

Appendix B. Sample Design

SAMPLE DESIGN

Introduction

This report series (H170) provides information on 24 metropolitan areas interviewed as part of the American Housing Survey which was conducted by the Bureau of the Census acting as collection agent for the Department of Housing and Urban Development. The estimates for 18 of these metropolitan areas are based on data collected from the 1995 and 1996 American Housing Survey Metropolitan Sample (AHS-MS). These metropolitan areas and their respective years in sample are:

1995 AHS-MS

Charlotte, NC-SC MSA
Columbus, OH MSA
Denver, CO PMSA
Kansas City, MO-KS MSA
Miami-Ft. Lauderdale, FL CMSA
New Orleans, LA MSA
Pittsburgh, PA MSA
Portland, OR-WA PMSA
San Antonio, TX MSA

1996 AHS-MS

Atlanta, GA MSA
Cleveland, OH PMSA
Hartford, CT MSA
Indianapolis, IN MSA
Memphis, TN-AR-MS MSA
Oklahoma City, OK MSA
St. Louis, MO-IL MSA
Sacramento, CA PMSA
Seattle-Everett, WA PMSA

The estimates for the remaining six of the metropolitan areas in this report series are based on data collected from the 1995 American Housing Survey National Sample (AHS-National). The data for these areas are based on AHS-National sample because the AHS-MS sample in these six areas was dropped to reduce costs. These metropolitan areas are:

Chicago, IL PMSA
Detroit, MI PMSA
New York-Nassau-Suffolk-Orange, NY PMSA's
Northern New Jersey PMSA's
Los Angeles-Long Beach, CA PMSA
Philadelphia, PA-NJ PMSA

Most of these metropolitan areas are consistent with the 1993 Office of Management and Budget (OMB) definitions of the metropolitan statistical area (MSA), consolidated metropolitan statistical area (CMSA), or primary metropolitan statistical area (PMSA) with the following exceptions:

- The New Orleans, LA MSA does not include St. James Parish from the 1993 OMB definition.
- The Chicago, IL PMSA does not include DeKalb County from the 1993 OMB definition.
- The Detroit, MI PMSA includes Livingston County in addition to the 1993 OMB definition.
- The Northern New Jersey PMSA's do not include Warren County, NJ and Pike County, PA from the 1993 OMB definition.
- The Philadelphia, PA-NJ PMSA does not include Salem County, NJ from the 1993 OMB definition.
- The Atlanta, GA MSA does not include Carroll County and Pickens County from the 1993 OMB definition.
- The St. Louis, MO-IL MSA does not include Sullivan City in Crawford County, MO from the 1993 OMB definition.
- The Cleveland, OH PMSA does not include Lorain County from the 1993 OMB definition.

AHS-MS areas. The metropolitan areas selected for AHS-MS are usually interviewed on a rotating basis about once every 4 years. The Bureau of the Census collected 1995 AHS-MS data between March and December of 1995 and 1996 AHS-MS data between March and November of 1996. Initially, the sample in each metropolitan area was uniformly distributed throughout 9 panels (panels 3 through 11).

Because of budget constraints, we dropped panel 11 in all of the metropolitan areas in sample in 1995, except in the Pittsburgh, PA MSA where only half of panel 11 was dropped. Additionally, in the Denver, CO PMSA and the Miami-Ft. Lauderdale, FL CMSA panels 5, 7, and 9 were dropped. We also dropped half of panel 10 in the Miami-Ft. Lauderdale, FL CMSA.

Also, because of budget constraints, in 1996, we dropped panels 5, 7, 9, and 11 from the Atlanta, GA, MSA and the St. Louis, MO-IL MSA. In the Seattle-Everett, WA PMSA panels 5 and 9, and half of panel 11 were dropped.

AHS-National areas. The sample cases for these areas were interviewed between August 1995 and February 1996. For AHS-National, the same basic sample of housing units is interviewed every 2 years until a new sample is selected. The Bureau of the Census updates the sample by adding newly constructed housing units and units discovered through coverage improvement efforts every enumeration.

To provide more reliable sample estimates for the six metropolitan areas, we used sample cases from the basic sample along with an extra sample that had been selected for possible sample supplementation. We refer to this extra sample as the supplemental sample. In 1987 and 1991, some of this sample was used for rural supplementation. However, most of the supplemental sample was interviewed for the first time in 1995. The size of the supplemental sample added in each of the six metropolitan areas is shown in Table A.

Table A. Supplemental Sample Size for Each of the Six AHS-National Based Metropolitan Areas

Metropolitan area	Supplemental sample size
Chicago, IL PMSA	1,923
Detroit, MI PMSA	1,172
Los Angeles-Long Beach, CA PMSA	2,149
New York-Nassau-Suffolk-Orange, NY PMSA's	147
Northern New Jersey PMSA's	129
Philadelphia, PA-NJ PMSA	1,231

In all of the metropolitan areas except Northern New Jersey and New York, the supplemental sample units included all units selected from the 1980 census and any new construction since the 1980 census. In Northern New Jersey and New York only 1980 census renters in urban areas in a few counties were added to the sample.

We used all of the 1995 AHS-National basic and supplemental sample for the following areas: Chicago, Detroit, Northern New Jersey, and Philadelphia.

In Los Angeles, we used all of the AHS-National sample from the urbanized areas of this MS and used only the supplemental sample from urban areas outside urbanized areas and from rural areas. This was done for confidentiality reasons.

In New York, we used different samples for the user file and the publication. For the publication, we used the AHS-National basic and supplemental sample in all areas. For the user file, we used the AHS-National basic and supplemental sample after excluding the urbanized area cases in Orange County. This was done for confidentiality reasons.

Table B. Interview Activity for the 1995 and 1996 American Housing Survey Metropolitan Areas

Metropolitan area	Eligible units			Ineligible units ²
	Total	Interviewed	Not interviewed ¹	
1995 AHS-MS total	36,924	34,900	2,024	1,431
Charlotte, NC-SC MSA	3,915	3,684	231	181
Columbus, OH MSA	4,115	3,843	272	78
Denver, CO PMSA	4,229	4,039	190	97
Kansas City, MO-KS MSA	4,062	3,746	316	170
Miami-Ft. Lauderdale, FL CMSA	4,085	3,862	223	202
New Orleans, LA MSA	3,914	3,679	235	332
Pittsburgh, PA MSA	4,320	4,153	167	113
Portland, OR-WA PMSA	4,086	3,872	214	99
San Antonio, TX MSA	4,198	4,022	176	159
1995 AHS-National total ..	14,328	13,036	1,292	1,381
Chicago, IL PMSA	3,216	2,851	365	274
Detroit, MI PMSA	1,912	1,771	141	167
Los Angeles-Long Beach, CA PMSA	3,485	3,244	241	262
New York-Nassau-Suffolk-Orange, NY PMSA's	2,343	2,146	197	369
Northern New Jersey PMSA's ..	1,272	1,190	82	165
Philadelphia, PA-NJ PMSA	2,100	1,834	266	144
1996 AHS-MS total	40,638	37,728	2,910	1,729
Atlanta, GA MSA	4,640	4,252	388	232
Cleveland, OH PMSA	4,602	4,294	308	140
Hartford, CT MSA	4,531	4,298	233	131
Indianapolis, IN MSA	4,642	4,446	196	155
Memphis, TN-AR-MS MSA	4,534	4,260	274	234
Oklahoma City, OK MSA	4,471	4,074	397	276
St. Louis, MO-IL MSA	4,553	4,240	313	234
Sacramento, CA PMSA	3,983	3,671	312	175
Seattle-Everett, WA PMSA	4,682	4,193	489	152

¹Sample units were visited but occupants were not at home after repeated visits or were unavailable for some other reasons.

²Sample units were visited but did not provide information relevant to the housing inventory. This category includes sample units that were found not to be in the sampling frame.

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

AHS-MS Sampling Operations

The 1995 and 1996 AHS-MS sample consists of the following types of housing units:

1. Housing units selected from the 1990 census
2. New construction in areas that issue building permits
3. Housing units missed in the 1990 census
4. Other housing units added since the 1990 census

Before we selected sample for the 1995 and 1996 AHS-MS, all housing units enumerated in the 1990 Census of Population and Housing in the United States were

initially grouped into census blocks and divided into two frames: the unit/group quarters frame and the area frame. We used two criteria to distinguish to which frame a census block belonged: (1) the completeness of addresses in the block and (2) whether the block was in an area which issued building permits for new construction at the time of the 1990 Census of Population and Housing. Four situations arose:

1. Most addresses within the census block were complete, and the block was located in an area which issued permits for new construction. These blocks were placed in the unit/group quarters frame.
2. Most addresses within the census block were complete, and the block was located in an area which did not issue permits for new construction. These blocks were placed in the area frame.
3. There were not enough complete addresses within the census block, and the block was located in an area which issued permits for new construction. These blocks were placed in the area frame.
4. There were not enough complete addresses within the census block, and the block was located in an area which did not issue permits for new construction. These blocks were also placed in the area frame.

We then split the unit/group quarters frame into the unit frame and the group quarters frame by removing all group quarters and placing them in the group quarters frame. In addition, to coordinate with another Census Bureau survey, a subset of census blocks in the unit frame which contained sample selected by this other survey was moved to the area frame.

All new construction housing units which were built after the 1990 Census of Population and Housing in areas where construction of new homes was monitored by building permits were placed into a separate frame, the permit frame.

Sample was selected independently for each metropolitan area. Sampling operations for all frames were performed separately within a designated group of counties in each state. The size of the sample determined the overall sampling rate used to select the sample. Prior to the AHS-MS sample selection, other Census Bureau surveys sampled from each of the frames. We removed records selected by other surveys from each of the frames to avoid having the same housing unit in sample for more than one survey. AHS-MS selected sample from the remaining records after adjusting the sampling ratio to reflect the removal of the other surveys' sample. Table C presents the percentage of AHS-MS sample drawn from each frame.

Unit frame. 1990 census housing units were stratified by the central city and balance of the metropolitan area, by the rent or value of the unit, and by the number of rooms. A systematic sample of housing units was then selected across these strata.

Table C. **Percentage of 1995 and 1996 AHS-MS Sample by Frame**

Metropolitan area	Unit frame	Group quarters frame	Permit frame	Area frame
1995 AHS-MS				
Charlotte, NC-SC MSA	68.6	.05	12.2	19.1
Columbus, OH MSA	84.4	.1	10.2	5.3
Denver, CO PMSA	89.0	.05	7.9	3.1
Kansas City, MO-KS MSA	81.9	.2	7.3	10.7
Miami-Ft. Lauderdale, FL CMSA ..	86.6	.1	8.2	5.2
New Orleans, LA MSA	80.8	.1	1.6	17.5
Pittsburgh, PA MSA	77.0	.1	3.9	18.9
Portland, OR-WA PMSA	82.8	.1	11.9	5.2
San Antonio, TX MSA	81.0	.1	4.8	14.0
1996 AHS-MS				
Atlanta, GA MSA	74.2	.06	16.3	9.4
Cleveland, OH PMSA	83.8	.06	3.7	12.4
Hartford, CT MSA	88.0	.1	5.1	6.7
Indianapolis, IN MSA	79.8	.1	11.0	9.2
Memphis, TN-AR-MS MSA	78.8	.04	10.8	10.4
Oklahoma City, OK MSA	80.4	.1	5.4	14.0
St. Louis, MO-IL MSA	81.4	.04	6.7	11.9
Sacramento, CA PMSA	71.4	.1	10.6	17.9
Seattle-Everett, WA PMSA	83.0	.1	11.1	5.8

Group quarters frame. Sampling from the group quarters frame was a two-stage process. In the first stage, census blocks were systematically sampled with a probability proportional to the group quarters measure of size. For institutional group quarters, the measure of size is always equal to one. For noninstitutional group quarters, the measure of size is a function of the number of people living in the group quarters. Based upon a block's measure of size, clusters expected to yield four housing units were then sampled in the second stage. These group quarters were then monitored by field representatives and housing units that came into existence after April 1, 1990, were sampled.

Permit frame. All sample in the permit frame was drawn from a computerized list of new construction building permits issued in each metropolitan area. Housing units authorized by these permits were expected to be completed after April 1, 1990. In certain permit areas and for certain structure sizes, permits issued as early as January 1, 1989, were included. Most permits included in sample, though, were issued after September 1, 1989. Prior to sample selection, the list of permits was sorted by 1990 central city and balance of the metropolitan area, permit office, and the date the permit was issued. Clusters of approximate size four were selected and then were sampled down to one unit. Some of the original clusters were larger than four. These were sampled at 1 in 4.

Area frame. Census blocks were sorted by central city and balance and by the percentage of renter-occupied housing units in the block. Each block was assigned a measure of

size equivalent to total housing units in the block divided by four. A systematic sample of blocks was selected with a probability proportionate to the block's measure of size. Field representatives listed all housing units in these area frame sample blocks. Based upon a block's measure of size, clusters of an expected size of four housing units were then sampled from the field representatives' lists. These listings were also matched back to the 1990 census to obtain census data for the sample housing units. The sample drawn from the field representatives' listings for this frame includes housing units enumerated in the 1990 census, as well as housing units missed during the census and housing units built since the 1990 census in blocks that did not monitor new construction by issuing building permits. In blocks that did issue building permits, nonmobile home housing units built since the 1990 census were screened out.

To reduce field listing costs, a subset of the blocks from the unit frame, that was moved to the area frame to coordinate with another survey, were matched to the census and the 1990 census list of housing units in this subset of blocks was created. These housing units were sorted by address within census block and a systematic sample of housing units (yielding approximately four units per block) was then selected from this sample of blocks. New construction since the 1990 census was captured in the permit frame since new construction in these blocks was covered by the building permit system.

AHS-National Sampling Operations

AHS-National has interviewed the current basic sample of housing units since 1985. First, we divided the United States into areas made up of counties or groups of counties and independent cities, which we refer to as primary sampling units (PSUs). We selected a sample of these PSUs. Then we selected a sample of housing units within these PSUs. If there were a sufficient number of housing units in a PSU, the PSU was known as a self-representing PSU and was in sample with certainty. The sample from the PSU represents only that PSU. All PSUs in these six areas were self-representing PSUs.

Selection of sample housing units. The AHS-National sample consists of the following types of housing units:

- Housing units selected from the 1980 census.
- New construction in areas that issue building permits.
- Housing units missed in the 1980 census.
- Other housing units added since the 1980 census.

We classified the areas within a PSU into two types based on (a) the completeness of the addresses in the areas that make up the PSU and (b) the presence of a system to monitor new construction through building permits.

The two types of areas were known as address enumeration districts (EDs) or area enumeration districts. We selected the sample of 1980 census units differently in the two types of areas.

In *address EDs*, most of the housing-unit addresses were complete, and the construction of new housing units was monitored by building permits (permit-issuing areas). We selected a sample of housing units from the list of units that received long-form questionnaires in the 1980 census.

We also used the census files to select a sample of living quarters in address EDs that did not meet the definition of a housing unit (for example, military barracks, college dorm). We use this sample to identify units that convert to housing units after the 1980 census.

In *area EDs*, 4 percent or more of the 1980 census addresses were either incomplete or inadequate or new construction was not governed by building permits (mostly rural areas).

We selected a sample of housing units from the list of units that received 1980 census long-form questionnaires in several steps. First, we grouped area EDs based on certain characteristics of interest. Then we selected a systematic sample of EDs. We selected a sample of land areas in these EDs. Finally, we selected a sample of housing units that received 1980 census long forms within the land areas.

New construction in permit-issuing areas. The building permit frame covers only nonmobile home new construction. We selected the sample of permit new-construction housing units from permits that were expected to be completed after April 1, 1980. In certain permit areas and for structures of certain sizes, we included permits issued as early as March 1979. But, for the most part, we included permits issued since July 1979. Within each PSU, we selected building permits monthly, based on certain geography characteristics. We created clusters of approximately four housing units and subsampled these clusters to yield clusters of size one. Some of the original clusters were larger than four. These were sampled at 1 in 4.

Housing units missed in the 1980 census. The Census Bureau conducted a special study, called the Housing Unit Coverage Study (HUCS), as part of the 1980 census. This study identified units at addresses missed or inadequately defined in the 1980 census. We included a sample of the units identified in the HUCS in the AHS sample.

Housing units added since the 1980 census. We picked up two other types of units added since the 1980 census: (a) units added within structures containing sample units and (b) whole structure additions that did not contain living quarters at the time of the 1980 census.

Within structure additions. These additions have a chance of being in sample, because there is at least one unit that existed at the time of the 1980 census that was eligible for

selection. We identified these adds in structures with at least one unit selected from the 1980 census sample and the HUCS sample. We also pick up adds in permit new construction; for example, units added since the structure was completed. The rules for identifying within structure additions differed in certain types of areas and frames.

In *area EDs*, all within-structure additions in structures containing at least one sample unit were interviewed for the AHS.

In *address EDs and in the HUCS and building permit frames*, we interviewed all within-structure additions in 1-15 unit structures containing at least one sample unit for AHS. In 16-or-more-unit structures, we only interviewed a sample of units.

Whole structure additions. These types of additions are units in structures that contained no living quarters at the time of the 1980 census. We used area sampling methods to identify these in all types of areas. Under area sampling, we list all housing units within a land area and then select a systematic sample.

To identify whole structure additions in address EDs, we used land areas in sample for the National Health Interview Survey (NHIS). The NHIS uses an area sampling approach in all its sample EDs. We only used NHIS areas that were in AHS PSUs or in NHIS PSUs adjacent to AHS PSUs. Only units that were not already assigned to NHIS were eligible.

We matched these units to the 1980 census address registers. If the address matched to the census, the unit was ineligible. (Only the basic address; that is, 801 Main Street, had to match. Apartment number, mobile home site number, etc., did not have to match.)

When we listed all the units in structure, we screened eligible units further to pick up units with no previous chance of selection. (The screening eliminated units such as nonmobile home new construction, which is covered by building permits, and census misses.) We updated these areas in 1991.

In *area EDs where new construction is not governed by building permits*, we used all land areas chosen for the area ED sample. We selected an expected four units, using area sampling methods, within these land areas to identify whole structure additions. However, we did not match this sample to the census. Instead, we screened this sample, using criteria similar to those used in address EDs. One important difference to note is that we did not eliminate new construction during the screening process. In 1993, we updated half of the land areas (three of six panels). In 1995, we updated the other half of the land areas.

In *area EDs where new construction is governed by building permits*, we only used one-third of the land areas chosen for the area ED sample. We selected an expected eight units using area sampling methods within these areas to identify whole structure additions. We screened this sample using the same criteria as for address EDs. Again, we did not match this sample to the census. The screening

process eliminated nonmobile home new construction, because it is covered by the building permit frame. In 1993, we updated one-half of the land areas. In 1995, we updated the other half of the land areas.

After the 1990 decennial census, certain area EDs switched the management of new construction. Nationally, about 800 EDs changed from not issuing building permits to issuing building permits. About 20 EDs changed from issuing building permits to not issuing building permits.

ESTIMATION

The American Housing Survey produced estimates pertaining to characteristics of the housing inventory at the time of interview (that is, the 1995 and 1996 housing inventory) based on the sample in the metropolitan areas.

Weighting for AHS-MS Metropolitan Areas

The sample housing units were weighted according to a multiple-stage ratio estimation procedure. Before implementation of 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 sample units for which

1. Occupants were not home
2. Occupants refused to be interviewed
3. Occupants were unavailable for some other reason

The calculations for this adjustment included only occupied units. The adjustment was computed separately for the following:

1. All housing units in the unit frame and housing units in the area frame with 1990 census data available.

In this case, we divided housing units by central city and balance into two groups for the purpose of calculating the adjustment. Then we subdivided housing units within central city and balance by tenure status (owner/renter). In other words, the adjustment was calculated separately for owners in the central city, for owners in the balance of the metropolitan area, for renters in the central city, and for renters in the balance of the metropolitan area. Housing units were placed into cells based upon the strata used in the unit frame sampling. We categorized all owner-occupied housing units into 76 cells by the number of rooms in the housing unit and the value of the housing unit at the time of the 1990 census. We categorized all renter-occupied housing units into 51 cells by the number of rooms in the housing unit and the rent paid for the housing unit at the time of the 1990 census.

2. Housing units in the area frame with no data available from the 1990 census, and housing units in the group quarters frame.

Housing units were divided into two groups: housing units in the central city and housing units in the balance of the metropolitan area. Within the balance, housing units were placed in two categories based on frame. We further subdivided units in the central city and the balance depending upon the tenure status and whether the housing unit was a mobile home or not.

3. All housing units from the 1990-based permit frame.

Once again, we divided the housing units into two groups by central city and the balance of the metropolitan area. Within central city and balance, we subdivided the housing units further by tenure status at the time of the interview. Finally, the housing units were split on whether or not they had been constructed within the 4 years preceding this survey yielding a total of eight cells.

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

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

Ratio estimation procedure for the unit frame. We computed a unit frame ratio estimation factor for all housing units in the unit frame. This factor was computed separately for all sample housing units within each unit frame noninterview cell mentioned previously. We introduced this ratio estimation procedure to correct the probabilities of selection for samples in each of the strata used in the sample selection of the unit frame. Prior to the AHS-MS sample selection within each metropolitan area, housing units already selected for other Census Bureau surveys were deleted from the unit frame. The same probability of selection was then applied to the remaining units to select the AHS-MS sample. Since the number of housing units deleted from the AHS-MS unit frame was not necessarily proportional among all strata, some variation between strata in the actual probability of selection was introduced during the sample selection process. The unit frame ratio estimation factor for each cell was equivalent to:

$$\frac{\text{1990 census count of housing units from the unit frame in the corresponding cell}}{\text{AHS-MS sample estimate of housing units in the unit frame in 1990 in the corresponding cell}}$$

For each metropolitan area, the numerators of the factors were obtained from the 1990 Census of Population and Housing.

The denominators of these factors come from weighted estimates of all the AHS-MS housing units in existence at the time of the 1990 census from the unit frame, using the weights available at the time of calculation (that is, the product of the basic weight and the Type A noninterview adjustment factor). The computed unit frame ratio estimation factor is then multiplied by the existing weight for each sample housing unit within the corresponding ratio estimation cells.

Mobile home ratio estimation. To adjust for undercoverage of mobile homes, the following ratio estimation procedure was applied in all areas:

$$\frac{\text{Independent estimate of mobile homes for the corresponding geographic subdivision of the metropolitan area}}{\text{Sample estimate of mobile homes for the corresponding geographic subdivision of the metropolitan area}}$$

The numerator of this ratio was determined using data from the 1980 census and the 1990 census. Based upon the increase or decrease in the number of mobile homes between 1980 and 1990, the Census Bureau was able to estimate the total number of mobile homes in the survey year (1995 or 1996). The denominator was obtained using the existing weight of AHS-MS sample mobile home units (that is, the product of the basic weight and the weighting 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.

The effect of this ratio estimation procedure was to reduce 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, it can be expected that the sample housing population, or different portions of it, is brought into agreement with known good estimates of the metropolitan area housing population.

The following ratio estimation procedure was applied in all areas.

$$\frac{\text{Independent estimate of the total housing inventory (excluding mobile homes) for the corresponding geographic subdivision of the metropolitan area}}{\text{Sample estimate of the total housing inventory (excluding mobile homes) for the corresponding geographic subdivision of the metropolitan area}}$$

We determined the numerator of this ratio by making adjustments to the 1990 census data to account for residential new construction as well as losses to the housing inventory since the 1990 census. These estimates were generated at the county level and combined to form geographic subdivisions. For a more detailed description of how these numbers are obtained, refer to a description of a similar process at the state level in the *Current Population Report*, Series P-25, no. 1123. The denominator was obtained using the existing weight of AHS-MS sample units, excluding mobile homes (that is, the product of the basic weight and the weighting factor).

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.

Weighting for AHS-National Metropolitan Areas

The sample housing units were weighted according to a one-stage ratio estimation procedure. Before implementation of 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 sample units for which

1. Occupants were not home
2. Occupants refused to be interviewed
3. Occupants were unavailable for some other reason

When prior year AHS-National or 1980 census data are available, we use this information to determine the noninterview adjustment cell. The cells include the following characteristics: tenure, geography, units in structure, number of rooms, and value.

When previous data are not available, we compute adjustment factors using geography and tenure.

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

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

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.

The effect of this ratio estimation procedure was to reduce 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, it can be expected that the sample housing population, or different portions of it, is brought into agreement with known good estimates of the metropolitan area housing population.

The following ratio estimation procedure was applied in all areas:

$$\frac{\text{Independent estimate of the total housing inventory for the corresponding geographic subdivision of the metropolitan area}}{\text{Sample estimate of the total housing inventory for the corresponding geographic subdivision of the metropolitan area}}$$

The numerator of this ratio was determined by making adjustments to the 1990 census data to account for residential new construction as well as losses to the housing inventory since the 1990 census. These estimates were generated at the county level and combined to form geographic subdivisions. For a more detailed description of how these numbers are obtained, refer to a description of a similar process at the state level in the *Current Population Report*, Series P-25, No. 1123. The denominator was obtained using the existing weight of AHS sample units (that is, the inverse of the probability of selection times the Type A Noninterview Adjustment Factor).

The computed ratio estimation factor was 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.

AHS-NATIONAL TELEPHONE EXPERIMENTS

The Census Bureau used only personal visit interviewing for the 1995 and 1996 AHS-MS. For the 1995 AHS-National, however, we used three different methods of interviewing: personal visit, decentralized telephone interviewing, and computer assisted telephone interviewing (CATI). Table D contains the percentages of interviews by method of interviewing for each of the 6 metropolitan areas. CATI was generally assigned to areas where it is difficult to hire and retain field representatives. These areas are typically large urban PSUs.

Table D. Percentages of AHS-National Interviews by Method of Interviewing for Each of the Six Metropolitan Areas

Metropolitan area	Interviews conducted using CATI	Interviews conducted using decentralized telephone interviewing	Interviews conducted by personal visits
Chicago IL, PMSA	14.6	19.5	65.9
Detroit MI, PMSA	16.5	15.6	67.9
Los Angeles-Long Beach CA, PMSA	11.4	11.1	77.5
New York-Nassau-Suffolk-Orange NY, PMSA's	26.0	26.6	47.4
Northern New Jersey PMSA's	30.4	18.2	51.4
Philadelphia PA-NJ, PMSA	16.1	21.9	62.0

The effects of these different modes of telephone interviewing were analyzed in the following experiments conducted prior to 1995:

1. **Decentralized telephone interviewing.** A large decentralized telephone interviewing experiment was introduced for the 1983 AHS-National. Before 1983, all interviews were done by personal visits. We concluded telephone interviewing affected the data by:
 - Increasing the item nonresponse rate for income items (this did not appear to cause changes in the publication estimates)
 - Underreporting problems with neighborhood quality
2. **Computer assisted telephone interviewing (CATI).** We conducted large-scale Computer Assisted Telephone Interviewing experiments as part of the 1987, 1989, and 1991 enumerations for AHS-National. Although there were differences between CATI and non-CATI data in 1987, 1989, and 1991, we recommended continuing CATI for the AHS-National because of the positive aspects of CATI.

Positive aspects of CATI.

- Supervisors have the ability to monitor and observe inexperienced CATI interviewers while they collect data.
- We could hire fewer new interviewers if we use CATI in geographic areas with interviewer retention problems.

- We can continue to use CATI in these areas to reconcile questionable results from previous enumerations and to improve AHS data quality.

Possible effects of CATI on the data. Each of these experiments determined that there is strong evidence that differences exist in data collected using CATI versus non-CATI methods. Although we do not know which method provides better data, we speculate that CATI income estimates are probably better, but that some other estimates are probably worse. Because of the results from the analyses of the 1987 and 1989 experiments, we made changes to the CATI interview in 1991. These changes resulted in substantial reductions in “don’t know” responses and fewer significant differences.

Additional information on the changes made in the CATI interview for 1991 and the results of the analyses of the 1987-91 CATI experiments is available in the *Current Housing Report, Series H150/95*.

You can get detailed information on which specific characteristics are affected and the extent of the effect by writing to:

Demographic Statistical Methods Division
 Bureau of the Census
 Washington, DC 20233

Reconciliation experiment. As part of the CATI, we conducted reconciliation studies in 1987, 1989 and 1991. If the responses for a particular year differed from the previous year, we asked the respondent to explain the difference. Our goal was to determine if there was a change since the previous year or if one of the responses was wrong.

The reconciliation studies indicated respondents had difficulty reporting items such as the following: presence of basement, heating equipment, and heating fuel.

1991 moderate physical problems (MPPs) study. In 1991, an experiment was done to determine why CATI reported fewer moderate physical problems (MPPs) than non-CATI. This study indicated that the lower estimates of MPPs found by CATI were likely caused by CATI underestimating MPPs and non-CATI overestimating MPPs.