Michigan "Beating the Odds" Schools Business Rules

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Summary of Changes

Version	Date	Author/Editor	Description	Managerial Sign-Off
1.0	10/24/2016	Matt Gleason	Initial Version	
2.0	11/15/2016	Matt Gleason	Revisions	
3.0	12/14/2016	Alex Schwarz	Final Review	

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Overview

The purpose of this document is to provide a description of Michigan schools determined to be "Beating their Odds" as well as the high-level business rules used in their calculation. Much attention is paid to schools needing improvement through various avenues. Federal school accountability is calculated each year. Media reports often focus on the need for improvement in specific schools or school districts. Perhaps it is because it is harder to verify that a school is beating the odds that there are fewer analyses and stories identifying schools as such. Regardless, it is important that such studies be done. First, it is important to recognize schools that are beating the odds. Second, there are important lessons to be learned from schools beating the odds about how to serve our students in ways that maximize their possibilities for future success.

Identifying Schools Beating the Odds

While it is a relatively simple task to identify schools performing poorly, it is a much more difficult task to identify schools that are "Beating The Odds," or schools that given the things they cannot control, outperform schools in similar situations. In order to identify such schools, it is first necessary to determine the important contextual variables over which schools do not have control. After that has been done, it is necessary to identify the general performance of schools in similar circumstances. Another step is then to determine whether each school outperforms the general performance of those similar schools to a statistically significant and meaningful degree.

The last step is the most difficult because it involves more than just statistical analysis. While there are no intentionally low-performing schools, there are several types of schools that may show up as "Beating The Odds" when in fact their odds are actually very good. Such schools include schools set up as magnet programs, schools that do not just house a gifted and talented program for their own students, but draw gifted and talented students from a large geographic area, or schools that serve a population for whom risk factors are relatively unimportant (such as primarily serving children of graduate students who tend to be

economically disadvantaged but otherwise invested in their children's education). Unfortunately, some schools that show up as "Beating The Odds" may also have engaged in inappropriate behavior that increases their test scores above what would be an accurate portrayal of their level of achievement. The statistical analyses that flag schools as Beating The Odds are unfortunately unable to identify any such schools as problematic. A qualitative analysis is needed instead to identify whether there are such issues.

Calculation Sequence

Two studies were designed to identify schools Beating The Odds. Two studies were used to assure that no school is identified as Beating The Odds because of a statistical artifact rather than because the school is actually outperforming schools in similar circumstances.

Study 1: Schools Outperforming Their Predicted Performance

For each school, the outcome is the school's ranking on the statewide Top to Bottom ranking (see www.mi.gov/ttb for more information on the Top-to-Bottom ranking and its business rules). This means that the only schools which qualify for the Beating the Odds designation are those with a Top-to-Bottom Ranking.

This ranking was then used as the outcome variable in a multiple linear regression of the form $\hat{Y}_j = \hat{\beta}_0 + \hat{\beta}_1 percentED_j + \hat{\beta}_2 percentSWD_j + \hat{\beta}_3 percentELL_j + \hat{\beta}_4 percentMin_j$, where ED represents economic disadvantage, SWD represents students with disabilities, ELL represents English language learners, and MIN represents minority students.

The predicted ranking (based on the results of the multiple linear regression) was calculated for each school. A 95% confidence interval was constructed around that predicted ranking using the standard error of prediction. If the school's ranking was above the upper bound of the confidence interval, the school was identified as Beating The Odds.

Study 2: Schools Outperforming the Thirty Most Demographically Similar Schools in the State

For each school, the school's outcome again was their Top-To-Bottom ranking. The ranking of each school is based on full academic year students only. The rules for calculating this ranking can be found at www.mi.gov/ttb.

For each school, a set of demographic variables (not under the control of the school) was also gathered. These variables included the following:

- Grade configuration. Thirteen dummy variables were created for the 13 possible grades (K, and 1-12). Each school received a value for each of the thirteen dummy variables representing whether the school serves students in each of the thirteen grades.
- Total enrollment (based on the number of full academic year students who tested at the school)
- State foundation allowance
- Percent economically disadvantaged
- Percent minority enrollment
- Percent students with disabilities

- Percent English language learners
- Whether the school has over 80% of its students reported as students with disabilities

Each school was compared to every other school in the state on these demographic variables to identify the 30 most demographically similar schools in the state. This was done by calculating a weighted standardized Euclidean distance of each school with every other school in terms of the demographics. The distance was calculated as follows:

$$distance_{jk} = \sqrt{\frac{\sum_{d=1}^{N_d} w_d \left(z_{dj} - z_{dk}\right)^2}{\sum_{i=1}^{N_d} w_d}}$$

Where

$distance_{jk}$ is the distance between schools *j* and *k* in terms of demographics,

N_d is the number of dimensions on which schools are compared, or (12 + 13 +7 = 32)

w_d is the weight placed on dimension *d*,

z_{dj} is the z-score of school *j* on dimension *d*, and

z_{dj} is the z-score of school *k* on dimension *d*.

The weights used were 1 unless otherwise specified. The otherwise specified weights were 2 for state foundation allowance, 2 for enrollment, 2 for percent minority enrollment, 6 for percent ED, 2 for percent SWD, 2 for percent ELL, and 10 for being a special education center. This assured that heavy weight was particularly placed on grade configuration (13), being a special education center (10) and percent ED (6) so that schools in comparison groups are as alike as possible on these particular demographic variables.

After the distances had been computed between all pairs of schools, for each school the following was done:

1. Find the 29 closest schools (in terms of distance on demographics).
2. Identify the Top-to-Bottom overall school rankings for all schools in the cluster.
3. If the school was both (1) higher ranking than all 29 comparison schools and (2) statistically significantly higher ranking than the comparison group average at the $\alpha = 0.001$ level, then identify the school as Beating the Odds.

Applying Reward Status to Beating the Odds Schools

Schools identified through Study 1, Study 2, or both will be added to those schools already identified as Reward Schools through being a top 5% overall ranked school or a top 5% improving school. Schools meeting any or all of the pathways to be identified as a Reward School will have a Reward School badge applied to their scorecard.

Data Sources

Beating the Odds research studies are conducted using the following source datasets:

- Top-to-Bottom School Rankings with summary demographic percentages.
- Fall 2015 Headcount Enrollment datafile from CEPI:
    - https://www.mischooldata.org/Other/DataFiles/StudentCounts/HistoricalStudentCount.aspx
- Fiscal Year 2017 Publication file from State School Aid.