HISTORICAL CURRENT POPULATION SURVEY/HOUSING VACANCY SURVEY (CPS/HVS) CHANGES

Impacts of the coronavirus (COVID-19) pandemic on Housing Vacancies and Homeownership data collection for the Second Quarter 2020

How did the data collection procedures change for the CPS/HVS in response to the coronavirus pandemic?

The Census Bureau suspended in-person interviews for the CPS/HVS on March 20th, 2020. The suspension of in-person interviews continued through the entirety of data collection for the second quarter during April, May, and June. During this period, the Census Bureau continued to conduct the CPS/HVS by telephone, including efforts to collect telephone interviews for households and vacant units that would normally have been in-person interviews.
The CPS/HVS sample design seeks to collect data on sampled housing units for a total of 8 months, meaning that interviewers attempt to complete an interview in each of those 8 months. Once selected, a housing unit is in the sample for 4 consecutive months, out for 8 months, and then in the sample for 4 months. Under normal procedures, the first and fifth interviews are conducted via in-person interviews. In other months, a telephone interview can be conducted instead of an in-person interview if certain conditions are met. The suspension of in-person interviews during the second quarter of 2020 meant that telephone contact attempts replaced in-person interview attempts for all housing units in the sample, regardless of their month in sample.

These telephone contacts relied on phone numbers identified through multiple sources. For housing units with a completed interview in a previous month, interviewers attempted to contact the occupant or knowledgeable proxy interviewed during the previous month. Additionally, interviewers were encouraged to the use the resources available to them to identify contact information for sample housing units and/or knowledgeable proxy respondents. These resources included internal resources such as purchased third-party telephone lookup databases, as well as public records databases such as tax assessor records. They also included telephone contacts with knowledgeable local sources such as landlords, leasing offices, neighbors, and postal workers who might be able to identify vacant units, provide contact information for the property owner, and/or complete a proxy interview.

The suspension of in-person interviews affected the entirety of the data collection period for the second quarter during April, May, and June. It also affected data collection during the first quarter of 2020 because the suspension began prior to the end of data collection operations in March. In each month, CPS/HVS data collection begins at the start of the week containing the 19th and closes out early the following week. The suspension of in-person interviews on March 20th, 2020 occurred on Friday during the week of data collection. Interviewers were able to make at least one in-person visit attempt to most sample units before in-person visits were suspended.

How does the CPS/HVS weighting and methodology account for non-response?

The CPS/HVS methodology assumes that the in-person visits and other data collection steps will allow interviewers to make a determination for every unit in the sample of whether the unit is an occupied unit with a completed CPS interview or a Type A (eligible but no data collected/refusal), Type B (eligible but unoccupied/vacant), or Type C (ineligible/not a residential unit) non-interview. In months when normal data collection procedures are in place, this process relies on in-person visits to allow the interviewer to observe the visible attributes of the unit and attempt to contact neighbors or other individuals who may have knowledge of the vacancy status of the unit in order to identify all potential HVS-eligible units. Following the suspension of in-person interviewing, the number of HVS eligible interviews (Type Bs) declined in April, May, and June relative to their historical averages, and the number of Type A units increased. These changes may be due to the data collection changes resulting in more units with unresolved interview statuses or to a true decrease in the number of vacant units, and the data collected for the second quarter does not distinguish between these possibilities.

The CPS/HVS weighting and estimation procedures are designed under the assumption that the data collection procedures will accurately determine the interview status (Type A, B, or C) of the units in the housing sample. The CPS/HVS weights adjust for changes over time in the overall response rate by adjusting the weights to ensure that the estimates total to the overall number of housing units in the United States and to several other control totals. However, the weighting methodology does not include a non-response component to adjust for differences in response rates between vacant versus occupied units, rental versus homeowner units, or other subgroups. If the suspension of in-person interviews disproportionately reduced the ability of interviewers to complete data collection for HVS-eligible vacant units compared to occupied units, the impact would be a lower estimate of the vacancy rate.

In addition to the implications for the overall level of the vacancy rate estimates, data users should also consider the potential for the changes in data collection procedures to disproportionately affect data collection among some groups more than others, along with the consequences of differential non-response for the CPS/HVS estimates. Because the CPS/HVS weights do not include a non-response component to adjust for differences in the response rates of different subgroups, the CPS/HVS estimates would reflect any differences in the relative response rates of specific subgroups. For example, if the changes in data collection procedures increased the difficulty of data collection for vacant units more than occupied units, the CPS/HVS estimates would reflect this impact on data collection by showing a lower vacancy rate. Similarly, if the changes in data collection procedures increased the difficulty of data collection for vacant rental units more than vacant homeowner units, the CPS/HVS estimates would reflect the impact on data collection by showing a relatively larger reduction in the rental vacancy rate than in the homeowner vacancy rate.

Could the changes in data collection procedures affect the CPS/HVS estimates of vacancy?

The changes in data collection procedures could have affected the CPS/HVS estimates of vacancy for the second quarter of 2020. We have been investigating the potential impacts of the data collection changes, but given available resources and data we have not been able to precisely measure the effects of the data collection changes apart from the effects of the COVID-19 pandemic. Because the data collection changes occurred in response to the onset of the

COVID-19 pandemic, it is difficult to separate the effects of the data collection changes from the effects of COVID-19. Data users should therefore exercise caution when comparing the second quarter estimates to previous quarters, interpreting the differences between quarters to reflect both the effects of the COVID-19 pandemic and the effects of changes in data collection procedures.

Could the changes in data collection procedures affect the CPS/HVS estimates of the homeownership rate?

The changes in data collection procedures could have affected the CPS/HVS estimates of the homeownership rate for the second quarter of 2020. In particular, data users should consider the potential for the suspension of in-person interviews to disproportionately affect the response rates of renters versus homeowners. For example, if response rates declined further among rental units than homeowner units following the suspension of in-person interviews, the effects on the CPS/HVS estimates would be a lower estimate of the number of rental households, a higher estimate of the number of homeowner households, and a higher estimate of the homeownership rate. Data users should therefore exercise caution when comparing the second quarter estimates to previous quarters, interpreting the differences between quarters to reflect both the effects of the COVID-19 pandemic and the effects of changes in data collection procedures.
Table 2 shows the homeownership rate by mode and region in 2019 prior to the suspension of in-person interviews. These estimates show that homeowners accounted for approximately 60 percent of in-person interviews in 2019, compared to 67 percent of phone interviews and 70 percent of interviews where the data collection mode is missing. The regional estimates show that this pattern is present in all four regions, with in-person interviews showing a lower share of homeowners and a higher share of renters than the other modes.

Table 2: Homeownership rates in 2019 by mode and region.

		Region			
	All	**Northeast**	**Midwest**	**South**	**West**
In Person	60%	55%	63%	62%	56%
Phone	67%	64%	71%	68%	62%
Not Reported	70%	65%	73%	72%	66%

Note: Sample is limited to completed interviews of occupied housing units and includes data from all twelve months of 2019.

Could the changes in data collection procedures affect the CPS/HVS estimates of the housing inventory composition?

The changes in data collection procedures could have affected the CPS/HVS estimates of the components of the housing inventory. The CPS/HVS weights are controlled to the total number of housing units in the United States, so the estimated number of all housing units in the housing inventory is not affected by the data collection changes. However, the potential impacts of the data collection changes on the estimates of vacancy and tenure described in the previous sections could affect the estimated components of the housing inventory. Specifically, any change in the estimated vacancy rate will affect both the estimated number of vacant units and

the estimated number of occupied units, because the sum of vacant and occupied units must equal the total number of housing units in the United States. Data users should therefore consider the CPS/HVS weighting methodology when interpreting the estimates of the components of the housing inventory.

Impacts of the coronavirus (COVID-19) pandemic on Housing Vacancies and Homeownership data collection for the First Quarter 2020

The first quarter 2020 data from the Current Population Survey/Housing Vacancy Survey (CPS/HVS) may reflect the impacts of changes in data collection operations made in response to the coronavirus (COVID-19) pandemic. The first quarter estimates reflect the 3-month average of data collected in January, February, and March. The changes in data collection operations made in response to the coronavirus pandemic affect the data collected in March only.

Data are generally collected the week of the 19th. The reference period is the time of interview, in this case March 15-25. On March 20, the Census Bureau suspended in-person interviews. Further, two Census call centers that assist with interviews were closed. The Census Bureau continued to conduct the CPS/HVS by telephone and made efforts to collect telephone interviews for households and vacant units that would normally have been interviewed in person. The response rate was 73 percent in March 2020, about 10 percentage points lower than the response rates of 82 percent in January and 83 percent in February. The response rate in March 2019 was 82 percent.

The estimation methodology was not changed in response to the coronavirus pandemic. The lower response rate for March 2020 is addressed by the weights. We likely cannot fully understand or quantify the effects of the pandemic on the CPS/HVS data and estimates. This note is intended only to document the changes to data collection operations made in response to the coronavirus pandemic.

Changes in 2020

In the second quarter 2020, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2019 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2010 through the first quarter 2020. The vintage 2019 estimates are benchmarked to the 2010 Census. The same general procedure will be followed each year in revising housing inventory estimates with the most up-to-date independent housing estimates available. For an explanation of the methodology used in producing the housing inventory independent estimates, please see: www.census.gov/programs-surveys/popest.html

Note: This time series is by the latest "vintage year." For example, vintage 2019 means that all of the estimates in this time series are identified as belonging to "vintage 2019." The 2010 data are from the 2019 vintage, the 2011 data are from the 2019 vintage, and so on.

Changes in 2019

In the second quarter 2019, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2018 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2010 through the first quarter 2019. The vintage 2018 estimates are benchmarked to the 2010 Census.

Changes in 2018

In the second quarter 2018, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2017 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2010 through the first quarter 2018. The vintage 2017 estimates are benchmarked to the 2010 Census.

Changes in 2017

In the second quarter 2017, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2016 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2010 through the first quarter 2017. The vintage 2016 estimates are benchmarked to the 2010 Census.

In the first quarter 2017, the parameters used to calculate standard errors for rates and estimates were updated. The factors are evaluated, and updated if necessary, after approximately 15 months of data have been collected from a new CPS/HVS sample following a decennial census. The current sample has been fully phased-in since July 2015.

Changes in 2016

In the second quarter 2016, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2015 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2010 through the first quarter 2016. The vintage 2015 estimates are benchmarked to the 2010 Census.

Changes in 2015

In the second quarter 2015, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2014 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2010 through the first quarter 2015. The vintage 2014 estimates are benchmarked to the 2010 Census.

In the first quarter 2015, the Current Population Survey/Housing Vacancy Survey began using the new Metropolitan Statistical Area (MSA) definitions that were announced by the Office of Management and Budget (OMB) in February 2013, based on the application of the

2010 OMB standards to Census 2010 data. The definitions are available at: www.census.gov/programs-surveys/metro-micro.html. Caution should be used when comparing MSA data for 2015 to earlier data.

Changes in 2014

In the second quarter 2014, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2013 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2010 through the first quarter 2014. The vintage 2013 estimates are benchmarked to the 2010 Census.

Beginning in April 2014, a new sample was phased in over a 15-month period. The methods used to select the sample households for the survey are evaluated after each decennial census. Based on these evaluations, the design of the survey is modified and systems are put in place to provide the sample for the following decade. The previous decennial revision incorporated new information from Census 2000 and was complete as of July 2005. The design for the entire decade was selected from the 2000 based sample. The most recent revision incorporates new information from Census 2010 and was complete as of July 2015. The new sample is based on the Master Address File (MAF) compiled during the 2010 Census and will use annual selections from the MAF instead of the once a decade sample selection used previously.

Changes in 2013

In the second quarter 2013, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2012 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2010 through the first quarter 2013. The vintage 2012 estimates are benchmarked to the 2010 Census.

Changes in 2012

In the second quarter 2012, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2011 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2010 through the first quarter 2012. The vintage 2011 estimates are benchmarked to the 2010 Census.

Beginning in the first quarter 2012, the population controls reflect the results of the 2010 Decennial Census. This change has virtually no effect on vacancy and homeownership rates. Research has shown that the new 2010-based controls increased the rental vacancy rate in April 2010 from 10.43 percent to 10.45 percent - a difference of less than 1/10 of one percent. The homeowner vacancy rate remained the same at 2.63 percent, while the homeownership rate was up from 66.67 percent to 66.74 percent.

Changes in 2011

In the third quarter 2011, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2010 independent housing estimates issued by the Census Bureau's Population Division. This includes the housing inventory time-series data from 2000 through the second quarter 2011. The vintage 2010 estimates are benchmarked to the 2000 and 2010 Census.

Changes in 2010

In the third quarter 2010, historical housing inventory estimates were revised based on the latest series of independent housing controls, the vintage 2009 independent housing estimates issued by the Census Bureau's Population Division. The vintage 2010 estimates are benchmarked to the 2000 Census.

In the first quarter 2010, the Census Bureau began imputing missing values for the family income question, which is used in the homeownership table 8 of the press release. Previously, householders not responding to this question were excluded from the homeownership calculations for those below/above the median family income level.

Changes in 2007

In first quarter 2007, the Current Population Survey/Housing Vacancy Survey (CPS/HVS) began using Blaise, a powerful computer-assisted interviewing (CAI) system and survey processing tool for the Windows operating system. It is being used for many of the surveys now being conducted by the Census Bureau.

Changes in 2003

Beginning in the first quarter 2003, population controls that reflect the results of the 2000 Decennial Census were used in the CPS/HVS estimation process for the first time. This change had a slight effect on vacancy and homeownership rates, as described below. As a final additional step in the estimation process, the estimates were controlled to independent housing counts used for the first time in order to produce a more accurate estimate of housing units. This makes the CPS/HVS estimates of housing units more consistent with other Census Bureau housing surveys. The new housing controls affected the count of all housing units in the sense that both occupied and vacant units were ratio estimated to the new control total. Vacancy rates and homeownership rates were not affected by this change.

In the first quarter 2003, the CPS/HVS began computing first-stage factors (used for weighting purposes) based on year-round and seasonal counts of housing units from the 2000

decennial. From 1980 to 2002, the CPS/HVS first-stage factors were based on year-round estimates only. We believe that this improves our counts of year-round and seasonal units.

The shift from 1990-based to 2000-based population controls (including the weighting revision) had a very slight effect on vacancy rates and homeownership rates. Research has shown that the new 2000-based controls dropped the rental vacancy rate in the first quarter 2002 from 9.14 percent to 9.08 percent - a difference of less than 1/10 of one percent. The homeowner vacancy rate was revised from 1.67 percent to 1.65 percent, while the homeownership rate was revised from 67.82 percent to 67.81 percent.

Beginning in the first quarter 2003, the questions on race on the CPS were modified to comply with the revised standards for federal statistical agencies. Respondents are now allowed to select more than one race. The Hispanic/Non-Hispanic origin question continues to be asked separately.

Changes in 1994

Beginning in the first quarter 1994, a new weighting procedure was implemented based on the 1990 Decennial Census. The 1990-based weighting prodedure produced an estimate of the total housing inventory about 0.1 percent lower than the 1980-based weighting. Generally, the vacancy rates were only minimally affected, while the homeownership rate was about one-half of a percentage point lower with the new weighting procedures.

Also beginning in the first quarter 1994, the CPS/HVS became a fully computerized survey with the implementation of the Computer Assisted Survey Information Collection (CASIC). The CASIC tools consist of state-of-the-art computer-assisted modules for data collection and processing. Although the concepts, definitions and questionnaire items remain the same, the shift to CASIC may affect vacancy rates and homeownership rates. The Census Bureau was unable to determine the quantitative effects of the use of CASIC on the vacancy and homeownership rates. Data users should use caution when comparing data for 1994 and later with earlier data.

SOURCE AND ACCURACY OF ESTIMATES

Source of Data

The estimates presented in this report were primarily based on data obtained from the Census Bureau's Current Population Survey/Housing Vacancy Survey (CPS/HVS). The populations represented (the population universe) are all housing units (vacancy rates) and the civilian non-institutional population of the United States (homeownership rate). Data concerning vacancy rates and tenure of occupied housing units were from the monthly sample of the CPS. The data presented are averaged for the three months – April, May, and June 2020. The average weighted CPS response rate for the second quarter 2020 was 67.03 percent.

Distributions of characteristics of occupied housing units in detailed table 3 were from the American Housing Survey (AHS). The distributions were applied to the CPS/HVS housing inventory independent estimates to obtain the characteristics of occupied housing units used in

this report. The Survey of Construction (SOC) and the Consumer Price Index (CPI) also were used to improve estimates of the rent distribution.

For the 2017 AHS Integrated National sample, 84,879 sample housing units were selected for interview. Of the selected units, 2,052 were found to be ineligible because the units either no longer existed or did not meet the AHS definition of a housing unit. Of the 82,933 eligible sample units, 16,181 (both occupied and vacant housing units) were classified as noninterviews. The Integrated National Sample includes a representative sample of housing units for the United States. However, due to budget restrictions, the AHS does not include housing units from every political jurisdiction (that is, county or city) or census area (tract or block group) within the United States. A detailed description of the AHS sample design and estimation procedure can be found here: https://www.census.gov/programs-surveys/ahs/tech-documentation/def-errors-changes.html

CPS Design

Since the inception of the CPS in 1940, the sample has been redesigned several times to upgrade the quality and reliability of the data and to meet changing data needs. From July 1995 to March 2004, the CPS/HVS sample was selected from a frame based on the 1990 Decennial Census. From April 2004 to June 2005, the sample consisted of sample units drawn from both the 1990 and 2000 Decennial Censuses. From July 2005 to March 2014, the sample consisted of housing units drawn from Census 2000, along with housing units built after April 1, 2000. Beginning in April 2014, the CPS/HVS sample was based on the Master Address File (MAF) complied during the 2010 Census and will use annual selections from the MAF instead of the once a decade sample selection used previously.

Beginning in the first quarter 1986, vacant seasonal mobile homes were included in the count of vacant seasonal units. This change resulted in a 12 percent increase in the number of vacant seasonal housing units.

Beginning the second quarter of 1999, a change was made in the way data for housing units in structure were collected. Previously, there was one category to show a 1-unit structure. That has been broken into two categories: 1-unit attached and 1-unit detached.

Beginning in the first quarter 2002, the size of the CPS/HVS sample increased to approximately 72,000 housing units. This expansion was one of the Census Bureau's plans to meet the requirements of the State Children's Health Insurance Program (SCHIP) legislation. Of the 72,000 housing units contained in the CPS/HVS sample, approximately 61,200 are eligible for interview each month; of this number, on average 3,900 occupied units, are visited but interviews are not obtained because occupants are not found at home after repeated calls or are unavailable for some other reason. In addition of the 61,200 units, there are also about 10,800 sample units in an average month which are visited but are found to be vacant or otherwise not to be interviewed. About half of the 10,800 are vacant and interviewed for the HVS.

The CPS estimation procedure for occupied units involves the inflation of the weighted sample results to independent estimates of the total civilian non-institutional population of the United States by age, race, sex and Hispanic/non-Hispanic categories. These independent estimates were based on statistics from the decennial censuses of population; statistics on births, deaths, immigration and emigration; and statistics on the strength of the Armed Forces.

The HVS estimation procedure for vacant units is similar to that used for occupied units. Weighted sample results were adjusted at the state level using 2010 census vacant counts. A second adjustment inflated these results based on the CPS coverage of occupied units by geographic areas. As a final step for both the CPS and HVS, all housing unit counts were adjusted to reflect independent housing control totals. This change was effective, beginning in the first quarter 2003.

Comparability with Decennial Census Housing Data

The most recent research has shown that the CPS/HVS and the 2010 census produced significant differences for vacancy characteristics. The rental vacancy rate from the April 2010 census was 9.2 percent, whereas the CPS/HVS reported the rental vacancy rate of 10.6 percent for the first half of 2010. The April 2010 census had a homeowner vacancy rate of 2.4 percent, while the CPS/HVS had a vacancy rate of approximately 2.6 percent for the first half of 2010. For occupied housing, the April 2010 census produced a homeownership rate of 65.1 percent, while for the first half of 2010, the CPS/HVS produced a rate of 67.0 percent. These differences illustrate that, for these characteristics as well as others, caution should be used when making comparisons between the 2010 census and the CPS/HVS.

Further research has shown that the CPS/HVS and the 2000 census produced significant differences for vacancy characteristics. The rental vacancy rate from the April 2000 census was 6.8 percent, whereas the CPS/HVS reported the rental vacancy rate of 7.9 percent for the first half of 2000. The April 2000 census had a homeowner vacancy rate of 1.7 percent, while the CPS/HVS had a vacancy rate of approximately 1.5 percent for the first half of 2000. For occupied housing, the April 2000 census produced a homeownership rate of 66.2 percent, while for the first half of 2000, the CPS/HVS produced a rate of 67.2 percent. These differences illustrate that, for these characteristics as well as others, caution should be used when making comparisons between the 2000 census and the CPS/HVS.

Research has shown that the CPS/HVS and the 1990 census produced significant differences for vacancy characteristics. The rental vacancy rate from the April 1990 census was 8.5 percent, whereas, the CPS/HVS reported the rental vacancy rate of 7.2 percent for the first half of 1990. The April 1990 census had a homeowner vacancy rate of 2.1 percent, while the CPS/HVS had a vacancy rate of approximately 1.7 percent for the first half of 1990. For occupied housing, the April 1990 census produced a homeownership rate of 64.2 percent, while for the first half of 1990 the CPS/HVS produced a rate of 63.9 percent. These differences illustrate that, for these characteristics as well as others, caution should be used when making comparisons between the 1990 census and the CPS/HVS.

Most of the concepts and definitions were the same for items that appear in 1980, 1990, 2000 and 2010 censuses and the Housing Vacancy Survey. However, there was one minor difference in the housing unit definition between the CPS/HVS and the 1980 and 1990 Decennial Censuses. The difference was that, in the CPS/HVS prior to 1983, living arrangements containing five or more persons, not related to the person in charge, were classified as group quarters; for the 1980 and 1990 census, the requirement was raised to nine or more persons not related to the person in charge. For Census 2000, the conversion requirement was eliminated. There were some differences in what has been counted as housing units between the earlier censuses and the CPS/HVS. Descriptions of the differences between earlier censuses and the HVS appear in the 1985 and earlier reports of this series.

Prior to the first quarter 1990, there were significant differences between the CPS/HVS and the decennial censuses. The 1980 and 1990 Decennial Censuses included vacant mobile homes as housing units, whereas prior to 1986 the CPS/HVS did not. However, beginning in the first quarter 1986, vacant seasonal mobile homes were counted as housing units in the CPS/HVS. In addition, year-round vacant mobile homes were counted as housing units, beginning in the first quarter 1990 in the CPS/HVS. Another difference in the housing unit definition between the CPS/HVS (prior to 1986) and the 1980 and 1990 censuses was that the CPS/HVS required units to be separate living quarters and have direct access or have complete kitchen facilities. For the 1980 and 1990 Decennial Censuses, the complete kitchen facilities alternative was dropped with direct access required of all units. However, beginning in 1990, the CPS/HVS requirement for complete kitchen facilities was dropped with direct access required of all units. Thus, the earlier definitional differences were eliminated.

In addition, there are differences between the methodologies used to collect data for the CPS/HVS and the censuses. These differences include interviewing procedures, staff experience and training; differences in processing procedures and sample designs; the sampling variability associated with the CPS/HVS and the sample data from the census; and the non-sampling errors associated with the CPS/HVS and census data.

Comparability with Earlier CPS/HVS Data

As stated earlier in this report, beginning in the first quarter 1994 new weighting procedures based on the 1990 Decennial Census were implemented. In addition, the survey data collection procedures became fully computerized. Caution should be used when comparing current data with unrevised data prior to 1994.

In the first quarter 1990, year-round vacant mobile homes were included for the first time as part of the year-round vacant count of housing units. This change was made to make the composition of the housing unit inventory for the CPS/HVS similar to the decennial census and other surveys, which count all mobile homes as housing units for both occupied or vacant (available for occupancy on the site). Research has shown that the inclusion of vacant mobile homes increased the vacancy rate significantly in some cases. We have revised 1989 data in this report to reflect all changes. Caution should be used when comparing data from 1990 or later with unrevised data prior to 1990.

In the fourth quarter 1989, new edit procedures were implemented in the CPS/HVS. These new procedures were used to allocate cases that would have been classified as "not reported" under previous procedures.

In the first quarter 1980, several changes were implemented in the survey to improve the reliability of the data presented. These included adding a supplemental sample, refining the estimation procedures, and changing the source of occupied characteristics from the Quarterly Housing Survey to the AHS.

Although the above mentioned changes resulted in more reliable estimates, data for 1980 and later in this report are not completely comparable to data for the fourth quarter 1979 and previous quarters, as published in Housing Vacancies reports, series H-111, Nos. 1 to 79-Q4. Furthermore, unrevised data prior to 1990 were not completely comparable to 1990 data and beyond, due to the inclusion of year-round vacant mobile homes, beginning in the first quarter 1990. Thus, particular caution should be observed in drawing conclusions about trends that extend from before 1980 to 1980 and beyond, and also trends from before 1990 to 1990 and

later. For comparative purposes, 1979 data in this report were revised to incorporate all changes made in 1980, and 1989 data were revised to incorporate all changes made in 1990. Unrevised 1989 and 1979 data are provided to show the magnitude of the various changes.

Vacancy Rates for Characteristics in Historical Tables 3 and 4

Vacancy rates in historical tables 3 and 4 are based in part on forecasts of occupied housing units. These forecasts are periodically revised to incorporate more recent data and improved forecasting procedures. In fourth quarter 2013, historical tables 3 and 4 were updated to include the most recent AHS data. Beginning in 2013, the first quarter 2013 data are based on data from the 2011 AHS. Beginning in 2015, the first quarter 2015 data are based on data from the 2013 AHS. Beginning in 2017, first quarter 2017 data are based on data from the 2015 AHS. Beginning in the first quarter 2019, data are based on data from the 2017 AHS.

For the occupied unit forecasts of the monthly rent categories in detailed table 3, the AHS data are updated quarterly to reflect the rise in the cost of renting through the use of the residential rent index and the latest available asking rent data for newly constructed rental units.

Caution in Using Seasonal Vacant Data

Analysis of seasonal vacant data prior to the first quarter 1987 has shown that estimates for these characteristics have been underestimated by approximately 28 percent. The estimates beginning with the first quarter 1987 were adjusted to reflect this.

Accuracy of the Estimates

Since the CPS/HVS estimates are based on a sample, they may differ somewhat from the figures that would have been obtained if a complete census had been taken using the same questionnaires, instructions and enumerators. There are two types of errors possible in an estimate based on a sample survey: sampling and non-sampling. The accuracy of a survey result depends on both types of errors, but the full extent of the non-sampling error is unknown. Consequently, particular care should be exercised in the interpretation of figures based on a relatively small number of cases or on small differences between estimates. The margins of error provided for the CPS/HVS estimates primarily indicate the magnitude of the sampling error. They also partially measure the effect of some non-sampling errors in responses and enumeration; but do not measure any systematic biases in the data. (Bias is the difference averaged over all possible samples, between the estimate and the desired value). Approximately 2 percent of the CPS/HVS households are selected for quality control reinterview each month based on the previous month's outcome.

Non-Sampling Variability

Nonsampling errors can be attributed to many sources, e.g., inability to obtain information about all cases in the sample, definitional difficulties, differences in the interpretation of questions, inability or unwillingness on the part of respondents to provide correct information, inability to recall information, errors made in collection such as recording or coding the data, errors made in processing the data, errors made in estimating values for missing

data and failure to represent all units with the sample (undercoverage). Undercoverage in the CPS/HVS results from missed housing units and misclassifying housing units. Ratio estimation to independent controls, as described previously, partially corrects for the bias due to survey undercoverage. However, biases exist in the estimates to the extent that missed households have different characteristics than interviewed households. While highly unusual, HVS interviews may not always be complete. In the case of missing information, the data will be allocated. An HVS interview is not considered a Type B Noninterview unless the question "Is this interview by observation only?" is answered.

Sampling Variability

The margins of error shown in the tables are primarily measures of sampling variability - the variations that occurred by chance because a sample rather than the entire population was surveyed. The sample estimate and its standard error enable one to construct margins of error - ranges that would include the average results of all possible samples with a known probability. For example, if all possible samples were selected, each of these being surveyed under essentially the same general conditions and using the same sample design, and if an estimate and its standard error were calculated from each sample, then approximately 90-percent of the margins of error would include the average result of all possible samples.

The average estimate derived from all possible samples is or is not contained in any particular computed margin of error. However, for a particular sample, one can say with specified confidence that the average estimate derived from all possible samples is included in the margin of error.

Standard errors may also be used to perform hypothesis testing, a procedure for distinguishing between population parameters using sample estimates. The most common types of hypotheses appearing in this report are: (1) the population parameters are identical, and (2) the population parameters are different. An example of this would be comparing the vacancy rate inside MSAs versus the vacancy rate outside MSAs. Tests may be performed at various levels of significance, where a level of significance is the probability of concluding that the characteristics are different when in fact they are identical.

To perform the most common test, let x and y be sample estimates for two characteristics of interest. Let the standard error on the difference x-y be SEDIFF. If the ratio R = (x-y)/SEDIFF is between -1.645 and +1.645, no conclusion about the difference between the characteristics is justified at the 0.10 level of significance. If, on the other hand, this ratio is smaller than -1.645 or larger than +1.645, the observed difference is significant at the 0.10 level. In this event, it is a commonly accepted practice to say that the characteristics are different. Of course, sometimes this conclusion will be wrong. When the characteristics are in fact the same, there is a 10 percent chance of concluding that they are different.

The Census Bureau uses 90-percent confidence intervals and 0.10 levels of significance to determine statistical validity. All statements of comparison in the text have passed a hypothesis test at the 0.10 level of significance. This means that, for most differences cited in the text, the absolute value of the estimated difference between characteristics is greater than or equal to 1.645 times the estimated standard error of the difference. In addition to sampling error, the figures in this report, both the estimates and their margins of error, are also subject to rounding error.

Illustration of the Use of Tables and Standard Errors

The sample estimate and its standard error enable one to construct a margin of error. A margin of error is a measure of an estimate's variability. The larger a margin of error is in relation to the size of the estimate, the less reliable the estimate. For example, the estimated percent of housing units vacant and available for rent in the Northeast is 1.5 percent (Table 11) and the standard error on the estimate is 0.1 percentage points (Table A-1). The margin of error, at the 90 percent confidence interval, is calculated as 1.645 x 0.1, or 0.2. Thus, the 90 percent confidence interval is from 1.3 percent to 1.7 percent. If all possible samples were surveyed under essentially the same general conditions and the same sample design, and if an estimate and its standard error were calculated from each sample, then approximately 90 percent of the margins of error would include the average result of all possible samples.