Small Area Population Estimates by Demographic Characteristics: A Case Study for 170 Census Tracts in Multnomah County, Oregon

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Extended Abstract:

One of the trends in applied demography is that there is an increasing demand for small area population estimates by demographic or social-economic characteristics. For example, a school district needs estimates of its population aged 5-17; a fire district needs its resident population estimate; a town needs an estimate of its median household income in order to apply for a federal grant. Some of these estimates can be done with a survey, but most others would need to rely on population estimates methods. A trend as such, it calls for not only the innovative ways of using existing data, but also new techniques that are suitable for smaller area estimates.

This paper explores the estimate methods for census tract population by age, sex, race and Hispanic Origin. It is resulted from a contracted research with the Multnomah County Health Department (MCHD). Multnomah County is the largest county in Oregon and a major component of the Portland Metropolitan area. Its population in the 2000 Census registered 660,486, accounting for 19.3 percent of the total population in the state. It is also the most racially-diverse county among 36 counties in Oregon, with notably 5.89 percent blacks or African Americans alone population, 5.83 percent Asian alone population and 2.84 percent of two or more races population, compared to the state average of 1.71 percent, 3.04 percent and 2.20 percent respectively (numbers are based on the modified races excluding some other race). Hispanic population accounted for 7.5 percent of total population, close to the state average of 8 percent. In terms of age composition, Multnomah County is largely made of working age population, with 70 percent aged between 15-64, 11.1 percent aged 65 and above, and 18.7 percent aged below 15 in 2000. The median age for both sexes was 34.9, compared to the state average of 36.3.

Although annual estimates by county and by demographic characteristics are made available through the Population Research Center (PRC) at Portland State University and the Census Bureau, MCHD has its specific interests in sub-county populations by census tract. In order to assess the health and well being of residents among County's six sub-area and plan prevention and health promotion activities for different race, gender and age groups, MCHD made a request to PRC for developing 2003 population estimates by age, sex, race and Hispanic Origin by census tract.

The challenges for this project are several. In general, the available data for small geographic areas as census tracts are limited, therefore constrain the potential use of some standard estimate methods, such as ratio-correlation and component II methods. Also, population estimates with detailed demographic characteristics tend to introduce more estimate errors than without, and are especially so for small areas. In specific, MCHD had its own specification for race estimates. In order to keep data consistent with those

of the 1990s and make the comparison meaningful, MCHD requested the race estimates fit in four single race categories as used in the 1990 Census, rather than in new categorization as seen in the 2000 Census. This specific requirement involved the development of a bridged-race methodology to apportion multiple race responses into four race categories, i.e., White, Black or African American, American Indian or Alaska Native, and Asian/Pacific Islander, as well as the adjustment of five "alone" categories and "some other race" categories into the above four single races.

The estimate for census tract population was the first step. The county population estimates are produced annually by PRC. The July 1, 2003 population for Multnomah County was estimated 677,850, and this number was used as the control total: that is, the census tract estimates were scaled to sum to the county estimate. Two methods were considered for developing sub-county estimates: housing unit method and component method. By comparing the data reliability and updatability, component method was chosen. Births, deaths, and net migration were each accounted for a component of the population. The vital statistics data by census tract were readily available at MCHD, although minor adjustments had to be made to accommodate the changes in several census tracts boundaries between 1990 and 2000 (data were still collected by the 1990 census tracts). Migration was estimated differently from the traditional methods. It was derived from the building permits data, assuming new housing indicates new people. The residential building permits by census tract were obtained from Metro, a regional government that serves Multnomah County and two other counties in Portland Metropolitan areas. By subtracting the natural increase between 2000 and 2003 from the total population growth in the County since 2000, the estimate of total net migration to the County was derived. The migration number then was allocated to each census tract by its share of building permits issued between 2000-2003 in the county. The census tract population estimates were obtained by adding the births and net migration since 2000 to the 2000 Census population, and subtracting deaths.

The second step was to bridge the Census 2000 multiple-race population to single race categories. In 1977 the Office of Management and Budget (OMB) issued Race and Ethnicity Standards for Federal Statistics and Administrative Reporting in order to promote comparability of data among Federal data systems. The 1977 standards called for the Federal Government's data systems to classify individuals into the following four racial groups: American Indian or Alaska Native, Asian or Pacific Islander, Black, and White.

In 1997 new standards were announced for classification of individuals by race within the Federal Government’s data systems. The 1997 Standard have five racial groups: American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, and White. These five categories are the minimum set for data on race for Federal statistics. The 1997 standards also offer an opportunity for respondents to select more than one of the five groups, leading to many possible multiple race categories. Federal data systems are required to comply with the 1997 Standards by 2003. While the process for implementing the latest revisions of the birth and death certificates and the fetal death report is now underway, the data collection system is still

using the 1977 standard. Many health researchers use census data to provide denominators in the calculation of race-specific rates---including birth rates, death rates, rates of morbidity. The ability to check more than one race raises challenges in estimating population-based rates. Therefore, there is a need to convert the multiple-race population back to the four single race category so that denominators are consistent with numerators and also the comparisons with earlier data are meaningful.

The National Center for Health Statistics (NCHS) developed a regression method to allocate the multiple race population to single race categories. NCHS published the Census 2000 population with bridged race categories at nation, state and county level. The four single-race populations in Multnomah County would later be used as the control totals. The NCHS regression method, while well-developed, is not practical for small area as census tract. Instead, the Equal Fractions method was employed. This method allocates equal pats of an individual in a particular multiple-race group to all of the possible single-race categories. An AIAN/White/Black multiple-race individual, for example, would be allocated one-third to the AIAN category, one-third to the White category, and one-third to the Black category. Some other race and one of the four single-race combination were modified by dropping the some other race and using the single race response. Some other race alone category was allocated to four single race categories by the proportion of each race in the Hispanic population, since 90 percent of some other race are Hispanic population.

Once the 2000 Census population for each census tract was configured to the four single-race categories, estimates for 2002 were made by assuming the same annual change rates between 2000-2003 as between 1990-2000.

Alternatively, one could also incorporate the American Community Survey data for Multnomah County to get an updated picture of race composition. Potentials and problems of using ACS will be discussed in the paper.

Age and sex estimates, as well as the Hispanic population, will also be detailed in the paper.