Methodology for the Subcounty Total Resident Population Estimates (Vintage 2007): April 1, 2000 to July 1, 2007

NOTE: These estimates include adjustments due to the effects of hurricanes Katrina and Rita. For a description of these adjustments, refer to Special Processing Procedures for the Areas Affected by Hurricanes Katrina and Rita at: http://www.census.gov/popest/topics/methodology/.

BACKGROUND

The U.S. Census Bureau produces estimates of total resident population for all areas of general-purpose government on an annual basis. The subcounty areas consist of both incorporated places, such as cities, boroughs, and villages; and minor civil divisions such as towns and townships. We use a housing unit method to distribute county population to subcounty areas based on housing unit change. County population estimates are produced with a component of change population method, which updates the latest census population using data on births, deaths, and internal and international migration. A more detailed description of the county estimates methodology is at: <www.census.gov/popest/topics/methodology/2007-st-co-meth.html>.

Housing unit estimates are aggregated to the county and state summary levels and released as a separate data product.

METHODOLOGY

The Census Bureau develops subcounty population estimates for the household and group quarters populations and adds them together. To estimate the household population, the Census Bureau uses the "Distributive Housing Unit Method" which uses housing unit estimates to distribute the county population to subcounty areas within each county.[1] Housing unit estimates use building permits, estimates of construction where no building permits are reported, mobile home shipments, and estimates of housing unit loss to update housing unit change since the last census. Census 2000 base counts of housing units are geographically updated each year to reflect legal changes reported in the Boundary and Annexation Survey (BAS), other geographic program revisions, and census corrections.

The Census Bureau multiplies the occupancy rate and average persons per household (PPH) from the latest census at the subcounty level by the estimate of housing units. The estimate obtained from this method is then controlled to the final county population estimate. The assumption implicit in this method is that changes in the occupancy rate and/or the PPH are measured by the updated county population estimate and that the rate of change in the occupancy rate and/or PPH is uniform within counties.

The non-household population is measured by the change in the group quarters population. We produce the final estimate by adding the group quarters population to the household population.

The estimates are produced using the following steps:

A. Household Population

Step 1. Estimating Housing Units

We produce housing unit estimates for each area by the component model described below. The July 1, 2007 estimates are used here as an example.

$$HU_{07} = HU_{00} + NC_{07} + NM_{07} - HL_{07}$$

Where:

HU_{07} = Estimated 2007 housing units
HU_{00} = Census 2000 housing units retabulated to current geography
NC_{07} = Estimated new residential construction, April 1, 2000 to July 1, 2007
NM_{07} = Estimated new residential mobile home placements, April 1, 2000 to July 1, 2007
HL_{07} = Estimated residential housing loss, April 1, 2000 to July 1, 2007

1A. Census 2000 Housing Units (HU_{00}) -- Census 2000 housing units at the subcounty level reflect boundary updates that are legally effective as of January 1, 2007. The housing unit counts also include Count Question Resolution (CQR) actions, and geographic program revisions benchmarked in the Master Address File (MAF)/TIGER Database through May of 2007.

1B. Estimated Residential Construction (NC_{07}) --New residential construction is calculated using the following formula:

$$NC_{07} = (BP_{07} * 0.98) + NPC_{07}$$

Where:

NC_{07} = Estimate of new residential construction for the period: April 1, 2000 to July 1, 2007
BP_{07} = The residential building permits that result in the construction of new units for the period April 1, 2000 to July 1, 2007 include permits issued in calendar years

2000–2006 (allowing for a six-month lag time between permit issuance and completed construction).

NPC_{07} = Estimate of new residential construction in non-permit issuing areas for the period: April 1, 2000 to July 1, 2007

Note: We assume that using ¼ of the residential construction input data for the year 2000 represents the three-month period from April 1, 2000 to July 1, 2000.

Building permit data are compiled from internal data files developed by the Census Bureau's Manufacturing and Construction Division (MCD). These files include imputed permits where a jurisdiction did not report permit issuance for the entire year.

Two percent of all building permits never result in the actual construction of a housing unit (as derived from U.S. Census statistics on housing starts and completions; available on the Census Bureau website at http://www.census.gov/const/www/newresconstindex.html). Therefore, a factor of 0.98 is used to estimate completed new units.

The annual Survey of Construction (SOC) produces regional estimates of housing units constructed in non-permit issuing jurisdictions. The regional SOC estimates are then distributed to all subcounty areas where MCD lacks building permits for the estimates period. This distribution is based on the subcounty area's share of the regional total of units in nonpermit-issuing jurisdictions as of Census 2000.

1C. Estimated New Mobile Home Placements (NM_{07}) --The Census Bureau lacks updated data at the subcounty level on mobile home placements. We derive estimates for mobile homes by allocating state mobile home shipment data to subcounty areas based on their area's share of state mobile homes in Census 2000.

We receive monthly reports on mobile home shipments from MCD. These monthly reports are summed to calculate the annual total of state mobile home shipments.

To allocate the state mobile home shipment data to subcounty areas, we apply the subcounty area's share of state mobile homes as of Census 2000 to the updated number of state mobile home shipments. The type of structure question indicating that a housing unit is a mobile home was on the sample questionnaire in Census 2000. The following steps describe the process we use to produce sample data consistent with the 100-percent housing unit data in current geography:

1. Each unit in the Sample Edited Detail File (SEDF) is matched to the

geographically updated 100-percent Detail File (HDF) extract, by unit identification number.

2. The updated geographic codes from the HDF (higher level, census tract, and block) are applied to the SEDF records.
3. The sample data are retabulated with the sample weights for the primitive geographic areas into which they belong after the geographic update. [2]
4. The sample data tallies in each primitive geographic area are multiplied by the ratio of housing units in the tabulation Census 2000 HDF to the housing units in the tabulation Census 2000 SEDF.
5. The results are aggregated to all estimates geography summary levels.

1D. Estimated Housing Loss (HL_{07}) -- Housing unit loss is calculated by applying an annual rate of loss to the previous year's housing unit estimate. The 2007 estimates of housing unit loss are based on data derived from the 1997-2003 American Housing Survey (AHS) national sample. The following three types of AHS housing situations are 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 Mobile Home moved

Annual housing unit loss rates based on these types of housing loss were then developed for housing units based on structure type and age of structure. Type C, 31 houses were excluded before the final rate was computed. The rates for the categories are as follows:

Category:	Rate:
House, Apartment, or Flat built in:	
1990-1997:	0.031 percent
1980-1989:	0.054 percent
1970-1979:	0.103 percent
1960-1969:	0.172 percent
1950-1959:	0.249 percent
1940-1949:	0.324 percent
Pre-1940:	0.364 percent
Mobile Homes:	1.58 percent
Other:	0.19 percent
Overall loss rate:	0.295 percent

The type and age of housing units in Census 2000 for each governmental unit are used to estimate its housing unit loss. Other housing includes a variety of situations not defined above, including boats, recreational vehicles, or other housing arrangements.

1E. Estimates Review –The housing unit estimates are distributed to members of the Federal State Cooperative Program for Population Estimates (FSCPE) for review. Some FSCPE members provide revisions to the preliminary estimates of housing units based on information they compile from the jurisdictions within their respective states. Submitted revisions to the housing unit estimates are reviewed and often result in changes to the final housing unit estimates.

Step 2. Producing an Uncontrolled Subcounty Household Population Estimate

The uncontrolled subcounty household population estimate follows this equation:

$$UCHHP_{07} = HU_{07} * OCC_{00} * PPH_{00}$$

Where:

$UCHHP_{07}$ = Uncontrolled subcounty household population estimate for 2007
HU_{07} = July 1, 2007 housing unit estimate
OCC_{00} = Census 2000 occupancy rate
PPH_{00} = Census 2000 persons per household

Step 3. Producing a Controlled Subcounty Household Population Estimate

The final step in producing a household population estimate is to control the

uncontrolled subcounty estimates to the published county totals. The following equation describes the calculation of a controlled household estimate:

$$SCHHEST_{07} = UCHHP_{07}*(CHP_{07}/SUCHHP_{07})$$

Where:
$SCHHEST_{07}$ = 2007 subcounty household population estimate
$UCHHP_{07}$ = Uncontrolled subcounty household population estimate for 2007
CHP_{07} = County 2007 household population estimate
$SUCHHP_{07}$ = County sum of $UCHHP_{07}$ for all subcounty areas

Step 4. Group Quarters Population Estimate

The group quarters component of the total estimate is primarily a combination of military personnel living in barracks, college students living in dormitories, and persons residing in other types of institutions. Inmates of correctional facilities and persons in health care facilities also are included in group quarters.

We use group-quarters population data from two sources to estimate subcounty populations: (1) Census 2000 counts of group-quarters population by facility type for each subcounty area, and (2) a time series of individual group-quarters records from the Group Quarters Report (GQR). State representatives of the Federal State Cooperative Program for Population Estimates (FSCPE) prepare the GQR.

These two sets of group-quarters population data are used to derive a time series of group-quarters population through the following process:

Part 1. We sum the facility-level group quarters populations from the GQR to the subcounty level by the seven facility types for each estimate date in the time series. Then, we calculate the year-to-year change indicated by the aggregated GQR time series of population.

Part 2. We aggregate the group quarters population from Census 2000 to the subcounty level by the seven facility types. Then, we apply the time series of numeric year-to-year change to the Census 2000 data to create a census-based time series of group quarters population at the subcounty level for each of the seven facility types.

Step 5. Final Subcounty Population Estimate

To produce the final subcounty population estimate, the controlled household population estimate and the group quarters population estimate are added together.

$$SCEST_{07} = SCHHEST_{07} + GQ_{07}$$

$SCEST_{07}$ = Final 2007 subcounty population estimate
$SCHHEST_{07}$ = 2007 subcounty household population estimate
GQ_{07} = 2007 subcounty group quarters population estimate

Step 6. Estimates Review

Before public dissemination, the subcounty population estimates are distributed to FSCPE members for review. Some FSCPE members provide revisions to the preliminary estimates of population based on their own analysis.

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[1] Includes the following statistical equivalents: parishes (Louisiana), boroughs and Census Areas (Alaska).
[2] *Primitive* geography describes a partition of the country into the lowest level of mutually exclusive entities that can be aggregated to all higher levels of geography for which the Census Bureau produces estimates.