporary Loss** | **Permanent Loss** |
| 1 | Housing Stock | 134,790,000 | 132,696,000 | 0 | 1,103,000 | 991,000 |
| **AHS Adequacy Measure** | | | | | | |
| 2 | Adequate | 124,208,500 | 116,734,500 | 6,071,200 | 745,800 | 657,000 |
| 3 | Moderately Inadequate | 7,869,100 | 1,716,300 | 5,785,200 | 204,100 | 163,500 |
| 4 | Severely Inadequate | 2,712,400 | 617,300 | 1,771,500 | 153,200 | 170,500 |
| **Possible Unit Problems** | | | | | | |
| 5 | Unit cold for 24 hours at least once last winter | 9,775,100 | 1,698,400 | 7,934,800 | 73,800 | 68,100 |
| 6 | No working toilet at least once in last 3 months | 2,501,600 | 221,200 | 2,249,700 | 14,200 | 16,600 |
| 7 | Unit without running water at least once last 3 months | 3,894,800 | 366,400 | 3,495,100 | 16,500 | 16,700 |
| 8 | Unit has no hot and cold running water | 1,327,900 | 383,200 | 674,500 | 120,000 | 150,200 |
| 9 | Unit had sewer breakdown at least once last 3 months | 1,508,800 | 71,500 | 1,423,800 | 5,300 | 8,200 |
| 10 | Signs of rodents in last 12 months | 13,509,400 | 5,102,400 | 8,234,800 | 92,000 | 80,300 |
| 11 | Foundation has cracks or is crumbling | 7,258,800 | 1,109,400 | 5,933,700 | 121,400 | 94,300 |
| 12 | Holes in roof | 2,030,800 | 331,600 | 1,540,000 | 87,900 | 71,300 |
| 13 | Roofs sags or is uneven | 3,052,200 | 600,300 | 2,250,700 | 95,100 | 106,200 |
| 14 | Outside walls missing siding or bricks | 3,543,300 | 783,400 | 2,532,500 | 114,300 | 113,100 |
| 15 | Outside wall lean, slope, or buckle | 1,801,400 | 278,600 | 1,360,600 | 83,100 | 79,000 |
| 16 | Window(s) boarded up | 1,937,600 | 400,300 | 1,344,400 | 96,900 | 96,000 |
| 17 | Holes in floors | 2,687,700 | 353,600 | 2,136,700 | 100,700 | 96,700 |
| 18 | Water leak from outside in last 12 months | 11,860,700 | 3,088,500 | 8,669,000 | 46,100 | 57,200 |
| 19 | Water leak from inside in last 12 months | 10,120,700 | 1,522,600 | 8,507,000 | 44,600 | 46,600 |
| 20 | Mold present in last 12 months | 4,365,900 | 788,500 | 3,508,600 | 33,300 | 35,400 |
| 21 | Unit has no stove or range with oven | 2,877,200 | 800,300 | 1,620,300 | 232,600 | 224,100 |

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2015 | Present in 2017 With Same Characteristics | Present in 2017 With Different Characteristics | Temporary Loss | Permanent Loss |
| **Possible Unit Problems (continued)** | | | | | | |
| 22 | Unit has no working refrigerator | 3,689,800 | 934,600 | 2,296,400 | 217,400 | 241,400 |
| 23 | Unit has no kitchen sink | 1,622,900 | 333,300 | 1,029,000 | 139,300 | 121,400 |
| 24 | Unit does not have exclusive use of kitchen | 1,018,600 | 111,100 | 878,600 | 8,100 | 20,800 |
| **Count of Problems** | | | | | | |
| 25 | No problems | 85,993,700 | 62,148,800 | 22,819,600 | 544,500 | 480,800 |
| 26 | One problem | 27,982,400 | 6,936,700 | 20,747,400 | 171,500 | 126,800 |
| 27 | Two problems | 10,895,500 | 1,410,500 | 9,253,900 | 116,100 | 115,100 |
| 28 | Three problems | 5,153,600 | 512,200 | 4,453,000 | 111,800 | 76,600 |
| 29 | Four or more problems | 4,764,800 | 1,109,600 | 3,304,300 | 159,100 | 191,700 |
| **Water Source** | | | | | | |
| 30 | Public/private water | 117,914,700 | 115,145,300 | 1,031,800 | 947,800 | 789,800 |
| 31 | Well | 16,055,100 | 14,555,700 | 1,223,900 | 116,500 | 159,100 |
| 32 | Other water source | 820,200 | 256,900 | 482,500 | 38,700 | 42,100 |
| **Sewerage Treatment** | | | | | | |
| 33 | Public sewer | 105,552,900 | 104,173,500 | 0 | 780,500 | 598,800 |
| 34 | Septic tank/cesspool | 26,621,300 | 22,809,000 | 3,323,500 | 195,500 | 293,400 |
| 35 | Other, none, or no response | 2,615,800 | 342,100 | 2,047,900 | 127,000 | 98,700 |

## Forward-Looking Table C: Householder and Household Characteristics (Rounded to Hundreds of Housing Units)

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2015 | Present in 2017 With Same Characteristics | Present in 2017 With Different Characteristics | Temporary Loss | Permanent Loss |
| 1 | Occupied Units | 118,289,200 | 108,451,600 | 8,710,900 | 585,300 | 541,400 |
| **Age of Householder** | | | | | | |
| 2 | Under 65 | 90,608,200 | 83,821,000 | 5,924,700 | 439,900 | 422,700 |
| 3 | 65 to 74 | 15,950,300 | 11,104,100 | 4,731,200 | 52,300 | 62,800 |
| 4 | 75 or older | 11,730,700 | 8,882,400 | 2,699,200 | 93,200 | 55,900 |
| **Children in Household** | | | | | | |
| 5 | Children: Some | 35,483,500 | 25,809,200 | 9,399,900 | 138,100 | 136,200 |
| 6 | Children: None | 82,805,800 | 74,751,100 | 7,202,300 | 447,200 | 405,200 |
| **Race of Householder** | | | | | | |
| 7 | White alone | 93,869,800 | 82,747,600 | 10,260,900 | 449,300 | 412,000 |
| 8 | Black alone | 15,824,700 | 11,830,300 | 3,795,700 | 104,200 | 94,400 |
| 9 | American Indian, Eskimo, Aleut alone | 1,159,181 | 764,550 | 384,115 | 1,328 | 9,188 |
| 10 | Asian alone | 5,518,800 | 4,109,400 | 1,367,900 | 19,100 | 22,500 |
| 11 | Pacific Islander alone | 391,200 | 213,000 | 174,000 | 4,100 | 0 |
| 12 | Two or more races | 1,525,500 | 1,094,400 | 420,600 | 7,300 | 3,200 |
| **Ethnicity of Householder** | | | | | | |
| 13 | Hispanic | 15,790,900 | 12,588,700 | 3,008,400 | 102,800 | 91,100 |
| **Household Composition** | | | | | | |
| 14 | Married couple | 57,363,300 | 47,571,400 | 9,508,900 | 135,300 | 147,800 |
| 15 | Other family: Male householder, no wife | 5,697,400 | 2,827,100 | 2,808,900 | 28,100 | 33,300 |
| 16 | Other family: Female householder, no husband | 14,605,300 | 8,730,600 | 5,714,100 | 91,100 | 69,600 |
| 17 | Nonfamily: Male householder, living alone | 15,020,800 | 8,860,000 | 5,861,400 | 155,700 | 143,800 |
| 18 | Nonfamily: Male householder, not living alone | 4,546,200 | 1,693,700 | 2,811,800 | 20,200 | 20,500 |
| 19 | Nonfamily: Female householder, living alone | 17,707,500 | 11,687,800 | 5,782,600 | 133,200 | 103,900 |
| 20 | Nonfamily: Female householder, not living alone | 3,348,700 | 1,187,100 | 2,117,400 | 21,700 | 22,500 |

## Forward-Looking Table D: Tenure, Housing Cost, and Household Income (Rounded to Hundreds of Housing Units)

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2015 | Present in 2017 With Same Characteristics | Present in 2017 With Different Characteristics | Temporary Loss | Permanent Loss |
| 1 | Occupied Units | 118,289,200 | 108,451,600 | 8,710,900 | 585,300 | 541,400 |
| **Tenure of Unit** | | | | | | |
| 2 | Owner-occupied | 74,297,900 | 67,667,800 | 6,168,300 | 211,500 | 250,300 |
| 3 | Renter-occupied | 43,991,300 | 34,395,200 | 8,931,200 | 373,800 | 291,100 |
| **Renter Monthly Housing Costs** | | | | | | |
| 4 | No cash rent or HUD-assisted | 6,478,500 | 3,993,400 | 2,366,900 | 69,800 | 48,500 |
| 5 | Less than 500 | 3,609,200 | 1,130,100 | 2,366,100 | 62,900 | 50,000 |
| 6 | $500 to $799 | 9,197,000 | 4,461,000 | 4,563,200 | 95,200 | 77,600 |
| 7 | $800 to $999 | 7,094,100 | 2,777,900 | 4,248,100 | 35,800 | 32,400 |
| 8 | $1,000 to $1,499 | 10,038,800 | 5,278,000 | 4,664,200 | 39,700 | 56,800 |
| 9 | $1500 or more | 7,573,700 | 4,655,800 | 2,821,700 | 70,400 | 25,800 |
| **Renter Household Income** | | | | | | |
| 10 | Less than $15,000 | 10,521,400 | 4,044,100 | 6,236,500 | 137,200 | 103,700 |
| 11 | $15,000 to $29,999 | 9,592,900 | 2,543,600 | 6,885,400 | 100,000 | 63,900 |
| 12 | $30,000 to $49,999 | 9,450,900 | 2,456,100 | 6,876,900 | 62,800 | 55,100 |
| 13 | $50,000 to $79,999 | 7,749,800 | 2,011,800 | 5,667,500 | 31,900 | 38,600 |
| 14 | $80,000 or more | 6,676,300 | 2,565,700 | 4,038,800 | 41,900 | 29,800 |
| **Owner Housing Costs** | | | | | | |
| 15 | Less than $500 | 15,459,000 | 8,119,700 | 7,114,700 | 95,900 | 128,700 |
| 16 | $500 to $799 | 13,028,200 | 5,066,300 | 7,893,100 | 28,100 | 40,700 |
| 17 | $800 to $1,249 | 15,444,400 | 6,937,200 | 8,443,900 | 30,600 | 32,800 |
| 18 | $1,250 to $1,999 | 16,435,500 | 8,363,900 | 8,020,600 | 28,400 | 22,700 |
| 19 | $2,000 or more | 13,930,800 | 8,999,200 | 4,877,600 | 28,500 | 25,500 |

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2015 | Present in 2017 With Same Characteristics | Present in 2017 With Different Characteristics | Temporary Loss | Permanent Loss |
| **Owner Household Income** | | | | | | |
| 20 | Less than $29,999 | 15,270,400 | 6,939,300 | 8,133,300 | 97,900 | 99,900 |
| 21 | $30,000 to $59,999 | 17,960,000 | 7,214,100 | 10,616,200 | 52,200 | 77,500 |
| 22 | $60,000 to $99,999 | 18,270,100 | 7,185,900 | 11,017,600 | 24,500 | 42,100 |
| 23 | $100,000 or more | 22,797,400 | 15,079,200 | 7,650,400 | 37,000 | 30,800 |

## Backward-Looking Table A: Housing Characteristics (Rounded to Hundreds of Housing Units)

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2017 | Present in 2015 With Same Characteristics | Present in 2015 With Different Characteristics | Units Added by New Construction | Recovered Temporary Losses | Newly Sampled Units Added in Other Ways |
| 1 | Housing Stock | 137,403,000 | 133,747,000 | 0 | 2,103,000 | 1,050,000 | 503,000 |
| **Occupancy Status** | | | | | | | |
| 2 | Occupied | 121,560,000 | 109,982,600 | 8,874,000 | 1,812,200 | 473,000 | 418,100 |
| 3 | Occupancy Status: Vacant | 13,050,000 | 4,744,900 | 7,554,500 | 261,200 | 412,500 | 76,900 |
| 4 | Occupancy Status: Seasonal | 2,793,000 | 1,241,100 | 1,349,800 | 29,600 | 164,500 | 8,000 |
| **Structure Type** | | | | | | | |
| 5 | Single-family, detached | 84,641,700 | 83,018,000 | NA | 1,089,500 | 374,900 | 159,300 |
| 6 | Single-family, attached | 10,095,000 | 9,800,400 | NA | 190,300 | 63,500 | 40,800 |
| 7 | 2- to 4-unit building | 9,840,000 | 9,631,400 | NA | 67,300 | 117,400 | 23,900 |
| 8 | 5- to 9-unit building | 6,702,600 | 6,571,200 | NA | 59,100 | 49,200 | 23,100 |
| 9 | 10- to 19-unit building | 6,276,700 | 6,082,400 | NA | 110,300 | 44,500 | 39,600 |
| 10 | 20- to 49-unit building | 4,911,500 | 4,607,900 | NA | 203,400 | 59,300 | 40,900 |
| 11 | 50-or-more-unit building | 6,427,300 | 5,919,600 | NA | 320,600 | 127,000 | 60,100 |
| 12 | Mobile home/manufactured/other | 8,508,100 | 8,116,200 | NA | 62,500 | 214,200 | 115,200 |
| **Year Built** | | | | | | | |
| 13 | 2010 or later | 6,655,200 | 4,488,700 | NA | 2,056,300 | 110,200 | 0 |
| 14 | 2000–2009 | 19,706,300 | 19,382,000 | NA | 9,000 | 162,400 | 152,900 |
| 15 | 1990–1999 | 17,383,800 | 17,163,300 | NA | 7,100 | 128,500 | 85,000 |
| 16 | 1980–1989 | 19,026,100 | 18,837,700 | NA | 700 | 130,800 | 57,000 |
| 17 | 1970–1979 | 20,336,000 | 20,156,300 | NA | 3,800 | 129,600 | 46,300 |
| 18 | 1960–1969 | 14,211,600 | 14,073,400 | NA | 2,400 | 105,100 | 30,600 |
| 19 | 1950–1959 | 14,240,000 | 14,137,900 | NA | 3,000 | 71,200 | 27,800 |
| 20 | 1950–1959 | 6,627,400 | 6,574,100 | NA | 8,000 | 34,200 | 11,100 |
| 21 | 1930–1939 | 4,198,000 | 4,139,900 | NA | 5,100 | 39,000 | 14,000 |
| 22 | 1930–1939 | 5,413,900 | 5,332,700 | NA | 2,400 | 50,000 | 28,800 |
| 23 | 1919 or earlier | 9,604,600 | 9,460,900 | NA | 5,200 | 89,000 | 49,400 |

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2017 | Present in 2015 With Same Characteristics | Present in 2015 With Different Characteristics | Units Added by New Construction | Recovered Temporary Losses | Newly Sampled Units Added in Other Ways |
| **Number of Rooms** | | | | | | | |
| 24 | 1 room | 754,600 | 249,800 | 423,800 | 8,900 | 64,800 | 7,300 |
| 25 | 2 rooms | 1,465,700 | 587,600 | 790,400 | 21,900 | 61,600 | 4,200 |
| 26 | 3 rooms | 11,556,800 | 7,489,800 | 3,453,400 | 288,400 | 240,700 | 84,400 |
| 27 | 4 rooms | 24,097,200 | 14,459,700 | 8,905,000 | 351,700 | 231,900 | 148,900 |
| 28 | 5 rooms | 31,515,800 | 16,176,000 | 14,636,700 | 398,000 | 190,100 | 115,000 |
| 29 | 6 rooms | 28,690,000 | 14,102,200 | 14,080,400 | 285,800 | 140,000 | 81,600 |
| 30 | 7 rooms | 19,182,700 | 8,240,500 | 10,628,000 | 234,600 | 57,600 | 22,000 |
| 31 | 8 rooms | 12,022,800 | 5,096,900 | 6,592,200 | 268,000 | 40,700 | 25,000 |
| 32 | 9 rooms | 5,749,000 | 2,225,300 | 3,358,300 | 144,500 | 11,700 | 9,200 |
| 33 | 10 rooms or more | 2,368,400 | 1,016,200 | 1,234,800 | 101,000 | 10,900 | 5,500 |
| **Number of Bedrooms** | | | | | | | |
| 34 | Bedrooms: None | 1,156,100 | 548,600 | 515,600 | 26,200 | 54,200 | 11,500 |
| 35 | Bedrooms: 1 | 15,988,500 | 12,846,400 | 2,373,700 | 318,300 | 342,000 | 108,100 |
| 36 | Bedrooms: 2 | 35,978,600 | 29,590,000 | 5,468,600 | 477,200 | 279,700 | 163,100 |
| 37 | Bedrooms: 3 | 54,439,600 | 45,855,900 | 7,558,800 | 609,000 | 250,800 | 165,100 |
| 38 | Bedrooms: 4 or more | 29,840,300 | 24,402,600 | 4,586,800 | 672,300 | 123,400 | 55,200 |
| **Structures** | | | | | | | |
| 39 | **Multiunit Structures** | 34,158,100 | 32,812,400 | NA | 760,700 | 397,400 | 187,700 |
| 40 | Stories: 1 | 3,692,200 | 3,548,200 | NA | 45,600 | 90,600 | 7,700 |
| 41 | Stories: 2 | 14,048,400 | 13,782,600 | NA | 128,500 | 106,900 | 30,500 |
| 42 | Stories: 3 | 9,153,500 | 8,758,500 | NA | 228,600 | 88,900 | 77,400 |
| 43 | Stories: 4 to 6 | 4,416,800 | 4,065,900 | NA | 240,600 | 62,300 | 47,900 |
| 44 | Stories: 7 or more | 2,847,300 | 2,657,200 | NA | 117,400 | 48,600 | 24,100 |

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2017 | Present in 2015 With Same Characteristics | Present in 2015 With Different Characteristics | Units Added by New Construction | Recovered Temporary Losses | Newly Sampled Units Added in Other Ways |
| **Census Region & Division** | | | | | | | |
| 45 | Region: Northeast | 24,090,100 | 23,606,500 | NA | 214,100 | 185,100 | 84,400 |
| 46 | Division 1: CT, ME, MA, NH, RI, VE | 6,455,200 | 6,352,400 | NA | 42,200 | 39,400 | 21,200 |
| 47 | Division 2: NJ, NY, PA | 17,634,900 | 17,254,200 | NA | 171,900 | 145,700 | 63,200 |
| 48 | Region: Midwest | 29,997,900 | 29,308,600 | NA | 322,600 | 276,500 | 90,200 |
| 49 | Division 3: IL, IN, MI, OH, WI | 20,570,300 | 20,209,000 | NA | 157,200 | 159,800 | 44,300 |
| 50 | Division 4: IA, KS, MN, MO, ND, SD | 9,427,600 | 9,099,600 | NA | 165,400 | 116,700 | 45,900 |
| 51 | Region: South | 53,134,400 | 51,418,000 | NA | 1,049,900 | 409,600 | 256,800 |
| 52 | Division 5: DE, FL, GE, MD, NC, SC, VA, WV | 28,294,100 | 27,461,300 | NA | 485,800 | 248,100 | 98,900 |
| 53 | Division 6: AL, KY, MS, TN | 8,530,500 | 8,320,600 | NA | 137,300 | 27,300 | 45,200 |
| 54 | Division 7: AR, LA, OK, TX | 16,309,800 | 15,636,100 | NA | 426,800 | 134,200 | 112,700 |
| 55 | Region: West | 30,180,600 | 29,413,900 | NA | 516,400 | 178,700 | 71,600 |
| 56 | Division 8: AZ, CO, ID, MT, NM, NV, UT, WY | 10,113,200 | 9,776,200 | NA | 246,000 | 64,700 | 26,300 |
| 57 | Division 9: AK, CA, HI, OR, WA | 20,067,400 | 19,637,700 | NA | 270,400 | 114,000 | 45,300 |
| **Metropolitan Status** | | | | | | | |
| 58 | Central city | 46,343,000 | 45,234,000 | NA | 696,000 | 286,000 | 127,000 |
| 59 | Metropolitan area, non-central city | 68,744,000 | 66,905,000 | NA | 1,177,000 | 451,000 | 211,000 |
| 60 | Micropolitan area | 11,441,000 | 11,061,000 | NA | 151,000 | 131,000 | 97,000 |
| 61 | Non-Micropolitan area | 10,876,000 | 10,547,000 | NA | 79,000 | 182,000 | 68,000 |

## Backward-Looking Table B: Housing Conditions (Rounded to Hundreds of Housing Units)

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| **Row** | **Characteristics** | **Present in 2017** | **Present in 2015 With Same Characteristics** | **Present in 2015 With Different Characteristics** | **Units Added by New Construction** | **Recovered Temporary Losses** | **Newly Sampled Units Added in Other Ways** |
| 1 | Housing Stock | 137,403,000 | 133,747,000 | 0 | 2,103,000 | 1,050,000 | 503,000 |
| **AHS Adequacy Measure** | | | | | | | |
| 2 | Adequate | 127,971,500 | 117,780,900 | 6,971,100 | 2,036,400 | 739,400 | 443,800 |
| 3 | Moderately Inadequate | 6,644,500 | 1,726,300 | 4,660,000 | 51,700 | 158,200 | 48,200 |
| 4 | Severely Inadequate | 2,787,000 | 612,700 | 1,996,100 | 14,900 | 152,400 | 10,900 |
| **Possible Unit Problems** | | | | | | | |
| 5 | Unit cold for 24 hours at least once last winter | 6,989,000 | 1,729,500 | 5,162,600 | 50,200 | 29,600 | 17,200 |
| 6 | No working toilet at least once in last 3 months | 2,339,000 | 225,200 | 2,091,300 | 5,400 | 17,100 | 0 |
| 7 | Unit without running water at least once last 3 months | 3,637,600 | 369,400 | 3,215,200 | 26,400 | 11,500 | 15,300 |
| 8 | Unit has no hot and cold running water | 1,713,600 | 370,600 | 1,198,200 | 5,600 | 131,900 | 7,300 |
| 9 | Unit had sewer breakdown at least once last 3 months | 1,374,400 | 71,900 | 1,292,000 | 800 | 9,700 | 0 |
| 10 | Signs of rodents in last 12 months | 15,800,700 | 5,185,600 | 10,480,600 | 43,100 | 47,600 | 43,900 |
| 11 | Foundation has cracks or is crumbling | 5,807,900 | 1,107,200 | 4,577,800 | 33,500 | 81,500 | 7,900 |
| 12 | Holes in roof | 1,886,700 | 323,000 | 1,502,500 | 1,100 | 56,300 | 3,800 |
| 13 | Roofs sags or is uneven | 2,404,700 | 598,800 | 1,731,000 | 0 | 71,400 | 3,600 |
| 14 | Outside walls missing siding or bricks | 3,329,100 | 784,100 | 2,445,100 | 4,100 | 81,600 | 14,300 |
| 15 | Outside wall lean, slope, or buckle | 1,697,600 | 275,300 | 1,344,700 | 8,200 | 69,500 | 0 |
| 16 | Window(s) boarded up | 1,818,100 | 391,800 | 1,361,000 | 0 | 62,500 | 2,800 |
| 17 | Holes in floors | 2,357,100 | 352,100 | 1,882,400 | 18,800 | 84,600 | 19,200 |
| 18 | Water leak from outside in last 12 months | 12,573,700 | 3,132,500 | 9,296,600 | 65,400 | 42,100 | 37,100 |

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2017 | Present in 2015 With Same Characteristics | Present in 2015 With Different Characteristics | Units Added by New Construction | Recovered Temporary Losses | Newly Sampled Units Added in Other Ways |
| **Possible Unit Problems (continued)** | | | | | | | |
| 19 | Water leak from inside in last 12 months | 9,997,300 | 1,556,800 | 8,264,500 | 97,000 | 43,600 | 35,300 |
| 20 | Mold present in last 12 months | 3,885,100 | 806,900 | 3,039,000 | 6,200 | 14,600 | 18,400 |
| 21 | Unit has no stove or range with oven | 2,469,100 | 781,800 | 1,464,900 | 12,600 | 196,100 | 13,800 |
| 22 | Unit has no working refrigerator | 3,064,600 | 906,600 | 1,891,600 | 29,100 | 214,500 | 22,800 |
| 23 | Unit has no kitchen sink | 1,108,700 | 336,700 | 610,900 | 6,600 | 145,200 | 9,300 |
| 24 | Unit does not have exclusive use of kitchen | 768,000 | 109,200 | 620,600 | 22,000 | 6,200 | 9,900 |
| **Count of Problems** | | | | | | | |
| 25 | No problems | 89,822,000 | 62,496,000 | 24,623,400 | 1,753,700 | 618,700 | 330,300 |
| 26 | One problem | 28,369,000 | 7,025,200 | 20,763,800 | 295,700 | 160,400 | 123,900 |
| 27 | Two problems | 10,680,700 | 1,433,600 | 9,140,500 | 28,300 | 52,800 | 25,500 |
| 28 | Three problems | 4,332,000 | 514,800 | 3,719,300 | 20,100 | 70,800 | 7,000 |
| 29 | Four or more problems | 4,199,300 | 1,100,400 | 2,930,100 | 5,200 | 147,300 | 16,300 |
| **Water Source** | | | | | | | |
| 30 | Public/private water | 120,636,300 | 116,013,500 | 1,404,800 | 1,959,400 | 853,100 | 405,500 |
| 31 | Well | 16,228,200 | 14,762,500 | 1,077,000 | 140,400 | 150,800 | 97,500 |
| 32 | Other water source | 538,500 | 256,100 | 233,100 | 3,200 | 46,100 | 0 |
| **Sewerage Treatment** | | | | | | | |
| 33 | Public sewer | 112,064,800 | 104,858,300 | 4,293,100 | 1,811,200 | 772,700 | 329,500 |
| 34 | Septic tank/cesspool | 24,412,200 | 23,142,700 | 638,900 | 271,000 | 195,700 | 163,900 |
| 35 | Other, none, or no response | 926,000 | 338,100 | 475,800 | 20,800 | 81,700 | 9,600 |

## Backward-Looking Table C: Householder and Household Characteristics (Rounded to Hundreds of Housing Units)

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2017 | Present in 2015 With Same Characteristics | Present in 2015 With Different Characteristics | Units Added by New Construction | Recovered Temporary Losses | Newly Sampled Units Added in Other Ways |
| 1 | Occupied Units | 121,560,000 | 109,982,600 | 8,874,000 | 1,812,200 | 473,000 | 418,100 |
| **Age of Householder** | | | | | | | |
| 2 | Under 65 | 91,454,100 | 85,704,500 | 3,470,300 | 1,591,800 | 342,500 | 345,000 |
| 3 | 65 to 74 | 17,492,000 | 11,435,300 | 5,785,100 | 161,800 | 56,500 | 53,300 |
| 4 | 75 or older | 12,613,900 | 9,143,700 | 3,317,800 | 58,600 | 74,100 | 19,800 |
| **Children in Household** | | | | | | | |
| 5 | Children: Some | 36,935,600 | 26,017,900 | 10,028,700 | 662,400 | 114,000 | 112,600 |
| 6 | Children: None | 84,624,400 | 75,700,300 | 7,109,800 | 1,149,800 | 359,000 | 305,500 |
| **Race of Householder** | | | | | | | |
| 7 | White alone | 95,459,400 | 83,823,300 | 9,653,400 | 1,322,600 | 357,000 | 303,100 |
| 8 | Black alone | 16,329,000 | 12,099,200 | 3,839,100 | 245,400 | 77,800 | 67,500 |
| 9 | American Indian, Eskimo, Aleut alone | 1,512,000 | 854,600 | 624,400 | 16,400 | 2,100 | 14,600 |
| 10 | Asian alone | 5,944,200 | 4,054,700 | 1,636,100 | 198,700 | 30,800 | 23,900 |
| 11 | Pacific Islander alone | 440,500 | 215,200 | 214,600 | 5,700 | 0 | 5,000 |
| 12 | Two or more races | 1,874,900 | 971,600 | 870,600 | 23,300 | 5,300 | 4,000 |
| **Ethnicity of Householder** | | | | | | | |
| 13 | Hispanic | 16,625,900 | 12,513,400 | 3,777,700 | 218,500 | 46,500 | 69,800 |
| **Household Composition** | | | | | | | |
| 14 | Married couple | 59,457,200 | 48,195,400 | 9,934,400 | 1,013,600 | 147,600 | 166,200 |
| 15 | Other family: Male householder, no wife | 5,955,300 | 2,865,600 | 3,020,900 | 54,000 | 7,800 | 6,900 |
| 16 | Other family: Female householder, no husband | 14,893,300 | 8,833,900 | 5,815,000 | 127,300 | 69,000 | 48,200 |
| 17 | Nonfamily: Male householder, living alone | 14,981,200 | 8,999,000 | 5,552,300 | 250,900 | 105,600 | 73,500 |
| 18 | Nonfamily: Male householder, not living alone | 4,754,200 | 1,706,800 | 2,912,500 | 73,600 | 33,500 | 27,800 |

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2017 | Present in 2015 With Same Characteristics | Present in 2015 With Different Characteristics | Units Added by New Construction | Recovered Temporary Losses | Newly Sampled Units Added in Other Ways |
| 19 | Nonfamily: Female householder, living alone | 17,966,400 | 11,881,000 | 5,719,700 | 213,900 | 84,700 | 67,000 |
| 20 | Nonfamily: Female householder, not living alone | 3,552,300 | 1,199,700 | 2,220,400 | 78,800 | 24,900 | 28,600 |

**Backward-Looking Table D: Tenure, Housing Costs, and Household Income (Rounded to Hundreds of Housing Units)**

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2017 | Present in 2015 With Same Characteristics | Present in 2015 With Different Characteristics | Units Added by New Construction | Recovered Temporary Losses | Newly Sampled Units Added in Other Ways |
| 1 | Occupied Units | 121,560,000 | 109,982,600 | 8,874,000 | 1,812,200 | 473,000 | 418,100 |
| **Tenure of Unit** | | | | | | | |
| 2 | Owner-occupied | 77,567,000 | 68,723,300 | 7,342,800 | 1,132,000 | 187,300 | 181,600 |
| 3 | Renter-occupied | 43,993,000 | 34,770,800 | 8,019,700 | 680,200 | 285,700 | 236,600 |
| **Renter Monthly Housing Costs** | | | | | | | |
| 4 | No cash rent or HUD-assisted | 6,385,100 | 3,978,400 | 2,296,300 | 25,700 | 62,000 | 22,600 |
| 5 | Less than 500 | 3,143,500 | 1,153,900 | 1,912,600 | 24,600 | 28,400 | 24,000 |
| 6 | $500 to $799 | 8,067,300 | 4,520,800 | 3,390,800 | 47,300 | 52,500 | 56,000 |
| 7 | $800 to $999 | 6,403,300 | 2,824,500 | 3,443,000 | 67,800 | 39,100 | 28,900 |
| 8 | $1,000 to $1,499 | 10,719,200 | 5,345,200 | 5,081,400 | 216,800 | 35,100 | 40,700 |
| 9 | $1500 or more | 9,274,600 | 4,694,400 | 4,149,200 | 298,000 | 68,700 | 64,300 |
| **Renter Household Income** | | | | | | | |
| 10 | Less than $15,000 | 9,449,500 | 4,074,400 | 5,088,400 | 133,000 | 116,900 | 36,800 |
| 11 | $15,000 to $29,999 | 8,832,100 | 2,582,200 | 6,099,400 | 59,600 | 45,600 | 45,200 |
| 12 | $30,000 to $49,999 | 9,413,900 | 2,492,200 | 6,684,700 | 116,700 | 51,800 | 68,500 |
| 13 | $50,000 to $79,999 | 8,200,200 | 2,033,700 | 5,962,300 | 135,900 | 27,200 | 41,100 |
| 14 | $80,000 or more | 8,097,400 | 2,591,200 | 5,181,800 | 235,100 | 44,400 | 45,000 |
| **Owner Housing Costs** | | | | | | | |
| 15 | Less than $500 | 14,862,600 | 8,298,700 | 6,379,400 | 69,000 | 50,700 | 64,800 |
| 16 | $500 to $799 | 13,461,900 | 5,142,400 | 8,163,100 | 108,300 | 22,400 | 25,600 |
| 17 | $800 to $1,249 | 16,334,800 | 7,040,800 | 9,131,500 | 89,200 | 47,200 | 26,100 |
| 18 | $1,250 to $1,999 | 17,249,000 | 8,476,400 | 8,411,300 | 283,500 | 37,000 | 40,800 |
| 19 | $2,000 or more | 15,658,600 | 9,125,200 | 5,897,400 | 581,900 | 30,000 | 24,200 |

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Row | Characteristics | Present in 2017 | Present in 2015 With Same Characteristics | Present in 2015 With Different Characteristics | Units Added by New Construction | Recovered Temporary Losses | Newly Sampled Units Added in Other Ways |
| **Owner Household Income** | | | | | | | |
| 20 | Less than $29,999 | 15,002,700 | 7,068,700 | 7,750,300 | 69,200 | 61,200 | 53,300 |
| 21 | $30,000 to $59,999 | 18,041,500 | 7,336,100 | 10,526,200 | 110,100 | 37,000 | 32,200 |
| 22 | $60,000 to $99,999 | 18,625,700 | 7,288,100 | 11,017,700 | 246,200 | 34,300 | 39,400 |
| 23 | $100,000 or more | 25,897,100 | 15,307,700 | 9,771,400 | 706,600 | 54,700 | 56,600 |

# Appendix B: Loss Rates, Addition Rates, t-statistics, and Change in Characteristics Rate

## Exhibit B-1. Loss Rates, Addition Rates, t-statistics, and Change in Characteristics Rate

| Row | Market Segment | Forward-Looking | | | Backward-Looking | | |
|---|---|---|---|---|---|---|---|
| | | Loss Rate (%) | t-statistic | 2015 Unit, Different in 2017 (%) | Addition Rate (%) | t-statistic | 2017 Unit, Different in 2015 (%) |
| **Table A: Housing Characteristics** | | | | | | | |
| 1 | Housing Stock | 1.6 | 0.000 | N/A | 2.7 | 0.000 | N/A |
| **Occupancy Status** | | | | | | | |
| 2 | Occupied | 1.0 | -9.062 | 7.4 | 2.2 | -4.749 | 7.5 |
| 3 | Occupancy Status: Vacant | 5.6 | 14.120 | 61.4 | 5.8 | 10.495 | 61.4 |
| 4 | Occupancy Status: Seasonal | 6.9 | 7.536 | 51.7 | 7.2 | 6.350 | 52.1 |
| **Structure Type** | | | | | | | |
| 5 | Single-family, detached | 1.0 | -7.239 | N/A | 1.9 | -7.520 | N/A |
| 6 | Single-family, attached | 1.3 | -1.701 | N/A | 2.9 | 1.064 | N/A |
| 7 | 2- to 4-unit building | 2.8 | 4.892 | N/A | 2.1 | -2.384 | N/A |
| 8 | 5- to 9-unit building | 1.7 | 0.761 | N/A | 2.0 | -2.817 | N/A |
| 9 | 10- to 19-unit building | 1.0 | -2.916 | N/A | 3.1 | 1.394 | N/A |
| 10 | 20- to 49-unit building | 1.8 | 1.058 | N/A | 6.2 | 7.239 | N/A |
| 11 | 50 or more unit building | 2.5 | 3.581 | N/A | 7.9 | 11.766 | N/A |
| 12 | Mobile home/manufactured/other | 4.9 | 8.781 | N/A | 4.6 | 5.151 | N/A |
| **Year Built** | | | | | | | |
| 13 | 2010 or later | 1.1 | -1.834 | N/A | 32.6 | 33.850 | N/A |
| 14 | 2000–2009 | 1.3 | -2.220 | N/A | 1.6 | -6.718 | N/A |
| 15 | 1990–1999 | 1.2 | -2.305 | N/A | 1.3 | -9.589 | N/A |
| 16 | 1980–1989 | 1.2 | -3.151 | N/A | 1.0 | -13.407 | N/A |
| 17 | 1970–1979 | 1.6 | 0.095 | N/A | 0.9 | -15.048 | N/A |
| 18 | 1960–1969 | 1.7 | 0.827 | N/A | 1.0 | -12.138 | N/A |

| Row | Market Segment | Forward-Looking | | | Backward-Looking | | |
|---|---|---|---|---|---|---|---|
| | | Loss Rate (%) | t-statistic | 2015 Unit, Different in 2017 (%) | Addition Rate (%) | t-statistic | 2017 Unit, Different in 2015 (%) |
| 19 | 1950–1959 | 1.2 | -2.060 | N/A | 0.7 | -15.498 | N/A |
| 19 | 1950–1959 | 2.2 | 2.225 | N/A | 0.8 | -10.560 | N/A |
| 21 | 1930–1939 | 2.5 | 2.581 | N/A | 1.4 | -4.384 | N/A |
| 22 | 1930–1939 | 2.9 | 3.807 | N/A | 1.5 | -4.435 | N/A |
| 23 | 1919 or earlier | 2.3 | 3.005 | N/A | 1.5 | -5.537 | N/A |
| **Number of Rooms** | | | | | | | |
| 24 | 1 room | 13.9 | 6.302 | 58.3 | 10.7 | 4.784 | 62.9 |
| 25 | 2 rooms | 7.1 | 5.768 | 58.5 | 6.0 | 3.646 | 57.4 |
| 26 | 3 rooms | 2.9 | 5.916 | 31.2 | 5.3 | 8.966 | 31.6 |
| 27 | 4 rooms | 2.4 | 5.663 | 38.6 | 3.0 | 2.136 | 38.1 |
| 28 | 5 rooms | 1.5 | -0.613 | 46.4 | 2.2 | -2.986 | 47.5 |
| 29 | 6 rooms | 1.1 | -4.458 | 50.8 | 1.8 | -6.526 | 50.0 |
| 30 | 7 rooms | 0.7 | -8.014 | 56.1 | 1.6 | -6.557 | 56.3 |
| 31 | 8 rooms | 0.4 | -11.084 | 57.1 | 2.8 | 0.483 | 56.4 |
| 32 | 9 rooms | 0.5 | -6.826 | 60.0 | 2.9 | 0.635 | 60.1 |
| 33 | 10 rooms or more | 0.7 | -3.828 | 57.4 | 5.0 | 3.569 | 54.9 |
| **Number of Bedrooms** | | | | | | | |
| 34 | Bedrooms: None | 5.7 | 4.243 | 49.5 | 7.9 | 4.680 | 48.4 |
| 35 | Bedrooms: 1 | 3.4 | 8.819 | 15.6 | 4.8 | 8.789 | 15.6 |
| 36 | Bedrooms: 2 | 2.1 | 4.054 | 15.9 | 2.6 | -0.733 | 15.6 |
| 37 | Bedrooms: 3 | 1.0 | -6.020 | 14.5 | 1.9 | -6.944 | 14.2 |
| 38 | Bedrooms: 4 or more | 0.7 | -9.230 | 15.0 | 2.9 | 1.194 | 15.8 |
| **Structures** | | | | | | | |
| 39 | Multiunit structures | 2.1 | 4.414 | N/A | 3.9 | 7.885 | N/A |
| 40 | Stories: 1 | 2.8 | 3.409 | N/A | 3.9 | 2.705 | N/A |
| 41 | Stories: 2 | 1.9 | 2.132 | N/A | 1.9 | -4.341 | N/A |

| Row | Market Segment | Forward-Looking | | | Backward-Looking | | |
|---|---|---|---|---|---|---|---|
| | | Loss Rate (%) | t-statistic | 2015 Unit, Different in 2017 (%) | Addition Rate (%) | t-statistic | 2017 Unit, Different in 2015 (%) |
| 42 | Stories: 3 | 2.0 | 2.190 | N/A | 4.3 | 5.349 | N/A |
| 43 | Stories: 4 to 6 | 1.8 | 0.960 | N/A | 7.9 | 9.406 | N/A |
| 44 | Stories: 7 or more | 2.4 | 2.086 | N/A | 6.7 | 6.420 | N/A |
| **Census Region & Division** | | | | | | | |
| 45 | Region: Northeast | 1.8 | 1.593 | N/A | 2.0 | -3.961 | N/A |
| 46 | Division 1: CT, ME, MA, NH, RI, VE | 1.9 | 1.482 | N/A | 1.6 | -4.499 | N/A |
| 47 | Division 2: NJ, NY, PA | 1.7 | 1.051 | N/A | 2.2 | -2.442 | N/A |
| 48 | Region: Midwest | 1.4 | -1.046 | N/A | 2.3 | -2.337 | N/A |
| 49 | Division 3: IL, IN, MI, OH, WI | 1.4 | -0.952 | N/A | 1.8 | -5.780 | N/A |
| 50 | Division 4: IA, KS, MN, MO, ND, SD | 1.4 | -0.522 | N/A | 3.5 | 2.315 | N/A |
| 51 | Region: South | 1.8 | 2.276 | N/A | 3.2 | 4.315 | N/A |
| 52 | Division 5: DE, FL, GE, MD, NC, SC, VA, WV | 1.4 | -1.066 | N/A | 2.9 | 1.745 | N/A |
| 53 | Division 6: AL, KY, MS, TN | 2.2 | 2.278 | N/A | 2.5 | -0.649 | N/A |
| 54 | Division 7: AR, LA, OK, TX | 2.2 | 3.574 | N/A | 4.1 | 6.413 | N/A |
| 55 | Region: West | 1.1 | -4.851 | N/A | 2.5 | -0.864 | N/A |
| 56 | Division 8: AZ, CO, ID, MT, NM, NV, UT, WY | 1.4 | -0.684 | N/A | 3.3 | 2.401 | N/A |
| 57 | Division 9: AK, CA, HI, OR, WA | 0.9 | -6.260 | N/A | 2.1 | -3.523 | N/A |
| **Metropolitan Status** | | | | | | | |
| 58 | Central city | 1.4 | N/A | N/A | 2.4 | N/A | N/A |
| 59 | Metropolitan area, non-central city | 1.3 | N/A | N/A | 2.7 | N/A | N/A |
| 60 | Micropolitan area | 2.1 | N/A | N/A | 3.3 | N/A | N/A |
| 61 | Non-Micropolitan area | 3.1 | N/A | N/A | 3.0 | N/A | N/A |
| **Table B: Housing Condition** | | | | | | | |
| 1 | Housing Stock | 1.6 | 0.000 | N/A | 2.7 | 0.000 | N/A |
| **AHS Adequacy Measure** | | | | | | | |
| 2 | Adequate | 1.1 | -6.246 | 4.9 | 2.5 | -1.555 | 5.6 |

| Row | Market Segment | Forward-Looking | | | Backward-Looking | | |
|---|---|---|---|---|---|---|---|
| | | Loss Rate (%) | t-statistic | 2015 Unit, Different in 2017 (%) | Addition Rate (%) | t-statistic | 2017 Unit, Different in 2015 (%) |
| 3 | Moderately Inadequate | 4.7 | 8.690 | 77.1 | 3.9 | 3.379 | 73.0 |
| 4 | Severely Inadequate | 11.9 | 11.039 | 74.2 | 6.4 | 5.257 | 76.5 |
| **Possible Unit Problems** | | | | | | | |
| 5 | Unit cold for 24 hours at least once last winter | 1.5 | -0.537 | 82.4 | 1.4 | -5.749 | 74.9 |
| 6 | No working toilet at least once in last 3 months | 1.2 | -0.977 | 91.1 | 1.0 | -5.523 | 90.3 |
| 7 | Unit without running water at least once last 3 months | 0.9 | -3.113 | 90.5 | 1.5 | -3.959 | 89.7 |
| 8 | Unit has no hot and cold running water | 20.3 | 11.003 | 63.8 | 8.5 | 5.609 | 76.4 |
| 9 | Unit had sewer breakdown at least once last 3 months | 0.9 | -1.816 | 95.2 | 0.8 | -5.331 | 94.7 |
| 10 | Signs of rodents in last 12 months | 1.3 | -1.714 | 61.7 | 0.9 | -13.433 | 66.9 |
| 11 | Foundation has cracks or is crumbling | 3.0 | 4.572 | 84.2 | 2.1 | -1.842 | 80.5 |
| 12 | Holes in roof | 7.8 | 6.851 | 82.3 | 3.2 | 0.930 | 82.3 |
| 13 | Roofs sags or is uneven | 6.6 | 7.109 | 78.9 | 3.1 | 0.811 | 74.3 |
| 14 | Outside walls missing siding or bricks | 6.4 | 7.504 | 76.4 | 3.0 | 0.714 | 75.7 |
| 15 | Outside wall lean, slope, or buckle | 9.0 | 7.064 | 83.0 | 4.6 | 2.397 | 83.0 |
| 16 | Window(s) boarded up | 10.0 | 8.152 | 77.1 | 3.6 | 1.396 | 77.6 |
| 17 | Holes in floors | 7.3 | 7.453 | 85.8 | 5.2 | 3.650 | 84.2 |
| 18 | Water leak from outside in last 12 months | 0.9 | -4.860 | 73.7 | 1.2 | -9.275 | 74.8 |
| 19 | Water leak from inside in last 12 months | 0.9 | -4.369 | 84.8 | 1.8 | -4.335 | 84.1 |
| 20 | Mold present in last 12 months | 1.6 | 0.070 | 81.6 | 1.0 | -6.626 | 79.0 |
| 21 | Unit has no stove or range with oven | 15.9 | 89.300 | 66.9 | 9.0 | 46.894 | 65.2 |
| 22 | Unit has no working refrigerator | 12.4 | 74.332 | 71.1 | 8.7 | 45.188 | 67.6 |
| 23 | Unit has no kitchen sink | 16.1 | 90.809 | 75.5 | 14.5 | 74.887 | 64.5 |
| 24 | Unit does not have exclusive use of kitchen | 2.8 | 1.777 | 88.8 | 5.0 | 2.109 | 85.0 |

| Row | Market Segment | Forward-Looking | | | Backward-Looking | | |
|---|---|---|---|---|---|---|---|
| | | Loss Rate (%) | t-statistic | 2015 Unit, Different in 2017 (%) | Addition Rate (%) | t-statistic | 2017 Unit, Different in 2015 (%) |
| **Count of Problems** | | | | | | | |
| 25 | No problems | 1.2 | -0.451 | 26.9 | 3.0 | 0.225 | 28.3 |
| 26 | One problem | 1.1 | -1.055 | 74.9 | 2.0 | -0.839 | 74.7 |
| 27 | Two problems | 2.1 | 1.246 | 86.8 | 1.0 | -5.016 | 86.4 |
| 28 | Three problems | 3.7 | 19.406 | 89.7 | 2.3 | -4.045 | 87.8 |
| 29 | Four or more problems | 7.4 | 29.857 | 74.9 | 4.0 | 8.602 | 72.7 |
| **Water Source** | | | | | | | |
| 30 | Public/private water | 1.5 | -1.102 | 0.9 | 2.7 | 0.071 | 1.2 |
| 31 | Well | 1.7 | 0.870 | 7.8 | 2.4 | -1.190 | 6.8 |
| 32 | Other water source | 9.9 | 4.740 | 65.3 | 9.2 | 3.119 | 47.6 |
| **Sewerage Treatment** | | | | | | | |
| 33 | Public sewer | 1.3 | -3.424 | 0.0 | 2.6 | -0.636 | 3.9 |
| 34 | Septic tank/cesspool | 1.8 | 1.899 | 12.7 | 2.6 | -0.413 | 2.7 |
| 35 | Other, none, or no response | 8.6 | 8.466 | 85.7 | 12.1 | 5.398 | 58.5 |
| **Table C: Householder & Household Characteristics** | | | | | | | |
| 1 | Occupied Units | 1.0 | 0.000 | N/A | 2.2 | 0.000 | N/A |
| **Age of Householder** | | | | | | | |
| 2 | Under 65 | 1.0 | -0.007 | 6.6 | 2.5 | 2.626 | 3.9 |
| 3 | 65 to 74 | 0.7 | -2.148 | 29.9 | 1.6 | -4.375 | 33.6 |
| 4 | 75 or older | 1.3 | 2.036 | 23.3 | 1.2 | -6.431 | 26.6 |
| **Children in Household** | | | | | | | |
| 5 | Children: Some | 0.8 | -2.196 | 26.7 | 2.4 | 1.342 | 27.8 |
| 6 | Children: None | 1.0 | 1.125 | 8.8 | 2.1 | -0.800 | 8.6 |
| **Race of Householder** | | | | | | | |
| 7 | White alone | 0.9 | -0.544 | 11.0 | 2.1 | -1.524 | 10.3 |
| 8 | Black alone | 1.3 | 2.262 | 24.3 | 2.4% | 0.913 | 24.1 |

| Row | Market Segment | Forward-Looking | | | Backward-Looking | | |
|---|---|---|---|---|---|---|---|
| | | Loss Rate (%) | t-statistic | 2015 Unit, Different in 2017 (%) | Addition Rate (%) | t-statistic | 2017 Unit, Different in 2015 (%) |
| 9 | American Indian, Eskimo, Aleut alone | 0.9 | -0.108 | 33.4 | 2.2 | -0.057 | 42.2 |
| 10 | Asian alone | 0.8 | -1.211 | 25.0 | 4.3 | 5.665 | 28.7 |
| 11 | Pacific Islander alone | 1.0 | 0.123 | 44.9 | 2.4 | 0.195 | 49.9 |
| 12 | Two or more races | 0.7 | -0.808 | 27.8 | 1.7 | -1.014 | 47.3 |
| **Ethnicity of Householder** | | | | | | | |
| 13 | Hispanic | 1.2 | 2.088 | 19.3 | 2.0 | -1.255 | 23.2 |
| **Household Composition** | | | | | | | |
| 14 | Married couple | 0.5 | -7.368 | 16.7 | 2.2 | 0.076 | 17.1 |
| 15 | Other family: Male householder, no wife | 1.1 | 0.587 | 49.8 | 1.2 | -4.838 | 51.3 |
| 16 | Other family: Female householder, no husband | 1.1 | 1.127 | 39.6 | 1.6 | -3.546 | 39.7 |
| 17 | Nonfamily: Male householder, living alone | 2.0 | 5.824 | 39.8 | 2.9 | 2.953 | 38.2 |
| 18 | Nonfamily: Male householder, not living alone | 0.9 | -0.261 | 62.4 | 2.8 | 1.626 | 63.1 |
| 19 | Nonfamily: Female householder, living alone | 1.3 | 2.912 | 33.1 | 2.0 | -1.121 | 32.5 |
| 20 | Nonfamily: Female householder, not living alone | 1.3 | 1.200 | 64.1 | 3.7 | 3.055 | 64.9 |
| **Table D: Tenure, Housing Costs, and Household Income** | | | | | | | |
| 1 | Occupied Units | 1.0 | 0.000 | N/A | 2.2 | 0.000 | N/A |
| **Tenure of Unit** | | | | | | | |
| 2 | Owner-occupied | 0.6 | -5.324 | 8.4 | 1.9 | -2.858 | 9.7 |
| 3 | Renter-occupied | 1.5 | 5.953 | 20.6 | 2.7 | 3.926 | 18.7 |
| **Renter Monthly Housing Costs** | | | | | | | |
| 4 | No cash rent or HUD-assisted | 1.8 | 1.561 | 37.2 | 1.7 | -4.647 | 36.6 |
| 5 | Less than 500 | 3.1 | 3.251 | 67.7 | 2.4 | -0.607 | 62.4 |
| 6 | $500 to $799 | 1.9 | 1.488 | 50.6 | 1.9 | -2.847 | 42.9 |
| 7 | $800 to $999 | 1.0 | -2.753 | 60.5 | 2.1 | -1.993 | 54.9 |
| 8 | $1,000 to $1,499 | 1.0 | -3.296 | 46.9 | 2.7 | -0.014 | 48.7 |

| Row | Market Segment | Forward-Looking | | | Backward-Looking | | |
|---|---|---|---|---|---|---|---|
| | | Loss Rate (%) | t-statistic | 2015 Unit, Different in 2017 (%) | Addition Rate (%) | t-statistic | 2017 Unit, Different in 2015 (%) |
| 9 | $1500 or more | 1.3 | -1.212 | 37.7 | 4.6 | 5.851 | 46.9 |
| **Renter Household Income** | | | | | | | |
| 10 | Less than $15,000 | 2.3 | 3.717 | 60.7 | 3.0 | 1.155 | 55.5 |
| 11 | $15,000 to $29,999 | 1.7 | 0.939 | 73.0 | 1.7 | -4.450 | 70.3 |
| 12 | $30,000 to $49,999 | 1.2 | -1.369 | 73.7 | 2.5 | -0.800 | 72.8 |
| 13 | $50,000 to $79,999 | 0.9 | -3.278 | 73.8 | 2.5 | -0.860 | 74.6 |
| 14 | $80,000 or more | 1.1 | -2.196 | 61.2 | 4.0 | 3.788 | 66.7 |
| **Owner Housing Costs** | | | | | | | |
| 15 | Less than $500 | 1.5 | 4.948 | 46.7 | 1.2 | -3.994 | 43.5 |
| 16 | $500 to $799 | 0.5 | -0.842 | 60.9 | 1.2 | -4.615 | 61.4 |
| 17 | $800 to $1,249 | 0.4 | -2.253 | 54.9 | 1.0 | -6.405 | 56.5 |
| 18 | $1,250 to $1,999 | 0.3 | -3.842 | 49.0 | 2.1 | 0.855 | 49.8 |
| 19 | $2,000 or more | 0.4 | -2.663 | 35.1 | 4.1 | 8.862 | 39.3 |
| **Owner Household Income** | | | | | | | |
| 20 | Less than $29,999 | 1.3 | 4.431 | 54.0 | 1.2 | -4.334 | 52.3 |
| 21 | $30,000 to $59,999 | 0.7 | 0.907 | 59.5 | 1.0 | -6.601 | 58.9 |
| 22 | $60,000 to $99,999 | 0.4 | -3.057 | 60.5 | 1.7 | -1.275 | 60.2 |
| 23 | $100,000 or more | 0.3 | -4.592 | 33.7 | 3.2 | 6.718 | 39.0 |

# Appendix C: Key Changes to CINCH Due to 2015 AHS Redesign

HUD and the U.S. Census Bureau redesigned the AHS prior to the 2015 survey and drew a new sample for that and later surveys. Five changes in the AHS affect post-2015 CINCH studies.

1. ***Using the Master Address List as the source from which sample units are selected.*** The 2015 sample was drawn from the Master Address File (MAF) and the 2017 additions to the sample were drawn from new addresses added to the MAF. The MAF serves as a good source for the original AHS sample; it is not clear how useful new addresses are for tracking new additions to the stock, unfortunately. There are ways in which new addresses can be created for already existing housing units—for example, renaming streets. How important these exceptions to the new address equals new unit presumption has not yet been determined.

2. ***Eliminating the REUAD variable.*** This and previous CINCH studies rely on additions to the AHS sample to identify new units in the stock. Previous CINCH studies relied on REUAD (reason unit added) to explain how these units came into the stock. For example, if REUAD = 3, the unit was added through new construction—if REUAD = 7, the unit was created when the original living quarters was split into multiple units. The Census Bureau no longer provides the REUAD variable. The immediate consequence is the elimination of columns in the backward-looking tables such as "unit created through merger or conversion" and making the "new construction" column less precise. An indirect consequence caused forward-looking CINCH analysis to drop columns such as "unit lost due to use for business purposes" or "unit lost to merger or conversion," because there are no mirror image columns on the backward-looking side.

3. ***Tighter restrictions on information available on the public use files (PUF).*** The most detrimental effect was on the YRBUILT variable. Without REUAD, CINCH must rely on YRBUILT to identify new construction. For the 2017 PUF, YRBUILT uses 2010 to identify all units built in 2010 or later. Previous CINCH studies used the METRO3 variable to determine if a unit was in the central city, the suburbs, or in other locations. METRO3 has been replaced by a slightly different variable, METRO_2013, but METRO_2013 is not available on the PUF. Table A contains metropolitan status information only because HUD ran the internal use file for the authors.

   The accompanying Rental Dynamics study ran into an almost fatal hurdle due to the tighter restrictions. Previous Rental Dynamics studies used a special dataset called the Housing Affordability Data Set (HADS), created by HUD. Prior to 2015, the HADS files were maintained by HUD, while the AHS files were maintained by the U.S. Census Bureau, and researchers had access to both and could merge the two files. Beginning with the 2015 AHS survey, HADS was added to the AHS but fell subject to the tighter restrictions applied to the AHS. To produce the Rental Dynamics report, the authors had to create code that HUD could run at the U.S. Census Bureau.

4. ***Other variable changes.*** For example, Table C in earlier CINCH studies reported if the household received income from social security or pensions using one variable, OSS. Without OSS, researchers have to compile individual responses (SSP and RETP) across members to create household-level information. Some changes made CINCH more useful. For example, Table C in this report uses HSDLDTYPE to look at occupant households by composition, such as married couples. This variable is new to the AHS.

5. ***GUTREHB.*** GUTREHB is new to the AHS as of 2015 and has the potential to substantially alter results of CINCH analysis. "Gut rehabilitation" is defined as the general replacement of the interior of a building, including the HVAC, plumbing, and electrical components. GUTREHB is asked only of owner-occupied units:

   "Has this housing unit undergone a gut rehabilitation in the last 10 years?"
   GUTREHB =1 IF YES; = 2 IF NO.

   If a unit is not new to the sample, but IN15_GUTREHB = 2 AND IN17_GUTREHB = 1, one can presume that something major happened to this unit between 2015 and 2017. There are a remarkable large number of these cases (2,322) where IN15_GUTREHB = 2 AND IN17_GUTREHB = 1—approximately 4,000,000 units weighted. The authors were interested in using GUTREHB in the CINCH analysis, but HUD and the U.S. Census Bureau discouraged them on the grounds that there was not enough known yet on how well the variable worked.

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