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2006 Population Estimates for
Zip Code Tabulation Areas (ZCTAs) and Primary Care Service Areas (PCSAs)

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Background

The objective of this task is to estimate recent population counts and socioeconomic measures for Primary Care Service Areas. Projecting population changes is a complex process that requires the analysis of births, deaths, and migration for each geographic area of interest. Small area population estimates are more difficult because demographic changes can be unpredictable and interdecennial census data for small areas are limited. The Population Estimates Program of U.S. Census Bureau releases annual (July 1) population and housing unit estimates for the United States and for each state and county. The U. S. Census does not provide estimates for smaller census areas, such as ZIP Code Tabulation Areas (ZCTA), Census Tracts, Block Groups, and Blocks. While each state also develops population estimates generally at the county and city level, these use differing estimation methods and are difficult to merge into a national data set.

We researched several companies that develop and market population estimates for smaller census areas such as census tracts, block groups, or blocks. None develop population estimates for ZCTAs, however, Claritas, a marketing information resources company, has a demographic estimation program to provide small area population estimates for block groups. Each year, Claritas estimates populations and economic indicators such as median household income based on several sources including U.S. Census county level estimates, local estimates, trends in USPS deliverable address counts, and consumer counts from the Equifax Consumer Marketing and TotalSource databases. A detailed description of Claritas methods is attached with this documentation.

Claritas reliance on Census data can lead to some apparent discrepancies in population estimates. The Census Bureau may revise population estimates for some areas based on *challenges* from the local government. *Challenges* here mean if governmental units such as counties or cities are dissatisfied with the annual population estimates provided by the Census Bureau, they can file a challenge to Census Bureau. If Census Bureau accepts the challenge and revises the population estimate, this revision is published on the Census website. The 2005 challenges can be found at http://www.census.gov/popest/archives/2000s/vintage_2005/05s_challenges.html. Some Census Bureau revisions are published after Claritas Demographic update has been completed and released (usually April 1). Caution should be taken when these challenged areas are of interest.

Data sources

We obtained year 2006 block group population estimates for 208,649 original Census 2000 block groups from Claritas. A few block group changes occurred because some counties changed in 2001 (Refer Attachment A for more information.). Estimates were provided for the following:
– Total population
– Gender

- Seven single race classifications (White alone, Black or African American alone, American Indian and Alaska Native alone, Asian alone, Native Hawaiian and Other Pacific Islander alone, Some other race alone, and Two or more races)
- 18 age groups: 0-4, 5-9, 10-14, 15-17, 18-20, 21-24, 25-34, 35-44, 45-49, 50-54, 55-59, 60-64, 65-74, 75-84, 85+, and 18+, 21+, 65+.
- Seven gender/race/age cross-tabulations
- Ethnicity (Hispanic or Latino)
- Group quarters populations (College dormitories, Military quarters, Correctional institutions, Nursing homes and Other institutions)
- Total number of households
- Median household income

The reference date for the Claritas estimates is April 1, 2006. We calculated one additional race category: Non-White and Non-Black, which is defined as the total population less White alone and Black alone. We also calculated one additional age category: 0-17 years old, and one additional ethnicity category: Non-Hispanic, which is defined as total population less Hispanic population.

Method

There are about eight million census blocks. These are the smallest geographic units used by the Census for enumeration. Blocks are also the primary components of block groups and ZCTAs and can be aggregated into either. However, there is no direct geographic relationship between a ZCTA and its block groups. For example, block groups can extend beyond the boundaries in one ZCTA to an adjacent ZCTA. On the other hand, census blocks are discrete and can be uniquely assigned to a ZCTA. Attachment B provides the hierarchical relationships between the different geographical types in the 2000 US Census.

Using Claritas 2006 estimates for census block groups, we prepared estimates at the block level, with data quality checks to ensure that our block group estimates (i.e., the sum of our block estimates) matched those provided by Claritas. The estimates for each ZCTAs component blocks were then summed to arrive at estimates for the 32,011 ZCTAs. From the ZCTA level estimates, we then aggregated component ZCTAs to arrive at estimates for the 6,542 PCSAs.

This process is explained in greater detail for estimates of populations, ethnicity populations, civilian population, households, and median household income.

A. Population estimates

We assumed that the proportion of population for each small stratum (gender/race/age) in the blocks within the same block groups was the same in 2000 and 2006.

Step 1. Calculate proportion of 2000 Block to 2000 Block Group population by gender/race/age

$$X = \text{2000 Block population/2000 Block Group population}_{\text{at gender/race/age}}$$

Step 2. Estimate 2006 Block population by applying X to 2006 Block Group population by gender/race/age

$$\text{Population at Block 2006}_{\text{at gender/race/age}} = \text{Block Group 2006} * X_{\text{at gender/race/age}}$$

Step 3. Sum each ZCTA's component Block populations to the ZCTA level

Step 4. Sum each PCSA's component ZCTA populations to the PCSA level

The output from processing the population estimates consists of the following population categories and variable counts:

- Total population (1 variable)
- Gender alone (2 variables)
- Age alone (19 age variables: 0-4, 5-9, 10-14, 15-17, 18-20, 21-24, 25-34, 35-44,45-49, 50-54, 55-59, 60-64, 65-74, 75-84, 85+, 0-17, 18+, 21+, and 65+)
- Race alone (8 variables: White, Black, Non-White and Non-Black, American Indian and Native Alaskan, Asian, Native Hawaiian or Other Pacific Islander, Two or More Races, and Some Other Race)
- Gender and Age (38 variables: Male or Female by 19 age categories)
- Race and Age (57 variables: White, Black, or Non-Black and Non-White by 19 age categories)
- Gender and Race (6 variables: Male or Female by White, Black or Non-White and None-Black)
- Race, Gender and Age (304 variables: 8 race categories by 2 gender categories by 19 age categories)

We also calculated percentage of total population for 9 groups (Male, Female, White alone, Black alone, Non-White and Non-Black, Age 0-17, Age 18+, Age 21+, and Age 65+).

B. Ethnicity Population estimates

We assumed that the proportion of the population for each small stratum (Hispanic/gender/age) in the blocks within the same block groups was the same in 2000 and 2006.

Step 1. Calculate proportion of 2000 Block to 2000 Block Group population by Hispanic/gender/age.

H = 2000 Block population/2000 Block Group population $_{\text{at Hispanic/gender/age}}$

Step 2. Estimate 2006 Block population by applying H to 2006 Block Group population by Hispanic/gender/age.

Population at Block 2006 $_{\text{at Hispanic/gender/age}}$ = Block Group 2006 * H $_{\text{at Hispanic/gender/age}}$

Step 3. Sum each Hispanic, gender and age compositions to get the Hispanic population at block level.

Step 4. Sum each ZCTA's component Block populations to the ZCTA level.

Step 5. Sum each PCSA's component ZCTA populations to the PCSA level

We provide Hispanic population estimate as well as the Non-Hispanic population estimate. Non-Hispanic population is equal to total population less Hispanic population.

Due to the population proportion variations among the small strata, some high percentage Hispanic resident blocks may have Hispanic population estimate greater than total population estimate. Please see one example in Attachment C. This problem was not significant at the larger area like ZCTA and PCSA. When it occurred, we capped the Hispanic population estimate to make it equal to total population. These ethnicity population estimates are not robust and caution should be taken when using them.

C. Civilian Population estimate

The civilian population is defined as the non-institutionalized population. Population counts for college dormitories and military quarters are excluded as well as persons in nursing homes, correctional facilities and other institutions. We assumed that the proportion of civilian population in blocks within the same block groups was the same in 2000 and 2006.

Step 1. Calculate proportion of 2000 Block to 2000 Block Group civilian population.

Y = 2000 Block civilian population/2000 Block Group civilian population

Step 2. Estimate 2006 Block civilian population by applying Y to 2006 Block Group civilian population.

2006 Civilian population at Block 2006 = 2006 Civilian population at Block Group * Y

Step 3. Sum each ZCTA's component Block populations to the ZCTA level.

Step 4. Sum each PCSA's component ZCTA populations to the PCSA level.

Similar to Hispanic population estimate, some high percentage civilian resident blocks may have civilian population estimate greater than total population estimate. Please refer to one Hispanic example in attachment C. When it occurred, we capped the civilian population estimate to make it equal to total population. The civilian population estimates are not robust and caution should be taken when using them.

For all the population estimates, there were instances where there was no population in a block group in 2000 but there was one in 2006, especially at the small strata (gender/race/age) level. In this situation, we assumed that the population changes were the same for all the blocks within that block group, so that equal fraction assignments to the blocks within the block group occurs. This method may misrepresent the population counts when the blocks are aggregated to the ZCTA level and may cause biased estimates, so caution should be taken.

D. Households and median household income estimates

We assumed that the proportion of households of blocks within the same block groups were the same in 2000 and 2006, and also assumed a consistent growth of income per household within block and block group.

Step 1. Calculate proportion of households of 2000 Block to 2000 Block Group.

Z = Number of 2000 Block households/Number of 2000 Block Group households

Step 2. Estimate number of 2006 households at the Block level

$\text{2006 Households}_{\text{at block}} = \text{2006 Households}_{\text{at block group}} * Z$

Step 3. Calculate 2006 total income at Block Group level

$\text{Income 2006}_{\text{at block group}} = \text{2006 Median Household Income} * \text{2006 Number of households}$

Step 4. Estimate 2006 total income at the Block level

$\text{Income 2006}_{\text{at block}} = \text{Income 2006}_{\text{at block group}} * Z$

Step 5. Estimate ZCTA median household income by Block household income, weighted by number of households at the Block level

Step 6. Estimate PCSA median household income by ZCTA household income, weighted by number of households at the ZCTA level

We provide the number of households and median household income.

County Change Notices
(source: http://www.itl.nist.gov/fipspubs/fip6-4.htm)

DATE OF CHANGE: JANUARY 24, 2002

The NIST has been notified by the U.S. Census Bureau that Broomfield County, Colorado, has been created from parts of Adams (001), Boulder (013), Jefferson (059), and Weld (123) counties effective November 15, 2001. The boundaries of Broomfield County reflect the boundaries of Broomfield city legally in effect on November 15, 2001. To maintain the alphanumeric sequence of counties, Broomfield County will have a code of 014 for FIPS 6-4, Counties and Equivalent Entities of the United States, Its Possessions and Associated Areas.

Please refer questions to Dorothy Stroz at the Bureau of the Census, (301) 457-1099.

DATE OF CHANGE: JULY 7, 2001

The independent city (county-equivalent) of Clifton Forge, Virginia, has reverted to town status, effective midnight, July 1, 2001. Clifton Forge is now an incorporated place within Alleghany County, rather than a separate county-equivalent surrounded by Alleghany County.

This action will reduce the number of Virginia independent cities to 39 and the number of United States counties and equivalent areas to 3,141. The action reduces the total number of independent cities in the United States to 42.

The FIPS county code of 560 for Clifton Forge, Virginia, is deleted. The FIPS-55 class code will change from C7 to C1. The census place code of 0285 and FIPS-55 code of 17440 are unaffected. The FIPS county code of 005 for Alleghany County remains unchanged.

Please refer questions to Dorothy Stroz at the Bureau of the Census, (301) 457-1099.

Claritas 2006 population estimate has incorporated these changes. There are a total of 208,667 unique block groups in Claritas 2006 population data, which represents the 208,649 original Census block groups. In order to perform our estimation, we restored the block groups in Broomfield County and part of the Alleghany County back to their original counties as of Census 2000. For Broomfield County, we used the unique combination of "census tract + block group" to merge back. For example if we found census tract "002002" and block group "4" in Broomfiled County (014), and we also found the same tract and block group combination in Weld county (123) in Census 2000 data, we reassigned this block group to Weld County (123). We also reassigned the 4 Block Groups in Alleghany County back to Clifton Forge County. By doing this we were able to correctly calculate the proportion.

Census Geography

Through its many surveys, the Census Bureau reports data for a wide variety of **geographic types**, ranging from the entire *United States* down to a *Census Block*. The geographic types that a survey reports on will depend upon the survey's purpose, and how the data were collected.
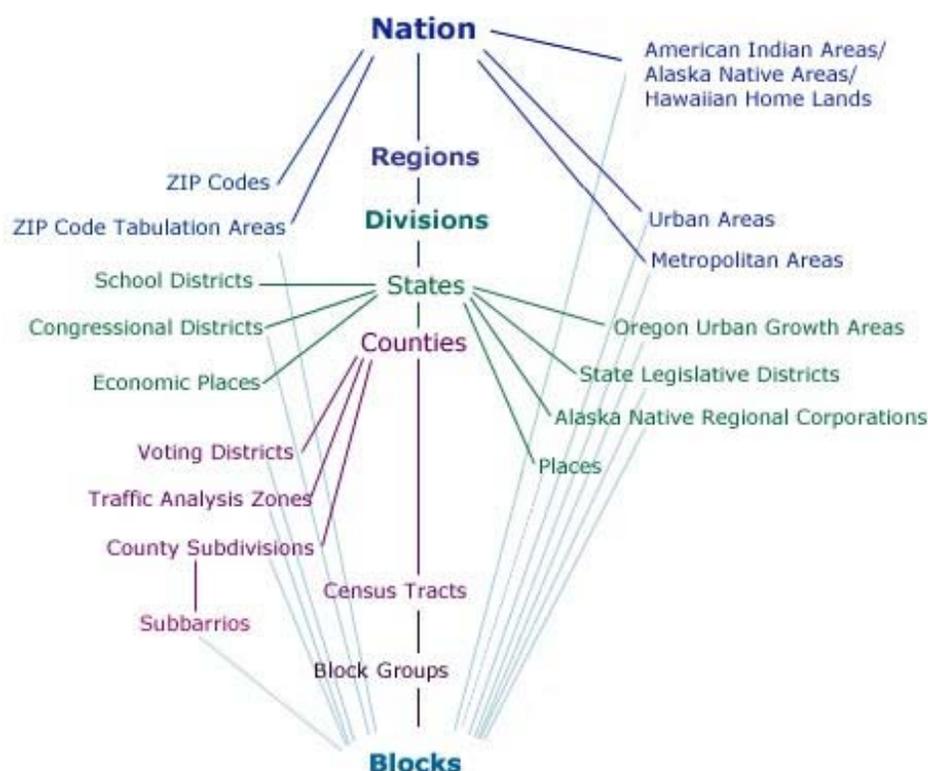
The diagram shows the many geographic types for which data are available in FactFinder. In general, larger geographic types (e.g., *state*) are shown near the top and smaller geographic types (e.g., *census tract*) are shown towards the bottom.

With connecting lines, the diagram also shows the hierarchical relationships between geographic types. For example, a line extends from *states* to *counties* because a state is comprised of many counties, and a single county can never cross a state boundary. To uniquely name a county, the state name must be included (e.g., Orange County, California; Orange County, Florida).

If no line joins 2 geographic types, then an absolute and predictable relationship does not exist between them. For example, many places are confined to one county. However, some places extend over more than one county, such as New York City. Therefore, an absolute hierarchical relationship does not exist between *counties* and *places*, and any tabulation involving both these geographic types may represent only a part of one county or one place.

Notice that many lines radiate from *blocks*, indicating that most geographic types can be described as a collection of blocks, the smallest geographic unit for which the Census Bureau reports data. However, only two of these lines also describe the path by which a block is uniquely named. That is, the path through the *Block Group* or through the *Tribal Block Group*.

source: http://factfinder.census.gov/home/en/epss/census_geography.html

Hispanic Population Estimate Study								
State TX (48), County 215, Tract 023506, Block Group 2, Block 2068, Age 0-4								
Block Level 2006		**Block Group 2000**		**Block Group 2006**		**Block Level 2000**		
b06_HM	18.01	bg00_HM	477	bg06_HM	716	b00_HM	12	
b06_HF	22.52	bg00_HF	475	bg06_HF	713	b00_HF	15	
Hispanic Pop:	40.53		952		1429		27	
b06_WM	10.16	bg00_WM	296	bg06_WM	334	b00_WM	9	
b06_WF	10.20	bg00_WF	263	bg06_WF	298	b00_WF	9	
b06_BM	0.00	bg00_BM	1	bg06_BM	3	b00_BM	0	
b06_BF	0.00	bg00_BF	2	bg06_BF	3	b00_BF	0	
b06_NM	0.00	bg00_NM	3	bg06_NM	5	b00_NM	0	
b06_NF	0.00	bg00_NF	1	bg06_NF	2	b00_NF	0	
b06_AM	0.00	bg00_AM	1	bg06_AM	1	b00_AM	0	
b06_AF	0.00	bg00_AF	0	bg06_AF	0	b00_AF	0	
b06_IM	0.00	bg00_IM	0	bg06_IM	0	b00_IM	0	
b06_IF	0.00	bg00_IF	0	bg06_IF	0	b00_IF	0	
b06_OM	6.50	bg00_OM	167	bg06_OM	362	b00_OM	3	
b06_OF	12.31	bg00_OF	192	bg06_OF	394	b00_OF	6	
b06_TM	0.00	bg00_TM	20	bg06_TM	23	b00_TM	0	
b06_TF	0.00	bg00_TF	22	bg06_TF	25	b00_TF	0	
Total Pop:	39.17		968		1450		27	

_A: ASIAN (race category)
_B: BLACK (race category)
_I: NATIVE HAWAIIAN OR OTHER PACIFIC ISLANDER (race category)
_N: AMERICAN INDIAN OR ALASKA NATIVE(race category)
_O: SOME OTHER RACE ALONE (race category)
_T: TWO OR MORE RACES (race category)
_W: WHITE (race category)
_H: Hispanic (ethnicity category)
M: Male
F: Female
b: block level
bg: block group level

In this example the total population estimate is less than Hispanic population estimate due to the variation among the small gender/race/age strata.