Methodology for the Subcounty Total Resident Population Estimates (Vintage 2008): April 1, 2000 to July 1, 2008

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/2008-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 the subcounty level 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:

Step 1. Estimating Housing Units

We produce updated housing unit estimates for each area using a component model of change. In this model we add together the Census 2000 count of housing units, estimated new residential construction (from April 1, 2000 to December 31, 2007), and estimated new residential mobile home placements (from April 1, 2000 to July 1, 2008).[2] From this number we subtract the estimated residential housing loss from April 1, 2000 to July 1, 2008. We combine these data to produce a set of preliminary housing estimates. The final housing estimates may reflect updates from the Federal-State Cooperative Program for Population Estimates (FSCPE) Member agencies and local jurisdictions. Each component in the housing estimates is described below.

Census 2000 Housing Units

Census 2000 housing units compiled at the subcounty level reflect boundary updates that are legally effective as of January 1, 2008. The housing units also include the results of any Count Question Resolution (CQR) actions and geographic program revisions benchmarked in the Master Address File (MAF)/TIGER Database through May of 2008.

Estimated Residential Construction

Residential construction is by far the largest component in the residential housing estimates component model. We estimate new residential construction in two parts: estimates of permitted and non-permitted construction.

Permitted Construction

Building permits cover approximately 98 percent annually of the new housing units nationwide and include data from approximately 20,000 jurisdictions. The building permit data are compiled by the Census Bureau's Manufacturing and Construction Division (MCD) through its annual Building Permit Survey. The survey data report the

number of residential building permits reported in calendar years. We aggregate this data for all years from 2000 through 2007 in order to develop our set of housing estimates. Implicit in this method of selecting and applying permits for whole calendar years in the component method is an assumption of an average six-month lag time between <u>when</u> a residential permit is issued and <u>when</u> the residence is completed. Thus, permits that are reported in the last six-month period before the July 1 estimate are excluded. Looked at another way, we exclude permits reported in the first six months of the calendar year in which the mid-year housing estimate are being prepared. This method is employed to ensure that the housing estimates are not inflated for construction that is not usually completed within six months of being reported as a building permit.[3]

We reduce the number of permitted annual calendar year construction by multiplying it by a factor of 0.98 to estimate the number of completed new units. We employ this approach based upon reports from other census studies that indicate that, on average, two percent of all building permits never result in the construction of a housing unit. This approach is applied uniformly across the United States.

Non-Permitted Residential Construction

We compile estimates for areas of non-permitted residential construction based upon the annual Survey of Construction (SOC) conducted by MCD. The survey produces annual regional estimates of housing units constructed in non-permit issuing jurisdictions. Within each region, we distribute each year's regional SOC estimate to the jurisdictions that did not report building permits to MCD for the corresponding calendar year. We base the distribution of the regional non-permitted construction to non-reporting jurisdictions based upon its share of the regional total of housing units enumerated as of Census 2000.

Combined Permitted and Non-Permitted Construction

Finally, we combine the estimates of non-permitted construction in non-permit issuing jurisdictions, for the period of April 1, 2000 to December 31, 2007, with the estimates of new residential construction in permit issuing jurisdictions to produce a uniform set of estimated new residential construction between April 1, 2000 and December 31, 2007 for all jurisdictions nationwide.

<u>Estimated New Mobile Home Placements</u>

The Census Bureau does not have available any updated data reported at the subcounty level on mobile home placements. However, we do acquire data that reports mobile home shipment data by state. We receive monthly reports on mobile home shipments

from MCD. We sum these monthly reports to calculate the annual (actually estimate year) total of state mobile home shipments. We then allocate the updated state mobile home shipment data to subcounty jurisdictions based on their share of state mobile homes estimated from Census 2000 sample data. We used the Type of Structure question on the sample questionnaire in Census 2000 to derive an estimate of residences that were mobile homes.[4]

Estimated Housing Loss

Housing unit loss is calculated by applying an annual rate of loss to the previous year's housing unit estimate. The 2008 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 is 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 jurisdiction are used to estimate its housing unit loss. The "Other" housing category includes a variety of situations not defined above, including boats, recreational vehicles, or other housing arrangements.

One final note: We also assume that using ¼ of the calendar year 2000 permits adequately represents the amount of new construction during the short three-month period from April 1, 2000 to July 1, 2000.

Estimates Review

The housing unit estimates are produced in preliminary form and 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 result in improvements to the final housing unit estimates.

Step 2. Producing an Uncontrolled Subcounty Household Population Estimate

The uncontrolled subcounty household population estimate begins with the July 1, 2008 housing unit estimate. We multiply this estimate by the Census 2000 occupancy rate and then by the Census 2000 persons per household to produce the uncontrolled population estimate.

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. To do this, we divide the 2008 county household population estimate by the sum of all of the uncontrolled subcounty household population estimates within the county. This quotient is then multiplied by the uncontrolled subcounty household population estimate calculated in Step 2. This calculation produces the controlled subcounty household population estimate.

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.

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] The different time frames of estimated new residential construction and estimated new mobile home placements result from the assumption of a six-month lag time for residential construction. See the *Permitted Construction* paragraph for further explanation.
[3] The basis for this approach is documented in http://www.census.gov/const/avg_starttocomp.pdf.
[4] The following steps describe the process we use to produce sample data consistent with the 100-percent housing unit data in current geography:
A. 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.
B. The updated geographic codes from the HDF (higher level, census tract, and block) are applied to the SEDF records.

C. The sample data are re-tabulated with the sample weights for the primitive geographic areas into which they belong after the geographic update. (Note: *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.)

D. 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.

E. The results are aggregated to all estimates geography summary levels.