

Between-Year Stability of Growth Percentiles¹: Technical Brief #3

Accountability & Data Analysis Unit



COLORADO
Department of Education

The purpose of this research brief is to examine the stability of year-to-year median growth percentiles by assessment content area and grade levels to help inform the use of Median Growth Percentiles.

Background

We can anticipate that each school's Median Growth Percentile (MGP) will vary to some degree across years due to factors such as improving or declining performance taking place across time and an expected degree of imprecision in measuring student performance. If the growth results appear to be very stable (i.e., year-to-year correlations are high at 0.9 and above), then this would indicate that almost all schools maintain a similar rank order on growth each year. This finding would be surprising since we should expect that the MGPs would be more sensitive to detecting changes in the average rate of improvement made at schools from one year to the next. On the other hand, if the growth estimates for most schools appear highly unstable or change dramatically from year to year, then this finding should also cause concern as this could indicate that an MGP earned by a school may be due largely to chance. This finding would subsequently lessen the credibility of using this indicator as a descriptive signal for improvement or growth.

Analysis & Findings

The stability of MGPs was investigated by computing the year to year correlations¹ of MGPs for each content area (English Language Arts and Math). The results show that the year-to-year correlations are moderate for adjacent years (e.g., between 2016 and 2017), are weaker for non-adjacent years (e.g., between 2009 and 2014), and are also higher overall for Math. For Math, the adjacent years correlations range from .45 to .57. For English Language Arts, the adjacent years correlations range from .36 to .53. These correlations are consistent with the year-to-year correlations for school and teacher growth metrics reported in other studies and states (see Timmermans & Van der Werf, 2017; Schochet & Chiang, 2010; McCaffrey, Sass, Lockwood, & Mihaly, 2009). The moderate correlations suggest that the rank order of schools on growth can change for many schools, but can also stay at similar levels for others. As pointed out by McCaffrey et al., if the year-to-year correlation is 0.5, then among the schools in the lowest quintile of growth in one year we would expect approximately 25, 17, 10, and 4 percent of them to be ranked in the second, third, fourth, or fifth quintiles, respectively, the following year.

We also examined the stability of mean scale scores over time to compare those results against the results found for growth. Table 1 below summarizes the results of examining the average year-to-year correlations for achievement relative to growth first for the period 2009-2014 and then for the years 2016 and 2017. The correlations are reported separately for these time periods due to changes to the state assessments that took place in 2015.

As shown in Table 1, average achievement results are highly correlated at levels 0.9 and above. These results suggest that when considering the performance of schools based on average achievement, both low and high achieving schools will likely maintain their relative performance on achievement the following year. In contrast, the moderate correlations found for the MGPs suggest that although there is a degree of stability found in the MGPs, there is less predictability in the annual performance outcomes for schools based on growth.

¹: this technical brief was prepared by the Center for Assessment Design, Research and Evaluation at the University of Colorado-Boulder for the Colorado Department of Education. Additional related reports are available at: <http://www.cde.state.co.us/accountability/research>. Please see the technical brief called, 'Growth Percentiles: Achievement & Demographics: Technical Brief #1' for an explanation regarding interpretation of correlation coefficients.

Table 1. Adjacent year correlations (2016 to 2017) for achievement and growth.

Subject	EMH	2009-2014		2016-2017	
		Mean SS	MGP	Mean SS	MGP
ELA	All	0.95	0.46	0.93	0.36
ELA	E	0.95	0.46	0.93	0.38
ELA	M	0.96	0.53	0.92	0.34
ELA	H	0.93	0.44	--	--
MATH	All	0.95	0.54	0.95	0.45
MATH	E	0.94	0.49	0.94	0.44
MATH	M	0.96	0.63	0.96	0.57
MATH	H	0.95	0.61	--	--

The findings from this third technical brief on measuring student growth using MGPs, in conjunction with the summary of findings in the first and second technical briefs, suggest that patterns in the MGPs are consistent with many expectations of stakeholders. That is, school performance on MGPs are not pre-determined based on the demographic characteristics of students enrolled at the school, and are moderately stable across years. The results in this brief also highlight that a school's MGP can vary from year to year, and that high-stakes decisions should not be based solely on a single year's worth of growth data. We also caution that these findings alone do not validate the uses of growth for high stakes accountability purposes, but do provide evidence to suggest that the use of MGPs to measure student progress supports the state's objective of providing all schools with the opportunity to demonstrate higher or lower growth, regardless of the student populations they serve or their starting point in terms of average achievement.

References

- McCaffrey, D. F., Sass, T. R., Lockwood, J. R., & Mihaly, K. (2009). The intertemporal variability of teacher effect estimates. *Education Finance and Policy*, 4(4), 572–606.
- Schochet, P., & Chiang, H. S. (2010). *Error rates in measuring teacher and school performance based on student test score gains*. (NCEE 2010–4004). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.
- Timmermans, A. & Van der Werf, G. (2017) Accounting for previous performance of students by means of growth curves analyses to estimate the size, stability, and consistency of school effects. *Educational Research and Evaluation*, 23:5-6, 221-246, DOI: [10.1080/13803611.2017.1455300](https://doi.org/10.1080/13803611.2017.1455300)

Where can I learn more?

- For additional questions related to the Colorado Growth Model visit: <http://www.cde.state.co.us/accountability/coloradogrowth>.
- For questions about this fact sheet, contact Dan Jorgensen, PhD at: Jorgensen_D@cde.state.co.us