

Enrollment Projection Methodology

The Madison Metropolitan School District uses both quantitative and qualitative methods to attain student projections. Details of the methodology are described below.

1. **Grade to Grade Cohort Survival Ratios** – District level enrollment projections are set based on statistical estimates known as cohort survival ratios. A survival cohort ratio is the proportion of students enrolled in one grade in specific school year (e.g., 2004-05) relative to the number of students enrolled in the next incremented grade level and school year (e.g., 2005-06). For example:

$$\text{Grade 1 to Grade 2 Cohort Survival Ratio} = \text{Gr 1 Enrollment 2004-05} / \text{Gr 2 Enrollment 2005-06}$$

Each grade to grade survival ratio is estimated for the projection process, thirteen in all across Kindergarten to Grade 12. Survival ratios have been a very effective method of estimating projections for the next school year. Over the past thirteen years the total district enrollment projection has missed the actual enrollment by two tenths of one percent. By educational level, districtwide projections are nearly consistently accurate with middle and elementary being slightly more accurate than high school.

Once grade level cohort survival ratios are decided on the ratios are applied across all schools and grades throughout the district consistently. The resulting estimates are locked and adjustments may then only be made with specific schools and grades that balance to the overall districtwide enrollment projections. More specific information about school and grade level adjustments are described in section 2 below.

The selection of an appropriate survival ratio is made by reviewing historical trends and patterns. Several estimation methods are applied and reviewed. Measures of central tendency (i.e., means) are calculated for varying time intervals including all available years, 10 years, 5 years, 4 years, and 3 years. Simple ordinary least squares regression analysis trend lines are also fit to the data using all available years for each grade level transition cohort. In addition, variation across years and within cohorts are also analyzed to determine which might result in possible error in estimates.

Migration patterns tend to explain most variations in grade level cohort survival ratios. However, at certain grade levels student movement from one educational structure to another also affects survival ratio estimation (e.g., private elementary and middle school students moving to public high school, grade 5 to 6 and grade 8 to 9, respectively).

Kindergarten cohort survival ratios are a special case for estimation. Birth rates for the City of Madison have proven to be a very reliable estimate for entering Kindergarten student cohorts. Despite the fact that the City and MMSD boundaries are not co-terminus these enrollment projection estimates based on a “Birth to Kindergarten” cohort survival ratio have been very close to actual enrollment counts, within less than one percent (i.e., seventeen students out of nearly 1,900) variation from projection over the past five years.

Historical enrollment trends for various demographic subgroups are used to ascertain changes in survival ratios over time and by grade. Examples more recently include an analysis of Hispanic student enrollment, a subgroup that has increased significantly over the past five years.

Final districtwide enrollment projection estimates are reviewed by the Superintendent, Chief of Staff, Assistant Superintendent for Business Services, and District planning staff. Discussion ensues which may lead to final changes in either district level projections.

2. **School Level Enrollment Projection Adjustments** – As stated in item 1 above, given the strong predictive power of the grade level cohort survival ratios, the district level ratios are applied uniformly across schools. However, applying the standard grade to grade cohort survival ratios to each school can be problematic given variations that are experienced across schools. This is most often the case with elementary schools, and rarely a concern at middle and high schools which generally have consistent survival ratio experience.

School Level Enrollment Variations - To determine which elementary schools varied from the standard, and to estimate more robust methods of estimations by school, several models were evaluated including:

- Average All Available Years
- Average Five (5) Most Recent Years
- Weighted Average Five (5) Most Recent Years
- Average Three (3) Most Recent Years
- Weighted Average Three (3) Most Recent Years
- Ordinary Least Squares Regression Trend – All Available Years
- Ordinary Least Squares Regression Trend - 5 Most Recent Years
- Ordinary Least Squares Regression Trend - 3 Most Recent Years

Each model was evaluated for how well it estimated Projection Year 1 projections by applying the model to previous year's enrollment data for each school. The best models for predicting school-level total school enrollment in Projection Year 1 were the weighted averages across the three (3) most recent years and five (5) most recent years. Across elementary schools, these two models had both the smallest degree of difference between actual and projected enrollment and the least amount of variation. The weighted average models emphasize the most current enrollment trends as more critical when projecting future enrollment patterns.

Kindergarten Enrollment Variations - Because cohort survival ratios are applied to an incoming Kindergarten cohort and extrapolated over a six year increment (i.e., Kindergarten through Grade 5), the Kindergarten projection has a large impact on overall long-term enrollment projections for individual schools. If there is a large error in estimating Kindergarten enrollment schools can be defined as "overcrowded" if the Kindergarten projection is too high and "under-enrolled" if the Kindergarten projection is too low.

A series of models were estimated for determining Kindergarten Projection Year 1 enrollments to determine which would be better at more accurately predicting Kindergarten enrollment at the school level. The models explored included:

- Average Enrollment for Five (5) Most Recent Years
- Weighted Average Enrollment for Five (5) Most Recent Years
- Simple Trend Line on Kindergarten Enrollment – All Available Years
- Current Year Average Grade Level Enrollment
- Simple Trend Line on Current Year Grade Level Enrollment

Each model was evaluated for how well it estimated Projection Year 1 Kindergarten projections by applying the model to previous year's enrollment data for each school. The best model for predicting school-level Kindergarten enrollment in Projection Year 1 is a simple trend line using current year grade level enrollments in the school (i.e., current Kindergarten, current grade 1, grade 2, etc.) This model has both the smallest degree of difference between actual and projected enrollment and the least amount of variation across all elementary schools and all years.

Long Term Projection Estimate Variation – Some schools do not fit the longer term projection as closely as others. An analysis was conducted of the variation across elementary schools between the projections made for Projection Year 3 and the actual enrollment experienced in that school when the count was made. Certain schools (e.g., Van Hise, Randall, and Gompers) were more consistently likely to be projected too low in Year 3 while others (e.g., Glendale, Mendota, Allis, and Lowell) were more consistently too low in Year 3. The results of the analysis helped shape adjustments in projections for Projection Years 3, 4, and 5.

Non-Resident Student Enrollments – Enrollment data are reviewed to determine whether or not trends may be occurring in the volume of students enrolled at a specific school who reside outside the school attendance boundary. These situations occur for several reasons. MMSD Board of Education Policy 4023 allows parents to request transfers to a school other than that which their child would attend based on the location of their residence. Known as internal transfers such requests are automatically granted when a family moves out of their current attendance area and wishes to have their child continue at their current school. Internal transfers may also be requested when movement from one residence to another is not the basis for the request. Such requests are evaluated primarily on the basis of school and grade level capacity. When granted, parents assume the responsibility for transporting their children to the out of attendance area school.

The State of Wisconsin requires that each local school district allow parents to request a transfer to another school district (e.g., from Verona Area School District to the MMSD) through the Open Enrollment Program. Applications for these transfers are made annually during the month of February for the next upcoming school

year. As with all approved internal transfers, parents of students approved for transfer through the Open Enrollment Program assume the responsibility of transporting their children to the new school.

Residential Development Information – Throughout the year municipalities in which the District provides services to students send to us information regarding proposed developments that are filed with their planning offices. In addition, at least once each year District staff meet with municipal planning department staff to review the status of each proposal. In addition to meetings with planning staff, each developer is contacted at least annually by District staff to update information about their project(s). Build out timelines, dwelling characteristics, and target markets are discussed.

Development project data tracked in a specific database for purposes of enrollment projections and includes for each development project:

- Development construction starting year;
- Projected number of years to complete construction;
- Number of anticipated dwelling units by type; and
- Estimated enrollment by dwelling type.

In addition, for known, existing development projects a membership count was made of each area by school year to track students entering the school district. These rates of enrollment do not necessarily immediately coincide with the completion of dwelling unit construction. It is known from the analysis that students enrolling in a schools from a development may lag by several year any construction completion as students obtain school age.

Educational Program Modifications - Decisions made by the Board of Education can affect projected enrollments. Movement or creation of specific programs will change school enrollment projections. Early childhood, English as a Second Language, and new charter programs are all recent examples of program decisions that have resulted in modifying enrollment projections for individual schools. To the extent they are known, finite student enrollment estimates are moved between schools depending on the details of such decisions.

Each of these factors is used when considering the balancing that is required across schools to maintain the overall district-level projections by grade and year. As an adjustment is made to increase enrollment at one school in a specific grade level and year it must be offset with a corresponding reduction at another school (and vice versa). These adjustments are made at each grade level across all five years of enrollment projections. Several iterations are made before the final estimates are established.