



The Observed Conditional Probabilities of Annual Measurable Objectives

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Overview

Performance on state tests was an important aspect of the district and school accountability structures resulting from the No Child Left Behind (NCLB) legislation enacted in 2002. Targets for student achievement were set such that 100% of students would perform at or above the “proficient” threshold on the state assessment by 2020. In 2011, the United States Department of Education (USDOE) allowed states to apply for waivers to NCLB in which progress could be measured against state-generated performance targets (with USDOE approval). The Tennessee Department of Education (TDOE) applied for and received a waiver in 2012. Since that time, student progress has been measured against Annual Measurable Objective targets (AMOs). The methodology used to calculate the AMOs was designed to cut the percentage of students who were not proficient in half over eight years. Mathematically, the AMO is calculated as follows:

$$AMO_{current\ year} = \frac{(100\% - \% Proficient_{previous\ year})}{2} * \frac{1}{8} + \% Proficient_{previous\ year}$$

AMOs are reset each academic year based on the outcome from the previous year. This means that schools in which the percentage of students meeting the proficiency threshold decreases from one year to the next will have a lower AMO in the following year. Conversely, schools that greatly exceed their AMO target in a given year will be assigned an even higher AMO in the following year. This methodology may be problematic for any school in which student proficiency exhibits large oscillations through time. Schools may greatly exceed AMO targets one year (which would set an increasingly high AMO target in subsequent years), and greatly miss their AMO targets in another year (which could conceivably set lower AMO targets in subsequent years).

The use of the AMO methodology in the state accountability structure proliferated with the passing of the Every Student Succeeds Act (ESSA) in December of 2015 and subsequent revisions to the state accountability protocols. Starting in the 2017-2018 school year (SY1718), AMOs were applied to metrics related to graduation rate, ready graduate rate (the proportion of graduates who meet certain college-ready and career-ready benchmarks), and the proportion of students who were considered chronically absent (students with an attendance rate less than 90%). The same mathematical formula was used to calculate AMOs for each of these accountability metrics per TDOE’s ESSA flexibility.

This study was commissioned in order to document trends in AMO attainment. Specifically, we are interested in studying the probabilities of meeting AMOs in multiple years and examining the differences in these probabilities among the various metrics that currently use AMOs.

Methodology

AMO attainment data was extracted from the official state accountability files. Data was used from SY1718 and SY1819, but it should be noted that all graduation data is lagged by a year since students are given four years and a summer to meet graduation requirements. This means that the class of SY1617 was used in graduation rate accountability metrics (graduation rate and ready-graduate) in SY1718. Only the AMOs created for the “all-students” subgroup are included in the analysis in order to make each observed AMO attainment independent of the other observations.

Frequency tables were generated for each of the AMO metrics. The conditional probabilities were calculated from the observed data in order to determine the probabilities of meeting an AMO in SY1819 given that an AMO was met in SY1718. The conditional probability was calculated using the following equation:

$$\Pr(AMO = Yes_{SY1819} | AMO = Yes_{SY1718}) = \frac{\Pr(AMO = Yes_{SY1819} \cap AMO = Yes_{SY1718})}{\Pr(AMO = Yes_{SY1718})}$$

Findings

The frequency tables (with marginal frequencies in grey) for each metric are available in Tables 1 through 4 below. The proficiency AMOs include data from 77 schools in Knox County (serving grades 3-12). The chronic absenteeism AMOs include data from 79 schools in Knox County (since primary schools can be included in this metric). Graduation Rate and Ready Graduate AMOs include data from 15 schools in Knox County.

Findings: Proficiency AMOs

Table 1: Proficiency AMO Frequency Table

		A: SY1819 AMO Attained (Count)		
		Yes	No	
B: SY1718 AMO Attained (Count)	Yes	0	9	9
	No	19	49	68
		19	58	77

From the available data, the probability of meeting a proficiency-based AMO in the “all-students” subgroup in SY1819 after meeting a proficiency-based AMO in the “all-students” subgroup in SY1718 was 0%.

Findings: Chronic Absenteeism AMOs

Table 2: Chronic Absenteeism AMO Frequency Table

		A: SY1819 AMO Attained (Count)		
		Yes	No	
B: SY1718 AMO Attained (Count)	Yes	37	32	69
	No	9	1	10
		46	33	79

From the available data, the probability of meeting an absenteeism-based AMO in the “all-students” subgroup in SY1819 after meeting a proficiency-based AMO in the “all-students” subgroup in SY1718 was 53.6%.

Findings: Graduation Rate AMOs

Table 3: Graduation Rate AMO Frequency Table

		A: SY1819 AMO Attained (Count)		
		Yes	No	
B: SY1718 AMO Attained (Count)	Yes	2	5	7
	No	4	4	8
		6	9	15

From the available data, the probability of meeting a graduation rate-based AMO in the “all-students” subgroup in SY1819 after meeting a proficiency-based AMO in the “all-students” subgroup in SY1718 was 28.6%.

Findings: Ready Graduate AMOs

Table 4: Ready Graduate AMO Frequency Table

		A: SY1819 AMO Attained (Count)		
		Yes	No	
B: SY1718 AMO Attained (Count)	Yes	3	3	6
	No	4	5	9
		7	8	15

From the available data, the probability of meeting a ready graduate-based AMO in the “all-students” subgroup in SY1819 after meeting a proficiency-based AMO in the “all-students” subgroup in SY1718 was 50.0%.

Conclusions

The available data makes it apparent that the probability of meeting an AMO in SY1819 after meeting an AMO in SY1718 varies greatly among the metrics on which the AMO methodology was used (at least among schools in Knox County). The AMO with the lowest probability of being met in SY1819 after being met in SY1718 was related to the number of students who were proficient (or better) on the state exam. Correspondence with TDOE staff indicates that a relatively low percentage of schools across the state meet these proficiency-based AMO targets in two consecutive years. TDOE reported a value for $\Pr(\text{AMO}=\text{Yes}_{1819} \cap \text{AMO}=\text{Yes}_{1718}) = 3.4\%$ (compared to 0% for Knox County Schools). This may suggest that although the current AMO methodology may be appropriate to setting aspirational proficiency-based goals, the odds of individual schools meeting proficiency-based AMO targets in two consecutive years is relatively low.

Knox County Schools believes that the AMO setting process is important and that it should perhaps be reconsidered for proficiency-based targets. There are at least two possibilities that the department of Research, Evaluation, and Assessment could consider for a different goal setting process:

1. Create empirical AMOs through quantile regression techniques using longitudinal changes in the proficiency data to set ambitious but attainable goals year over year.
2. Create AMOs that use a more stable baseline than just the results from the previous year. Perhaps consider setting proficiency-based AMOs off the average of the previous three years of proficiency data to smooth out large year-to-year variations.