Vintage 2013 Minor Civil Division Household Projection Methodology

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INTRODUCTION

The development of household projections at the minor civil division (MCD) level relies on three series of previously derived projections.[1] First, Demographic Services Center's county-level population projections by age and sex serve as the basis for subsequent projection series because they provide county control totals. Second, MCD population projections were produced; while lacking age-sex detail, the MCD projections within each county are controlled to the respective county's total population. Third, projected county households, household population, group quarters and average household size were generated; these projections contain some age-specific detail in terms of age of householder.

All three of these projections products—county age-sex population, MCD population and county households by age of householder—provide various controls for the MCD household projections, as will be described in the formulas that follow.

The current Census Bureau definition of a household is assumed to hold into the future: all persons who occupy a housing unit—a room or group of rooms that have direct access from outside the building or through a common hall—as separate living quarters.

Persons living in nursing homes, correctional institutions, mental care facilities, college residence halls, halfway houses and the like constitute group quarters population (shortened to GQ population below). Persons living in households constitute the household population. Thus, the total population minus the household population equals persons living in group quarters. The projections technique does not actively calculate projected GQ population; in other words, this population subset is a residual.

BASE MCD HOUSEHOLD POPULATION AND HOUSEHOLDS

Demographic Services' technique for calculating projected MCD households begins with base data on total household population and households. Generally for this vintage, the base data is from the 2010 Census, with modifications based on approved changes from the Census Bureau's Count Question Resolution program. In addition, two partial incorporations since the 2010 Census (V. Bloomfield, Walworth County and V. Harrison, Calumet County) required re-computation of base population and housing data for these new villages as well as for their town remnants.

The first calculation establishes household population rates at the base year. The formula is:

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[1] Minor civil divisions are also called "county subdivisions" in Census Bureau products. Both terms refer to local units of government or areal parts of local governments that nest within county boundaries. In Wisconsin, 54 municipalities (cities and villages, collectively called incorporated places) straddle county boundaries, so they have two or more component MCDs. In this document, the terms "MCD" and "community" are used interchangeably, but refer to minor civil divisions.

$$HHPR_{mc,2010} = HHP_{mc,2010} \div P_{mc,2010}$$

Where $HHPR_{mc,2010}$ is the household population rate for MCD m in county c at 2010,
$HHP_{mc,2010}$ is household population for MCD m in county c at 2010,
$P_{mc,2010}$ is the population for MCD m in county c at 2010.

This household population rate is assumed to hold constant across the span of the projections period. This single rate allows us to maintain, in effect, consistent definitions of household population and group quarters population into the future. Living arrangements have certainly changed over the past 30 years—for example, county nursing homes, which are treated as group quarters, have sometimes been replaced or supplemented by assisted living facilities, which are counted by the Census Bureau as housing units—but it is difficult to anticipate changes in definition over the next three decades.

PROJECTED MCD HOUSEHOLD POPULATION AND HOUSEHOLDS

For each MCD, an initial household population is projected at 2015, 2020, etc. using this formula:

$$HHP'_{mc,y} = HHPR_{mc,2010} \times P_{mc,y}$$

Where $HHP'_{mc,y}$ is the initial household population in MCD m in county c at projection year y,
$HHPR_{mc,2010}$ is the base household population rate for MCD m in county c,
$P_{mc,y}$ is the projected total population in MCD m in county c at projection year y.

Then, projected initial group quarters populations at each projection year can be derived for each MCD by subtracting the initial household populations from the total populations:

$$GQP'_{mc,y} = P_{mc,y} - HHP'_{mc,y}$$

These initial MCD group quarters populations are then controlled within counties to their respective counties' totals (from the county household projections) to generate finished group quarters projections by MCD:[2]

$$GQP_{mc,y} = \left(GQP_{c,y} \div \sum_{m=1}^{n} GQP'_{mc,y} \right) \times GQP'_{mc,y}$$

Where $GQP_{mc,y}$ is the controlled group quarters population in MCD m in county c at projection year y,
$GQP_{c,y}$ is the group quarters population in county c at projection year y.

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[2] A modification of this step had to be made for Forest County. The town of Blackwell has a large group quarters that contained more than 75 percent of its population at the 2010 Census. In addition, only two other MCDs in the county had GQ population at 2010. The total population of Blackwell is projected to decrease, while county GQ population is projected to increase. The distribution of the projected GQ residents to only three MCDs, dominated by one in particular, resulted in the GQ population of Blackwell eventually exceeding the total population—creating the untenable outcome of negative household population. A work-around was devised to keep Blackwell's projected GQ population at the initial (uncontrolled) levels, with the balance of the county's projected GQ population apportioned to the other two MCDs based on their initial projected GQ results.

To establish the finished MCD household populations, these controlled group quarters populations are subtracted from the total populations:

$$HHP_{mc,y} = P_{mc,y} - GQP_{mc,y}$$

Where $HHP_{mc,y}$ is the controlled household population in MCD m in county c at projection year y.

With projected household and group quarters populations completed, the method now turns to projecting MCD households. The first step is to project average household size (or persons per household, abbreviated to PPH) through the application of the ratios of counties' projected PPHs (from the county household projections) to the base year PPHs. Formulaically:

$$PPH'_{mc,y} = PPH_{mc,2010} \times \frac{PPH_{c,y}}{PPH_{c,2010}}$$

Where $PPH'_{mc,y}$ is the initial projected PPH for MCD m in county c at projection year y,
$PPH_{mc,2010}$ is the base household PPH for MCD m in county c,
$PPH_{c,y}$ is the projected PPH for county c at projection year y,
$PPH_{c,2010}$ is the base PPH for county c.

As a practical consideration, a floor of 1.00 was set for projected PPHs, as average household size cannot fall below 1; this minimum affected only one MCD.

Then, the initial calculation of projected MCD households can be made by dividing the projected household populations calculated earlier by the projected PPHs:

$$HH'_{mc,y} = HHP_{mc,y} \div PPH'_{mc,y}$$

Where $HH'_{mc,y}$ is the initial projected households in MCD m in county c at projection year y.

Finally, these initial projected households need to be controlled to the previously-derived county household projections.

$$HH_{mc,y} = \left(HH_{c,y} \div \sum_{m=1}^{n} HH'_{mc,y} \right) \times HH'_{mc,y}$$

Where $HH_{mc,y}$ is the controlled number of households in MCD m in county c at projection year y,
$HH_{c,y}$ is the number of households in county c at projection year y.

Now that finished numbers of households and household populations are completed, a finished set of projected PPH values for each MCD may be calculated.

$$PPH_{mc,y} = HHP_{mc,y} \div HH_{mc,y}$$

Where $PPH_{mc,y}$ is the controlled average household size for MCD m in county c at projection year y.