

Appendix B. Sample Design and Weighting

SAMPLE AREAS

The 2007 American Housing Survey Metropolitan Sample (AHS-MS) provides information on the following seven metropolitan areas interviewed as part of the American Housing Survey (AHS), which was conducted by the U.S. Census Bureau for the U.S. Department of Housing and Urban Development:

- Baltimore, MD (MSA)
- Boston, MA (NECTAD)
- Houston, TX (MSA)
- Miami-Fort Lauderdale, FL (MSA)
- Minneapolis-St. Paul, MN-WI (MSA)
- Tampa-St. Petersburg, FL (MSA)
- Washington, DC-MD-VA-WV (MSA)

These metropolitan areas are consistent with the 2003 Office of Management and Budget (OMB) definitions of the metropolitan statistical area (MSA) or metropolitan New England City and Town Area Division (NECTAD) as a result of the following sample adjustments:

1. Counties/Minor Civil Divisions (MCDs) were added or dropped so that the definition of each metropolitan area in sample was consistent with the final 2003 OMB definition of the metropolitan area and sample was selected in these added areas.
2. The sample in the counties/MCDs in the previous definition that were also in these new definitions (i.e.,

continuing counties/MCDs) was adjusted to maintain an overall sample size of 4,700 and in some cases it was replaced by a new sample for confidentiality reasons.

Interview Schedules

The Census Bureau collected 2007 AHS-MS data between April and September 2007.

Due to budget constraints, the sample sizes for each 2007 metropolitan area were reduced from about 4,700 to about 2,700 as is shown in Table B-1.

Table B-1. **Sample Size in the 2007 American Housing Survey Metropolitan Areas**

2007 AHS metropolitan area	2007 sample size (after reduction)
Baltimore, MD (MSA)	2,645
Boston, MA (NECTAD)	2,703
Houston, TX (MSA)	2,761
Miami-Fort Lauderdale, FL (MSA)	2,583
Minneapolis-St. Paul, MN-WI (MSA)	2,758
Tampa-St. Petersburg, FL (MSA)	2,791
Washington, DC-MD-VA-WV (MSA)	2,736

Interview Activity

Table B-2 summarizes the interview activity for each of the 2007 metropolitan areas in this report series. The table provides the weighted response rate, the number of eligible units (comprised of completed interviews and noninterviews), and the number of units visited but ineligible for interview.

Table B-2. **Interview Activity for the 2007 AHS-MS Areas**

Metropolitan area	Weighted response rate (percent)	Eligible units			Ineligible units
		Total	Interviewed	Not interviewed	
2007 AHS-MS total	89	18,028	15,737	2,291	949
Baltimore, MD (MSA)	85	2,503	2,065	438	142
Boston, MA (NECTAD)	83	2,559	2,050	509	144
Houston, TX (MSA)	87	2,604	2,235	369	157
Miami-Fort Lauderdale, FL (MSA)	94	2,449	2,287	162	134
Minneapolis-St. Paul, MN-WI (MSA)	91	2,654	2,405	249	104
Tampa-St. Petersburg, FL (MSA)	92	2,628	2,387	241	163
Washington, DC-MD-VA-WV (MSA)	89	2,631	2,308	323	105

AHS-MS SAMPLE HOUSING UNITS

1. The sample from continuing counties/MCDs consists of the following:
 - Interviews in the previous survey.
 - Type A noninterviews (that is, units eligible to be interviewed) or Type B noninterviews (that is, units not eligible for interview at the time of the survey but which could become eligible in the future) in the previous survey. For a list of reasons for Type A and Type B noninterviews, see Appendix A for the definition of “Noninterview.”
 - New construction housing units selected from a listing of new residential construction building permits issued since the previous survey. This sample represented the housing units built in permit-issuing areas since the previous survey.
 - Housing units added since the previous survey in sample blocks from the nonpermit universe. This sample represented the housing built in non-permit-issuing areas since the previous survey.
 - 2000 census manufactured/mobile homes.
 - 2000 census special living units.
 - 2000 census housing units replacing current sample housing units for confidentiality reasons.
2. The sample from new counties/MCDs consists of the following:
 - 2000 census housing units.
 - New construction housing units selected from a listing of new residential construction building permits issued since the previous survey. This sample represented the housing units built in permit-issuing areas since Census 2000.
 - Housing units added since the previous survey in sample blocks from the nonpermit universe. This sample represented the housing built in non-permit-issuing areas since Census 2000.

SAMPLE SELECTION

The Census Bureau initially grouped the housing units enumerated in the 1990 (2000) Census of Population and Housing into census blocks and assigned these blocks to either the unit/group quarters frame or the area frame, as follows:

1. Blocks located in an area that issued permits for new construction were assigned to the unit/group quarters frame.
2. All other blocks were assigned to the area frame.

The unit/group quarters frame was then split into the unit frame and the group quarters frame by removing all group quarters and placing them in a separate frame.

All housing units that were built after the 1990 (2000) census in areas where construction of new homes was monitored by building permits were placed into a separate frame, called the permit frame.

Sampling operations for all frames were performed separately within a designated group of counties in each state. Prior to the AHS-MS sample selection, records selected by other Census Bureau surveys were removed from each of the frames to avoid having the same housing unit in sample for more than one survey. The Census Bureau selected the AHS-MS sample from the remaining records.

The following adjustments were made to the AHS-MS in 2007 by adding certain types of units selected from the 2000 census:

- A new sample of manufactured/mobile homes was selected from the 2000 census in an attempt to improve coverage of manufactured/mobile homes built between 1990 and 2000. One-half of this sample was included in the 2007 interviewing and, as a result, one-half of the 1990-design sample was not included.
- In an attempt to improve coverage of the elderly, a sample of special living units was selected from the 2000 census.

Table B-3 presents the percentage of the AHS-MS sample drawn from each frame by sample design year.

Table B-3. **Percentage of 2007 AHS-MS Sample by Frame**

2007 AHS metropolitan area	Unit frame		Group quarters frame		Permit frame		Area frame		Total
	1990	2000	1990	2000	1990	2000	1990	2000	
Baltimore, MD (MSA)	69.0	10.0	0.2	–	14.3	2.5	4.0	–	100
Boston, MA (NECTAD)	70.8	18.1	0.4	–	6.2	1.6	2.9	–	100
Houston, TX (MSA)	47.6	17.6	0.3	–	16.7	8.7	7.8	1.5	100
Miami-Ft Lauderdale, FL (MSA)	53.1	23.4	0.4	0.2	12.8	7.1	2.9	0.2	100
Minneapolis-St. Paul, MN-WI (MSA)	66.4	2.7	0.3	–	21.0	4.4	5.2	–	100
Tampa-St. Petersburg, FL (MSA)	66.3	5.9	0.8	–	17.3	6.0	3.5	–	100
Washington, DC-MD-VA-WV (MSA)	62.5	5.5	0.4	–	20.0	4.3	7.2	0.1	100

– Represents or rounds to zero.

Estimation

The sample housing units were weighted according to a multiple-stage ratio estimation procedure. Before implementing the ratio estimation procedure, the basic weight (that is, the inverse of the probability of selection) for each interviewed sample housing unit was adjusted to account for Type A noninterviews.

Type A noninterview adjustment. Type A noninterviews are occupied sample units for which occupants:

- Were not home.
- Refused to be interviewed.
- Were unavailable for some other reason.

The Census Bureau computed the Type A noninterview adjustment by cross-classifying occupied housing units into various categories or cells on the basis of the following data items:

- Central city/balance.
- Frame.
- Tenure (i.e., owner or renter).
- Type of unit (i.e., mobile home, non-mobile home, or special living).
- Rent.
- Value.
- Number of rooms.

Within a given cell, the Type A noninterview adjustment factor was equal to the following ratio:

$$\frac{\text{Weighted count of interviewed housing units} + \text{Weighted count of Type A noninterviewed housing units}}{\text{Weighted count of interviewed housing units}}$$

Mobile home ratio estimation. To adjust for undercoverage of manufactured/mobile homes, the Census Bureau applied the following ratio estimation procedure in all

areas:

Independent estimate of manufactured/mobile homes for the corresponding geographic subdivision of the metropolitan area

Sample estimate of manufactured/mobile homes for the corresponding geographic subdivision of the metropolitan area

The numerator of this ratio was determined using data from the 1980 census, the 1990 census, and the 2000 census. Based upon the increase or decrease in the number of manufactured/mobile homes between 1990 and 2000 for the Boston and Houston metropolitan areas between 1980 and 1990 for the other five metropolitan areas, the Census Bureau estimated the total number of manufactured/mobile homes in the survey year 2007. The denominator was obtained using the existing weight of the AHS-MS sample manufactured/mobile home units (i.e., the product of the basic weight and Type A noninterview adjustment factor).

Independent total housing unit ratio estimation. For the ratio estimation procedure described below, each metropolitan area was subdivided into geographic areas consisting of individual counties or a combination of counties.

To lower the undercoverage of non-mobile homes, the Census Bureau applied the following ratio estimation procedure in all areas:

Independent estimate of the total housing inventory (excluding mobile homes) for the corresponding geographic subdivision of the metropolitan area

Sample estimate of the total housing inventory (excluding mobile homes) for the corresponding geographic subdivision of the metropolitan area

The numerator of this ratio was determined by a model consisting of the following components:

1. Census 2000 Housing Units. The Census 2000 counts of housing units are updated each year through the Geographic Update System to Support Intercensal Estimates to reflect boundary updates from the Boundary and Annexation Survey, Count Question Resolution actions, and administrative revisions.

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2. Estimated Residential Construction since April 1, 2000. This component is calculated through a formula involving counts of new residential construction in nonpermit issuing areas since April 1, 2000, plus counts of residential building permits that resulted in the construction of new units times a factor of 0.98 (since 2 percent of all building permits never result in the actual construction of a housing unit).
 3. Estimated New Mobile Home Placements. The Census Bureau derives estimates for manufactured/mobile homes by allocating state mobile home shipment data to subcounty areas based on the subcounty area's share of state mobile homes in Census 2000.
 4. Estimated Housing Loss. The yearly estimates of housing unit loss are based on data derived from the 1997–2003 American Housing Survey national sample (AHS-N). The following three types of AHS noninterviews were considered to represent permanent loss of a housing unit:
 - Type B-16—Interior exposed to the elements
 - Type C-30—Demolished or disaster loss
 - Type C-31—House or manufactured/mobile home moved

Housing unit loss rates based on these noninterview types were then developed for housing units based on structure type and age of structure.

5. Final State and County Housing Unit Estimates. The housing unit estimates at the subcounty level are summed to obtain county level housing unit estimates, which are then summed to produce state level housing unit estimates.

For a more detailed description of the determination of these numbers, see <http://www.census.gov/popest/topics/methodology/2003_hu_meth.pdf>. The denominator was obtained using the product of the basic weight and the weighting factors of AHS-MS sample units, excluding mobile homes.

The computed ratio estimation factors were then applied to all appropriate housing units in the corresponding geographic area of each metropolitan area, and the resulting product was used as the final weight for tabulation purposes.

The ratio estimation procedure reduced the sampling error for most statistics below what would have been obtained by simply weighting the results of the sample by the inverse of the probability of selection. Since the housing population of the sample differed somewhat by chance from the metropolitan area as a whole, one can expect that the sample housing population, or different portions of it, is brought into agreement with known good estimates of the metropolitan area housing population.