Illinois High School Growth

Considerations for use of ACT for SGP calculations

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Background: Illinois Assessments

- Beginning in Spring, 2025, students in grades 9, 10, and 11 will begin taking the ACT tests:
  - Grade 9: PreACT 9 Secure
  - Grade 10: PreACT Secure
  - Grade 11: ACT with Writing
- For the previous 8 years students in grade 9, 10, and 11 took SAT exams.
  - Grade 9: PSAT 8/9
  - Grade 10: PSAT
  - Grade 11: SAT with Essay
- Illinois wants to calculate growth for Illinois students in 2025

Questions for consideration

- What impact will the change in assessments have on the calculation of Student Growth Percentiles (SGPs)
  - How do the SAT and ACT suite of tests differ?
  - What impact will the transition year (and subsequent years) have on the calculation of student growth?

Background on student growth

- Calculation of student growth requires longitudinal, individual results from at least two assessments (usually in the same content area administered at the same time).
  - If gain scores are to be calculated, then the assessments must be vertically scaled (PSAT 9/PSAT/SAT are vertically scaled, I don't believe PreACT 9/PreACT/ACT are).
  - Gain scores are not a viable growth model, but if Illinois users are inclined to subtract scores, they should be informed about whether subtraction is supported by the score scale.

Student Growth Percentiles (SGPs)

- SGPs were derived to obviate issues related to the interpretation of change on score scales.
  - The SGP properties I discuss are associated with those derived via the methodology implemented in the SGP package for the R software environment.
  - There are alternative methods used to calculate SGP like quantities. I make no claims to the properties associated with those calculations.
- SGPs utilize non-parametric (B-spline) based quintile regression to accommodate both non-linearity of the multi-variate score distribution as well as heteroskedasticity.
  - SGPs are invariant to mono-tone transformations of scale.
- In general, assessment changes resulting in the change of score scale do not impact the calculation of SGPs (cohort referenced).
- Baseline referenced growth (which utilize historic growth norms) can only be used with the same prior/current score scales.
  - Transition from PSAT/SAT to PreACT/ACT will prevent baseline growth from being calculated until enough longitudinal data on the new scale is available to create growth norms on the new scale.

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Student Growth Percentiles (SGPs)

- SGP calculation produce growth norms that relate independent and dependent variables probabilistically.
- If $X_{t-2}, X_{t-1}, andX_t$ are student score distributions from times $t-2, t-1andt$, respectively, then:

$$(100 - SGP_i)/100 = Pr(X > X_{i,t}|X_{i,t-1}, X_{i,t-2})$$

- That is, an SGP indicates, probabilistically how exemplary the current score is given the prior scores.
  - An SGP of 1 implies 99% of students with the same scale score history had higher current scores.
  - An SGP of 99 implies 1% of students with the same scale score history had higher current scores.

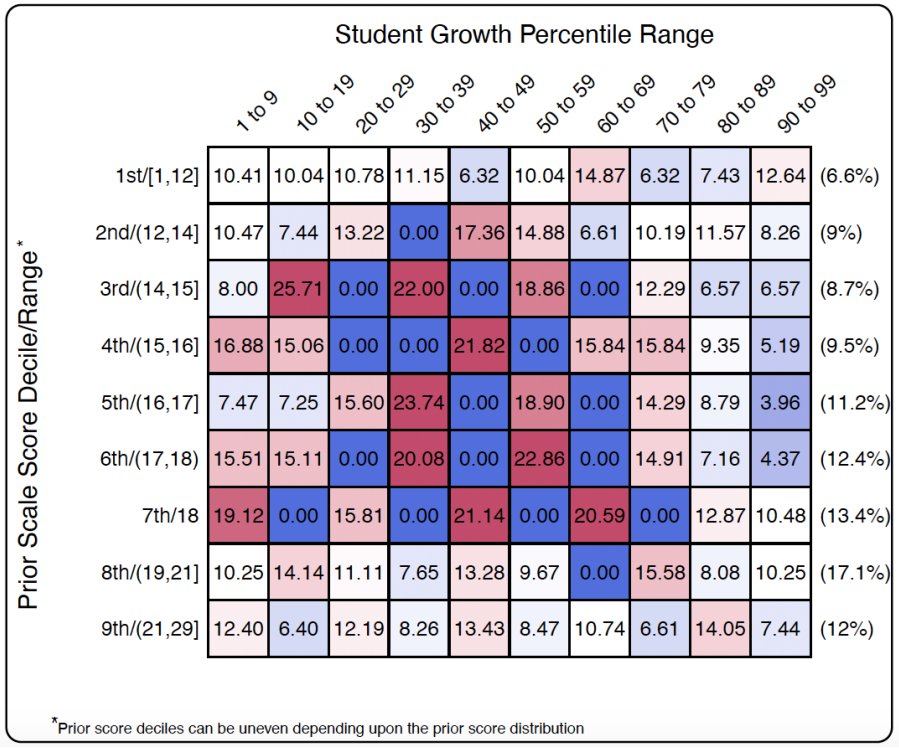
Issues related to the calculation of SGPs

- Because SGP calculations utilize scaled scores, properties of the scaled score distribution can impact the results.
  - Ceiling/Floor effects: SGPs model the multi-variate distribution and attempt to model 99 conditional quantile curves based upon the scaled score supplied. When the score distribution is capped and disproportionate numbers of students are assigned HOSS/LOSS, SGPs will be impacted.
  - Number of scaled score points: If the number of realized scaled score points is small (< 25), then fitting 99 conditional quantile curves will likely yield misfit as distinctions between 99 conditional quantile curves will be impossible given too few possible score combinations.

Goodness of Fit with simulated ACT data

Single prior (ACT current and prior)

ELA

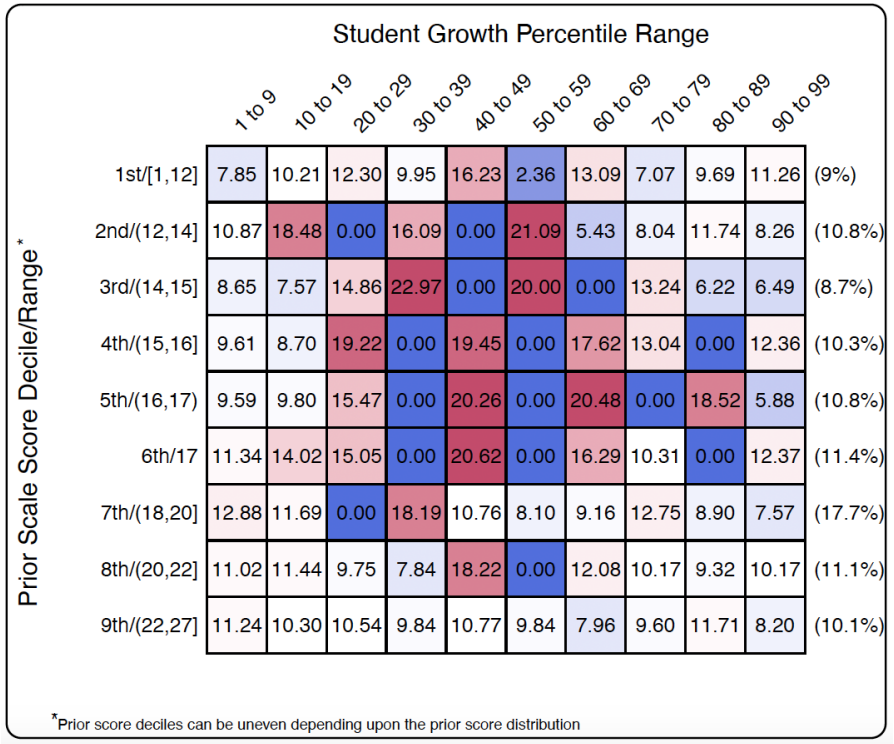


Student Growth Percentile Range

Prior Scale Score Decile/Range*	1 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	
1st/[1,12]	10.41	10.04	10.78	11.15	6.32	10.04	14.87	6.32	7.43	12.64	(6.6%)
2nd/(12,14]	10.47	7.44	13.22	0.00	17.36	14.88	6.61	10.19	11.57	8.26	(9%)
3rd/(14,15]	8.00	25.71	0.00	22.00	0.00	18.86	0.00	12.29	6.57	6.57	(8.7%)
4th/(15,16]	16.88	15.06	0.00	0.00	21.82	0.00	15.84	15.84	9.35	5.19	(9.5%)
5th/(16,17]	7.47	7.25	15.60	23.74	0.00	18.90	0.00	14.29	8.79	3.96	(11.2%)
6th/(17,18)	15.51	15.11	0.00	20.08	0.00	22.86	0.00	14.91	7.16	4.37	(12.4%)
7th/18	19.12	0.00	15.81	0.00	21.14	0.00	20.59	0.00	12.87	10.48	(13.4%)
8th/(19,21]	10.25	14.14	11.11	7.65	13.28	9.67	0.00	15.58	8.08	10.25	(17.1%)
9th/(21,29]	12.40	6.40	12.19	8.26	13.43	8.47	10.74	6.61	14.05	7.44	(12%)

*Prior score deciles can be uneven depending upon the prior score distribution

Mathematics



Student Growth Percentile Range

Prior Scale Score Decile/Range*	1 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	
1st/[1,12]	7.85	10.21	12.30	9.95	16.23	2.36	13.09	7.07	9.69	11.26	(9%)
2nd/(12,14]	10.87	18.48	0.00	16.09	0.00	21.09	5.43	8.04	11.74	8.26	(10.8%)
3rd/(14,15]	8.65	7.57	14.86	22.97	0.00	20.00	0.00	13.24	6.22	6.49	(8.7%)
4th/(15,16]	9.61	8.70	19.22	0.00	19.45	0.00	17.62	13.04	0.00	12.36	(10.3%)
5th/(16,17)	9.59	9.80	15.47	0.00	20.26	0.00	20.48	0.00	18.52	5.88	(10.8%)
6th/17	11.34	14.02	15.05	0.00	20.62	0.00	16.29	10.31	0.00	12.37	(11.4%)
7th/(18,20]	12.88	11.69	0.00	18.19	10.76	8.10	9.16	12.75	8.90	7.57	(17.7%)
8th/(20,22]	11.02	11.44	9.75	7.84	18.22	0.00	12.08	10.17	9.32	10.17	(11.1%)
9th/(22,27]	11.24	10.30	10.54	9.84	10.77	9.84	7.96	9.60	11.71	8.20	(10.1%)

*Prior score deciles can be uneven depending upon the prior score distribution

Goodness of Fit with simulated ACT data

Two priors (ACT current and priors)

ELA

Student Growth Percentile Range

Prior Scale Score Decile/Range*	1 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	
1st/[1,12)	8.94	8.94	10.30	11.38	8.67	11.38	9.76	11.92	9.76	8.94	(8.9%)
2nd/[12,14)	12.59	12.59	9.20	9.93	9.44	12.59	6.05	8.96	10.41	8.23	(9.9%)
3rd/[14,15)	11.96	9.30	9.63	9.97	8.97	9.30	12.62	11.30	5.32	11.63	(7.2%)
4th/[15,16)	5.66	7.20	16.20	5.91	16.45	3.60	16.20	6.94	14.40	7.46	(9.3%)
5th/[16,17)	9.44	12.83	12.83	10.17	8.96	5.57	11.86	6.54	12.35	9.44	(9.9%)
6th/[17,18)	10.81	10.59	9.11	13.14	10.59	10.17	8.05	10.17	7.63	9.75	(11.3%)
7th/[18,19)	11.63	10.08	11.43	7.75	10.27	11.63	10.27	7.36	9.88	9.69	(12.4%)
8th/[19,20)	8.85	7.86	15.97	2.21	15.48	5.90	15.48	6.14	11.55	10.57	(9.8%)
9th/[20,21)	7.74	10.22	9.60	12.38	10.53	9.91	6.81	12.07	10.84	9.91	(7.8%)
10th/[21,30]	12.72	11.83	10.57	11.11	7.17	10.57	8.42	10.04	8.42	9.14	(13.4%)

*Prior score deciles can be uneven depending upon the prior score distribution

Mathematics

Student Growth Percentile Range

Prior Scale Score Decile/Range*	1 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	
1st/[1,12)	9.61	10.59	10.59	8.87	8.37	10.10	10.10	12.07	9.85	9.85	(9.8%)
2nd/[12,13)	9.09	11.76	8.56	11.23	11.76	4.28	14.97	8.56	10.70	9.09	(4.5%)
3rd/[13,15)	9.03	12.81	7.88	14.78	8.54	9.36	9.69	9.20	8.87	9.85	(14.7%)
4th/[15,16)	10.77	10.77	10.77	6.67	6.92	11.03	7.44	14.10	10.77	10.77	(9.4%)
5th/[16,17)	8.20	8.88	12.30	11.85	7.74	11.39	14.12	9.57	8.43	7.52	(10.6%)
6th/[17,18)	10.00	9.09	10.00	8.18	13.64	7.95	13.64	5.23	13.18	9.09	(10.6%)
7th/[18,19)	8.53	9.48	11.61	9.48	11.14	6.40	11.37	10.19	10.90	10.90	(10.2%)
8th/[19,20)	12.20	10.03	12.74	7.59	9.21	10.57	7.59	12.20	7.05	10.84	(8.9%)
9th/[20,21)	8.25	11.88	8.58	12.54	7.92	13.53	7.26	12.54	7.92	9.57	(7.3%)
10th/[21,32]	9.98	8.97	9.81	8.46	11.34	9.81	11.51	9.81	10.49	9.81	(14.2%)

*Prior score deciles can be uneven depending upon the prior score distribution

Transition years (2025, 2026)

- In general, up to two priors are used for the calculation of SGPs.
  - More priors can be used, but their impact on the dependent variable is extremely small after the first two priors are accounted for.
  - In 2025, up to two IAR/PSAT priors will be used.
  - In 2026, up to two IAR priors and one PSAT or PreACT prior will be used.
  - In 2027, up to two IAR priors and up to two PreACT priors will be used.

Student Growth Projections

- With assessments going from Grade 3 to Grade 11, Illinois can calculate student growth projections for Grades 3 to 11.
- Projections are calculated by daisy-chaining together growth norms grade-by-grade to create percentile growth trajectories.
- These trajectories can then be used to determine “growth-to-standard” (e.g., growth necessary to reach “proficiency” or “college-readiness”)
- Projections cannot be calculated in the assessment transition year for the new test as we don’t have growth norms that relate PreACT9/PreACT/ACT (i.e., we haven’t used PreACT9/PreACT as priors yet).

Questions I have

- Are the PreACT/ACT administered at the same time (roughly) to all students or are students allowed to take the test throughout the year?
- Are there theta scores (is PreACT/ACT IRT based?) available for the PreACT/ACT?

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