

## **Wisconsin Demographic Services Center Population Estimates Program Description**

### **History**

The Wisconsin Legislature authorized the Population Estimates Program in 1971. The initial impetus for a formal estimates program was the distribution of state tax revenues to municipalities and counties. Involving several different formulae, these distribution programs were known collectively as the State Shared Revenue Program.

Wisconsin started the shared revenue program in 1911 with the enactment of the state income tax. At enactment, 10% of the proceeds were retained by the state, 70% were paid to the municipality where the taxpayer resided, and 20% were paid to the county where the taxpayer resided. The Legislature altered these percentages over time to reflect changes in state and local fiscal needs. In keeping with this precedent, when the state enacted other taxes, it also shared a percentage of the proceeds with local governments on a return-to-origins basis.

By the late 1960s, it was generally agreed that return-to-origins tax sharing was increasing local fiscal disparities. Communities with high levels of economic activity or high-income individuals received ever increasing state aids, allowing them to provide substantial levels of services at low (or no) property tax rates. In contrast, communities with little economic activity or low-income individuals experienced stagnating or declining state aids, resulting in low levels of services and high property tax rates. Therefore, the state revised the shared revenue system to shift the focus to a distribution based more on need. Population change was viewed as one of the major components of changing fiscal need at the local level.

Dr. Charles Palit of UW-Madison, working in league with an advisory panel of other professors and state employees who had demographic responsibilities, developed the original estimates methodology. The Department of Administration (DOA) produced the first official set of municipal and county population estimates, using Palit's technique, in 1973. DOA has issued the estimates annually since then.

While crafted initially to support the distribution of state revenues, the population estimates are now used in at least 27 official state functions and many other state processes. In addition, the estimates are used extensively at the regional, county and local levels for planning and other purposes.

### **Current Estimation Methodology**

The Demographic Services Center was established formally within DOA in 1976 or 1977. Demographic services has modified Wisconsin's estimation methodology since Palit's initial formulation. The current methodology involves both controlled estimates and uncontrolled estimates.

Controlled estimates are premised on a top-down approach. Generally, practitioners of applied demography presume that data that are symptomatic of population change are of better quality at a higher geographic level (or, at least, data errors are muted) than at smaller geographies. Setting a "control total" for larger geographic areas requires that all subareas then add to the control figure. In

Wisconsin’s current methodology, one technique controls county estimates to the state, and another technique controls municipal<sup>1</sup> estimates to their respective counties.

Uncontrolled estimates are premised on a bottom-up approach. Data at the lowest level of geography desired (in our case, the municipal level) are presumed to indicate potential change in population regardless of larger-area demographic forces. In Wisconsin’s current methodology, several estimating techniques based on annual housing unit change produce uncontrolled municipal estimates.

The various techniques are described in the sections below.

### **State Estimate**

The controlled techniques rely first on the setting of a state estimate. Currently, Demographic Services Center uses three data sets to establish a January 1 state estimate:

- Net housing unit change reported by all municipalities.
- Annual resident birth and death data.
- The Census Bureau’s annual estimates of population and migration, both those produced through its Population Estimates Program and the American Community Survey.

Previously, residential electric meter data, collected by the Wisconsin Division of Energy was used. This data had shown reasonable consistency in reckoning statewide households when compared with four prior decennial Census household counts. It was later discovered that this data had included electric utility customers living in Michigan’s Upper Peninsula. This time series was broken and could not be reconstructed when the Michigan customers came to be excluded. Demographic Services collects annual housing change data through a survey sent to all municipalities.

Using the state-level occupancy rate from the most recent Census, and a formulaic predictor of household size based on the last four Censuses, we estimate the state’s households and household population. The state’s group quarters population, updated annually through data collection and estimation, is added to arrive at a total population estimate.

The state’s birth and death data, from the Vital Records program at the Wisconsin Department of Health Services, is used to check the reasonableness of the estimate that we develop. The natural increase (births minus deaths) is subtracted from our estimated change of the prior year to obtain a residual estimate of net migration.

### **County Estimates**

Within the bounds of the state total, Demographic Services calculates population estimates for each of the 72 counties in Wisconsin, using a combination of the ratio difference method and the composite method.

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<sup>1</sup> To be precise, we make estimates at the “minor civil division” or “county subdivision” level. These terms, used by the Census Bureau, refer to the municipal segments within each county. For example, the city of Appleton—a single municipality—has three minor civil divisions, or MCDs: in Calumet, Outagamie and Winnebago counties. We make estimates for MCDs because we must also prepare county estimates. In this document, “municipality” and “minor civil division” are used interchangeably, but the latter term is more accurate.

In the ratio difference method, we rely on two statewide data sets:

- State income tax filers and dependents;
- Selected categories of motor vehicle registrations.

The tax filers and associated dependents are compiled for the prior calendar year by the state Department of Revenue; the vehicle registrations are a “point-in-time” extraction (approximately January 1) from the state Department of Transportation’s records. Both data sets are tabulated at a municipal level and then aggregated to county geography.

We determine the relationships between the enumerated non-institutional population in a county at the time of the last Census and the number of tax filers, tax filers plus dependents (or “tax persons”), and motor vehicles in the censal year. For each estimate year, we update these relationships (ratios) on the basis of changes observed statewide and then apply them to current counts of tax filers, tax persons and motor vehicles for each county to determine current estimates. We give separate consideration to the number of institutionalized persons in a county; these people are generally not covered by the tax and motor vehicle symptoms, and their number can be obtained from other, relatively accurate records.<sup>2</sup> Thus, the ratio difference method provides three estimates for each county: one based on tax filers, one on tax persons and one on vehicles.

To refine the county estimates, we average the three ratio-based estimates with a fourth one based on the composite method. The composite method relies on two data sets, tabulated at the county level:

- Resident births and deaths;
- School enrollments (public, private and home-schooled).

These data—the former from the Department of Health Services, the latter from the Department of Public Instruction—are employed to estimate county population within three broad age categories.

Among applied demographers, the composite method is no longer used as widely as it was when the Demographic Services Center initially developed its estimation methodology. Nonetheless, the composite method continues to reduce the overall error margin of Wisconsin population estimates.

### **Municipal Estimates--Controlled**

Using the county estimates as control totals, we estimate the non-institutional population for each municipality within each county using the ratio difference method. As we do for county estimates, we determine the relationships between the known non-institutional population in a municipality at the time of the last Census and the number of income tax filers, tax persons and vehicles. We update these relationships on the basis of estimated county-wide changes and then apply them to current counts of the three indicators for each municipality to determine current estimates of municipal population. As in the county calculations, we add the number of institutionalized persons residing in a municipality to the non-institutional estimate to produce a total population estimate.

It is not possible to utilize the composite method at a municipal level because the required data are not available for all municipalities.

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<sup>2</sup> Institutions, as currently defined and tabulated by the Census Bureau, are “group quarters that house people who are primarily ineligible, unable or unlikely to participate in the labor force while residents.” The most common institutional group quarters are correctional facilities, licensed nursing facilities, and in-patient treatment centers or hospitals.

## **Municipal Estimates--Uncontrolled**

The ratio difference method relies completely on data that third parties (that is, state agencies other than Demographic Services Center) collect and tabulate. Furthermore, the agencies compile these data without regard for their use as population symptoms. Finally, changes in municipal geography (due to annexations, incorporations, and cooperative agreements), not to mention households' movements, may produce a lag in symptoms moving from one community to another.

The Demographic Services Center's former demographer, Balkrishna Kale, noted increasing problems with symptomatic data quality during the early 1980s. From the mid-1980s into the early 1990s, he developed a number of estimation methodologies based on housing unit data. Originally surveying a selected set of municipalities, he expanded the annual request to all Wisconsin communities in 1990.

It is important to note that, unlike the municipal estimates generated through ratio difference, the housing-based estimates are not controlled to a county or state target. Thus, the housing method estimates for every municipality are "free-standing," uninfluenced by change in other municipalities within a county or within the state.

There are four sub-methods to the housing method. They all involve the recalibration of household size (also called persons per household or PPH), based on certain indicators:

- No Change In PPH: PPH for a municipality is held constant from the most recent Census;
- State Trend In PPH: Based on the calculations of households and household population that were made for the state control total, municipal PPHs are trended at the same rate of change as at the state level;
- Local Trend in PPH: The municipal change in PPH in the previous decade is trended to the current estimation year;
- Regression PPH: The change in state "tax persons" from the Census year is regressed in an equation with the Census PPH to estimate a PPH in the estimate year.

In addition, the housing methodologies include changes in local group quarters and the population that is shifted by annexations.

Finally, all four housing-based results are averaged to produce a housing average estimate. In sum, the housing methods produce five different estimates for each municipality.

## **Preliminary and Final Estimates**

Through controlled and uncontrolled procedures, Demographic Services produces eight initial estimates for every municipality. We review this set of estimates for accuracy and discrepancies. Taking account of all variables that could influence population growth or decline, we may select one estimate, or average two or three of them, to produce the result that appears most reasonable.

After this review, we control our selected estimates to our original state control total. These controlled estimates are the preliminary estimates that we release by August 10 of each year.

Communities have approximately 35 days to challenge our preliminary estimates. A municipality must provide data that indicate clearly a reason for a change to its preliminary estimate. Demographic Services reviews the local input and decides to revise or retain the preliminary estimate.

The challenge period ends September 15. Demographic Services releases the final population estimates on or before October 10.

## Other Small-Area Estimates

### Municipal Voting Age Estimates

The Demographic Services Center estimates the voting age population for municipalities and counties annually, identifying these estimates as courtesy figures to assist local government clerks to approximate the number of ballots that need to be printed and distributed for elections. In addition, the estimates provide a proxy of the 18-and-over adult population.

To estimate the voting age population, Demographic Services uses the proportion of persons 18 years and over at the most recent Census, and multiplies this base value by a state-level factor from its most current population projections. This adjusted proportion is then multiplied by the current population estimate to produce the voting age estimate.

### Zip Code Area Estimates

Demographic Services Center estimates the total population for Zip Code areas annually. At the 2010 Census, the Census Bureau defined Zip Code Tabulation Areas (ZCTAs), which correspond roughly (but not exactly) to the Zip Code delivery areas delineated by the U.S. Postal Service.<sup>3</sup>

To calculate these estimates, we begin with data from the most recent Census, cross-tabulating the number of persons within each minor civil division and ZCTA. We then calculate proportions: the population within the ZCTA in an MCD divided by the MCD's population. These proportions are then applied to the current MCD estimate. The data is re-summed based on the ZCTA values to obtain Zip Code area estimates.

## A Note about Municipalities Added, Municipalities, Deleted, and Municipal Boundary Changes

Sometimes a change is modest. Say a municipality annexes a small number of residents from another municipality. In these cases, Demographic Services continues to list Census base populations for the areas of municipalities as they existed on Census day.

Sometimes events like incorporations or cooperative agreements can add a municipality or delete a municipality or radically change municipalities' boundaries. For examples, see the Municipal Data System's incorporations module<sup>4</sup> and the MDS's ordinances module.<sup>5</sup> In these cases, Demographic Services displays Census base data in ways that are consistent with current estimates. Sometimes this means displaying Census base data for the area covered by the municipalities as they existed on the estimates' reference date.

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<sup>3</sup> From the Census Bureau's Census 2010 Technical Documentation: "The Census Bureau defines ZCTAs by allocating each block that contains addresses to a single ZCTA, usually to the ZCTA that reflects the most frequently occurring ZIP Code for the addresses within that tabulation block. ...The ZCTAs process used primarily residential addresses and was biased towards Zip Codes used for city-style mail delivery, thus there may be Zip Codes that are primarily nonresidential or boxes only that may not have a corresponding ZCTA."

<sup>4</sup> <https://mds.wi.gov/View/Incorporations>

<sup>5</sup> <https://mds.wi.gov/View/Ordinances>