Variation in the Performance of High School Early Warning Indicators across Districts and Schools

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Background

- Over the past two decades, early-warning indicators (EWIs) have become widely implemented across the country (Balfanz & Byrnes, 2019)
  - On-track indicator (Allensworth & Easton, 2005)
  - Attendance, behavior, and course performance (Balfanz et al., 2007; Neild & Balfanz, 2006)
- EWIs, when used, are usually applied consistently across local school systems within states or across schools within local school systems.
- However, the distribution of measures that typically underlie EWIs (i.e., GPA, attendance, test scores, behavior), can vary greatly across schools and districts.
- There is a need to examine the extent to which early-warning measures can effectively and equitably identify students in need of support across local school system and school-level contexts.

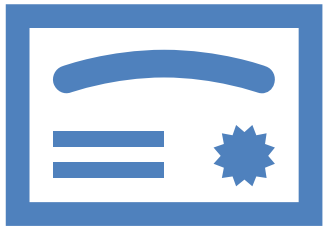
Research Question

To what extent do measures such as GPAs, attendance rates, test scores, and suspensions, differ in their ability to distinguish students who do and do not attain the following outcomes: on-time high school graduation and immediate college enrollment?

Variation will be examined across state, local school system, and school levels.

Population of Interest and Outcomes

First-time,
ninth-grade students



On-time
high school graduation

First-fall
college enrollment

Data Needs - Variables

K-12 Education Sector

- Grade 9
  - Demographic composition
  - Grade-point averages
  - Attendance rates
  - Algebra test scores
  - Suspensions
- Grade 10
  - English test scores
- HS on-time graduation status (i.e., within four years)

Postsecondary Education Sector

- Postsecondary enrollment records

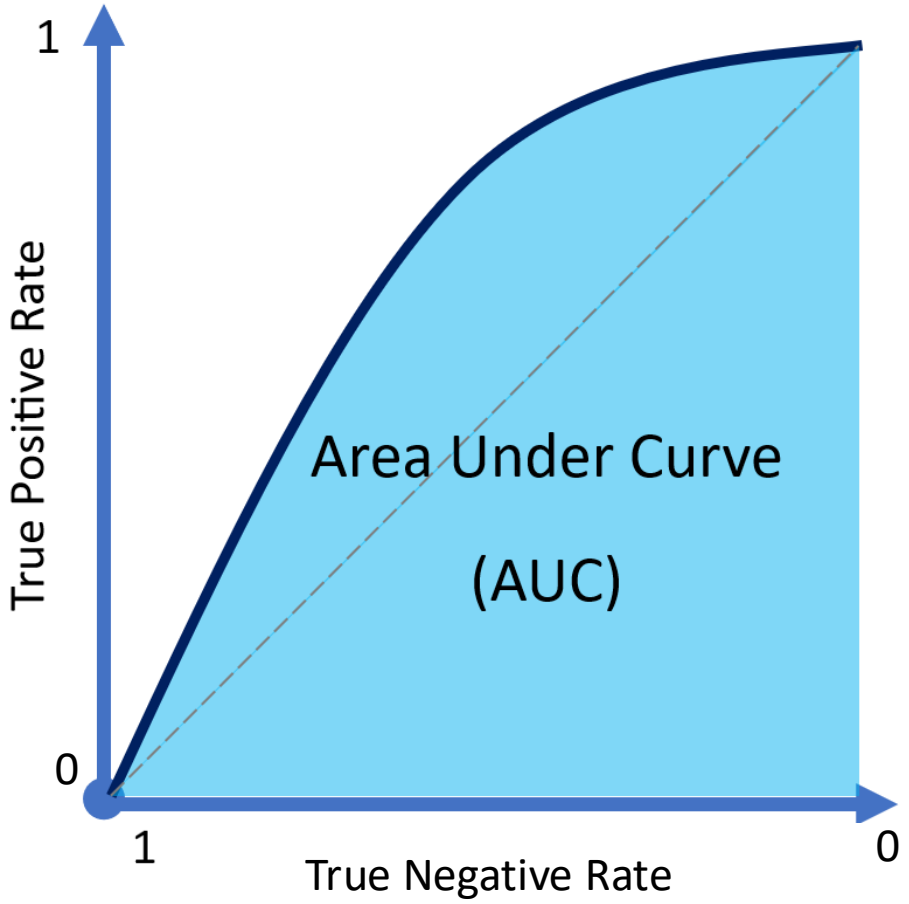
Data Needs – Student Cohorts

Cohort	First HS Year	Expected HS Graduation Year	Expected College Enrollment Year
1	2012-13	2015-16	2016-17
2	2013-14	2016-17	2017-18
3	2014-15	2017-18	2018-19
4	2015-16	2018-19	2019-20

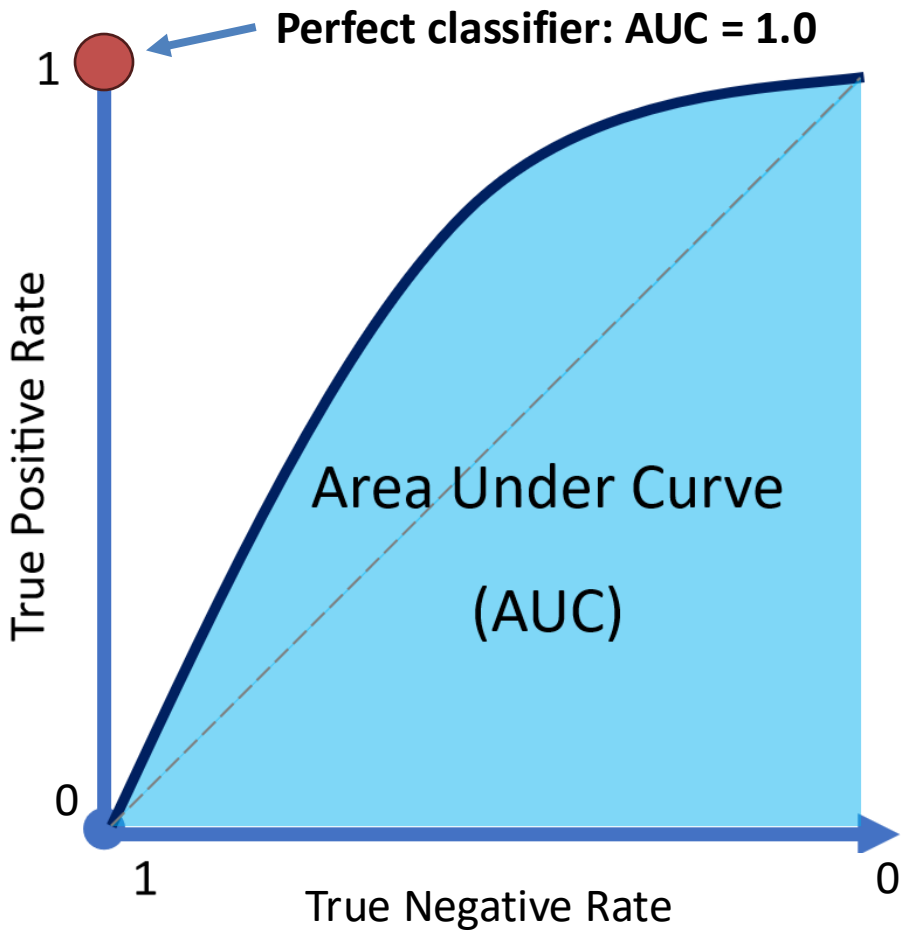
Methodological Approach

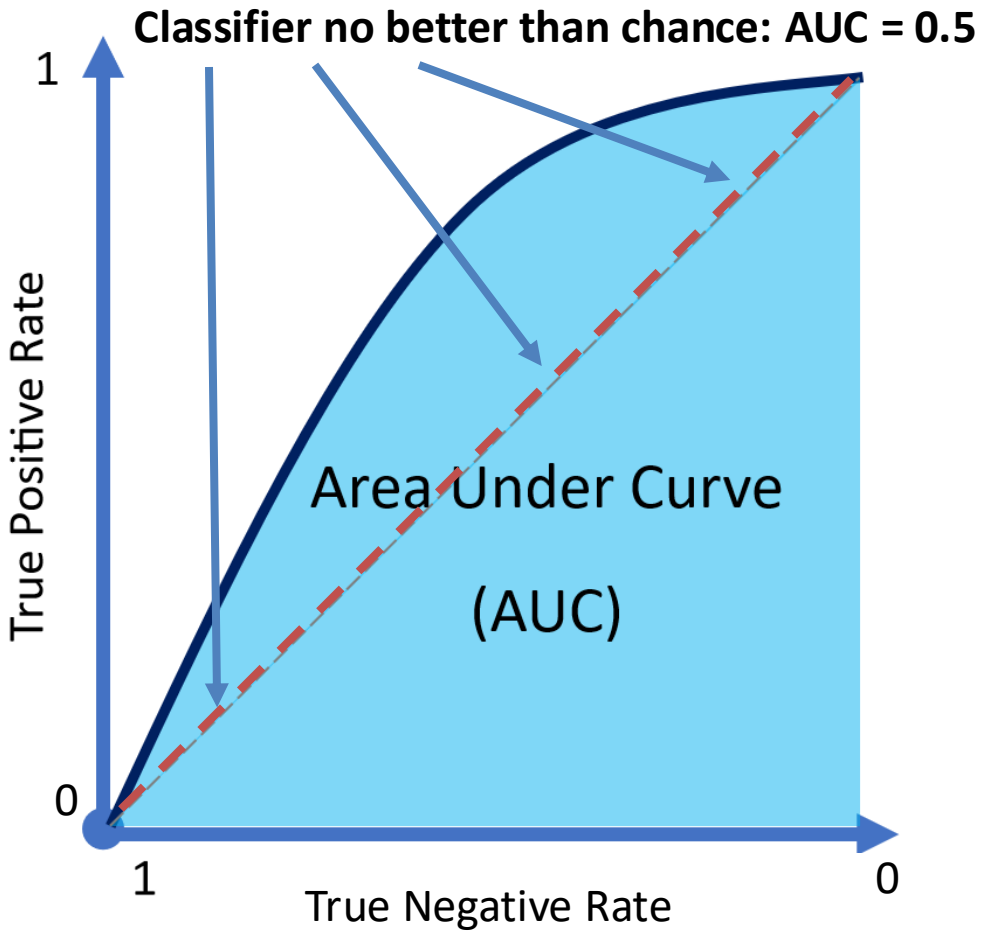
Receiver Operating Characteristic (ROC) analysis

- Utilize the Area Under Curve (AUC) statistic to summarize how well the underlying measure can distinguish between students who do and do not attain an outcome of interest (Bowers & Zhou, 2019; Fan et al., 2006).
- AUC provides a threshold agnostic measure of performance.



Reference points for ROC Graph





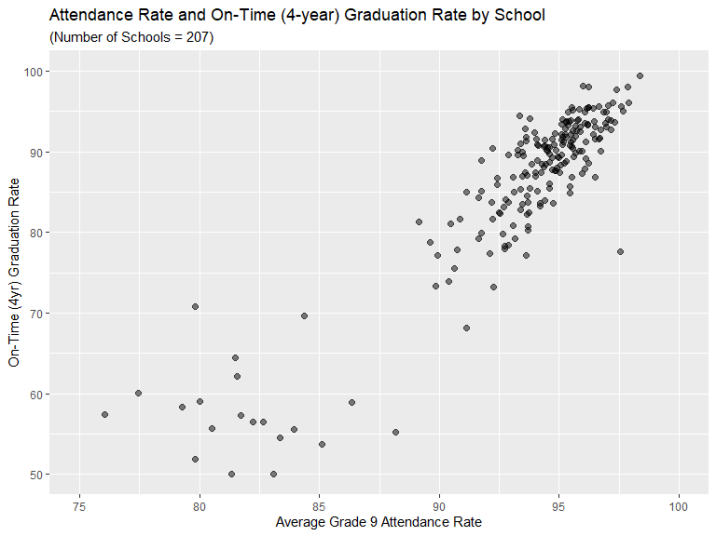
Analytic Sample

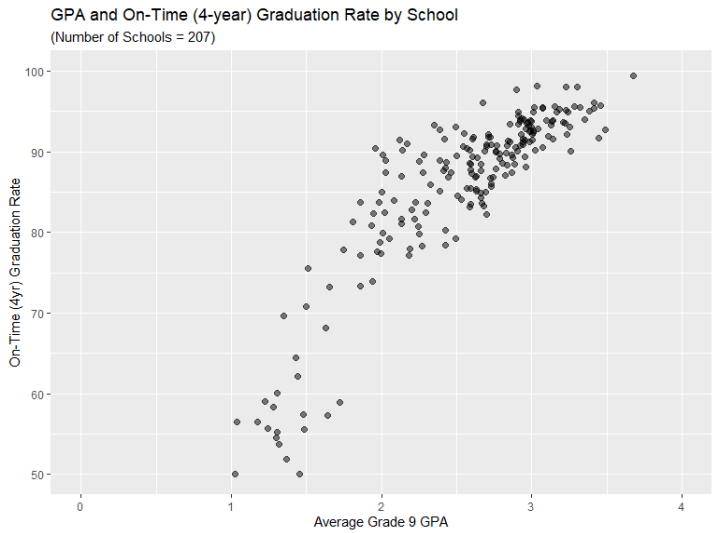
Comprised of **214,870 first-time, ninth grade students** in **207 schools** across **24 local school systems**

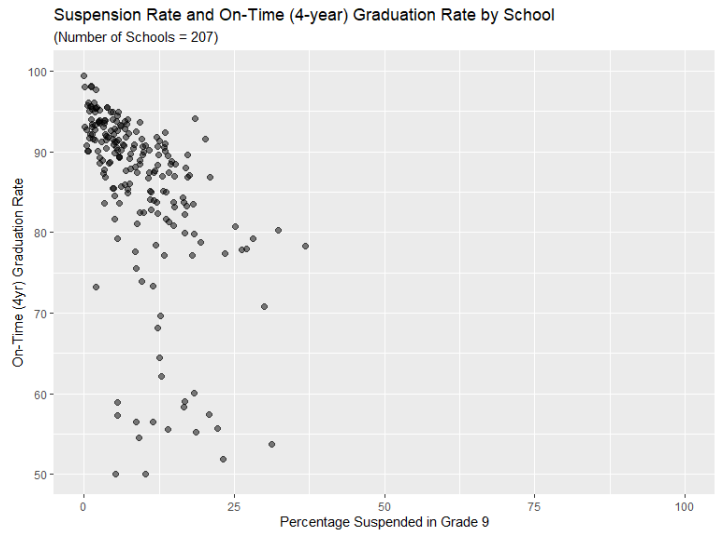
Demographic Composition	
Gender – Female	49.7%
Race – Asian	6.4%
Race – Black	34.8%
Race – White	48.6%
Ethnicity – Hispanic or Latinx	12.5%
Special Education	9.8%
English Learner	2.8%
FARMs	39.3%

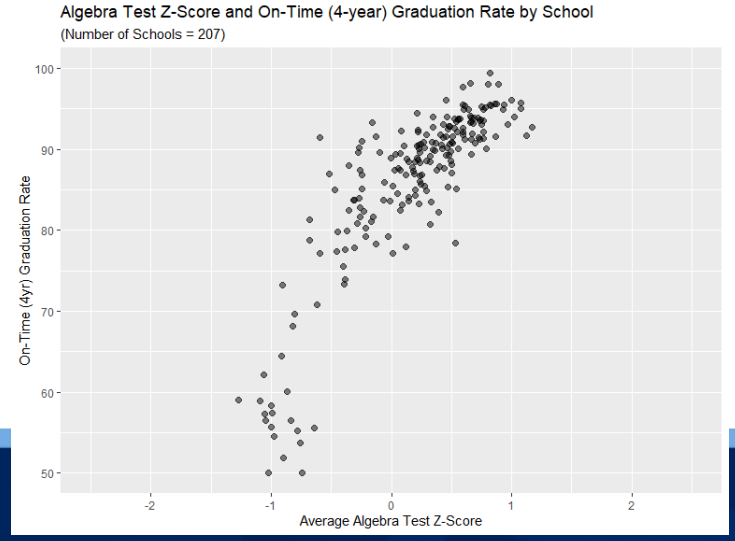
Variable	Mean (S.D.)
Grade 9 Attendance Rate	94.2 (8.0)
Grade 9 GPA	2.6 (1.0)
Algebra test z-score (% with algebra score: 93.4)	0.3 (0.9)
English test z-score (% with English score: 90.1)	0.1 (1.0)
Grade 9 Percentage Suspended	8.0%
High School Graduation Rate	87.7%
First-Fall College Enrollment Rate	59.1%

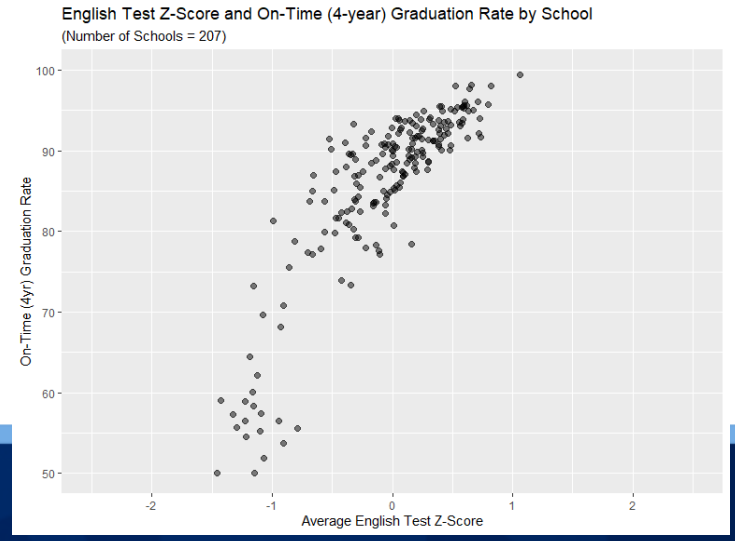
School-Level Variation in Variables of Interest and Graduation



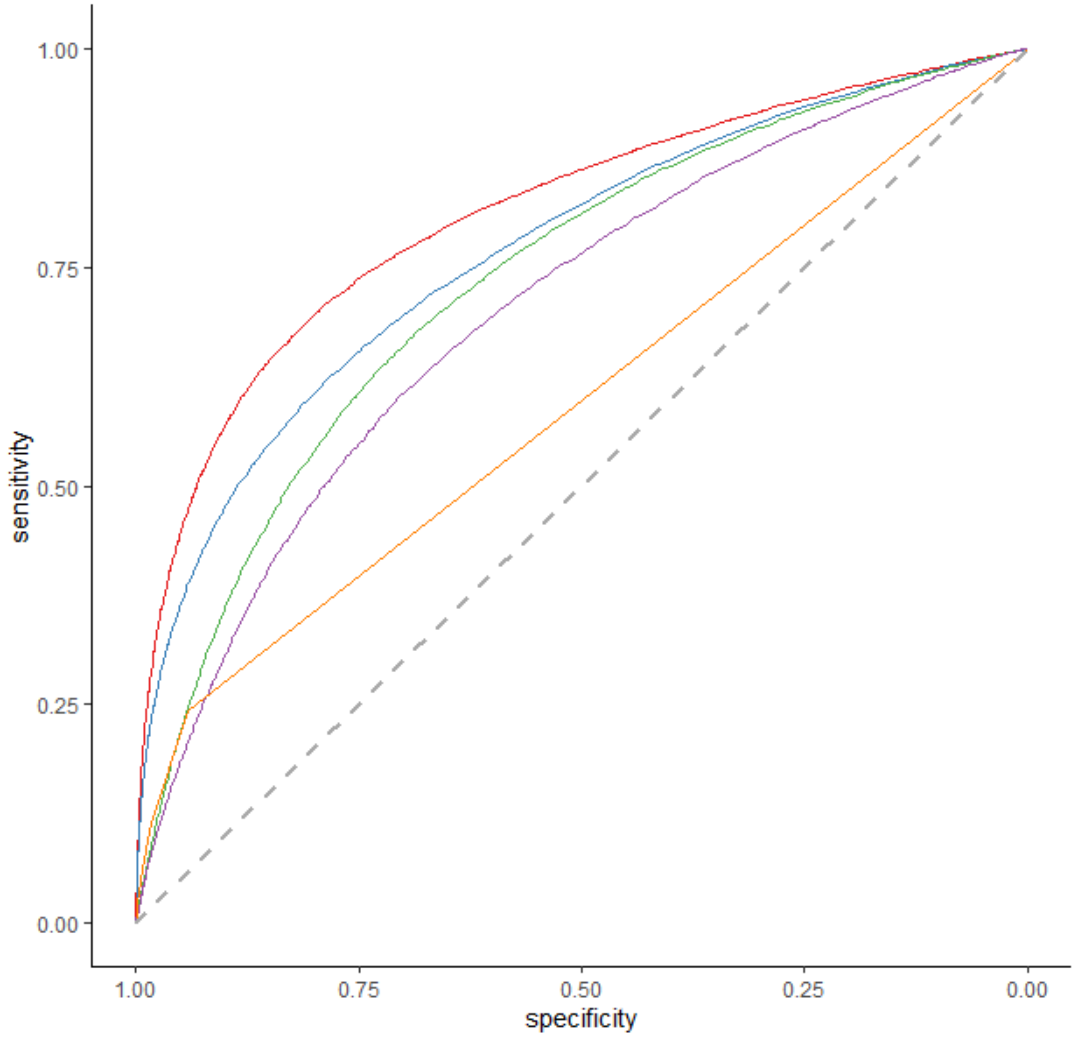








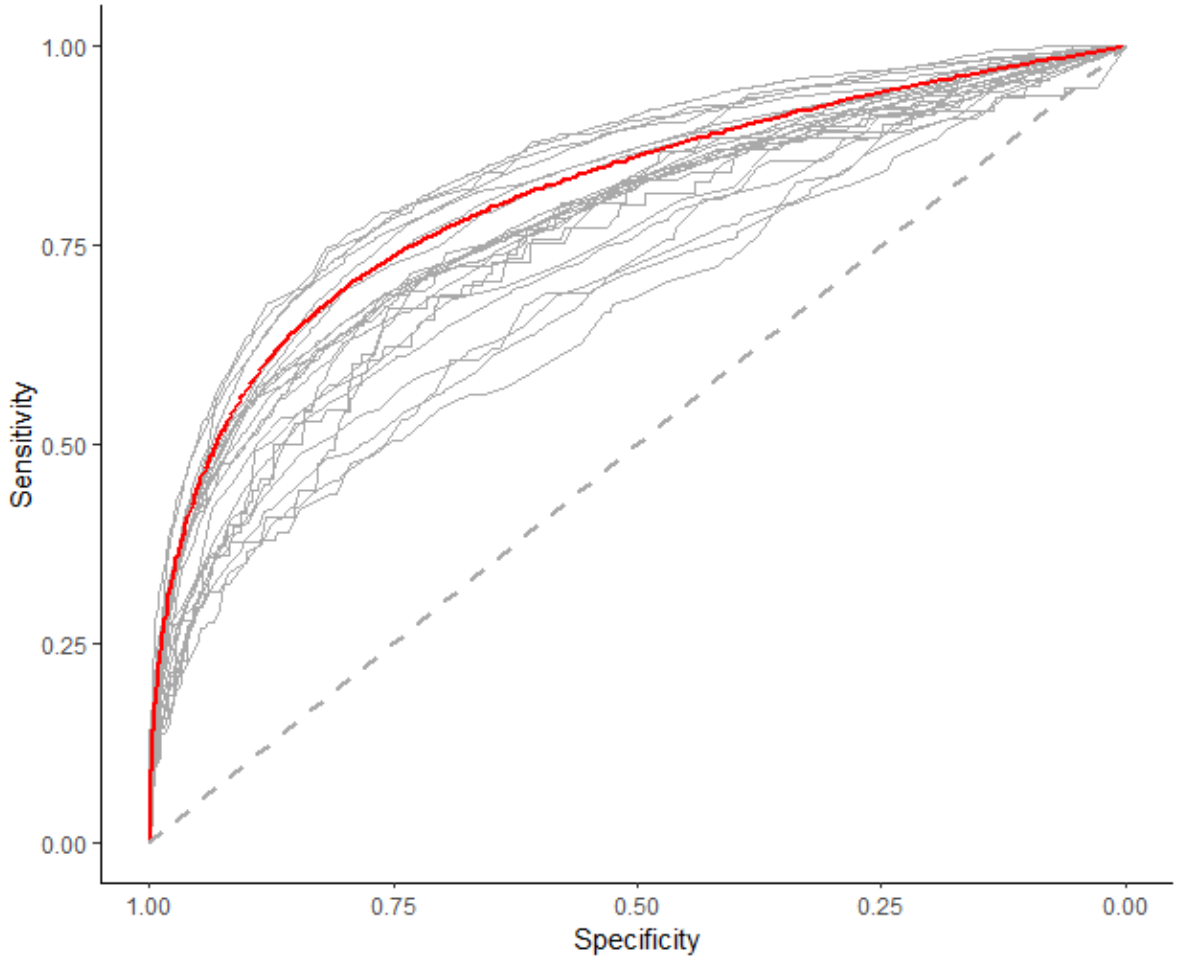
ROC Graph – Comparing Measures at State Level



Outcome:

Did not graduate high school within four years

ROC Graph – Comparing Measures across Local School Systems

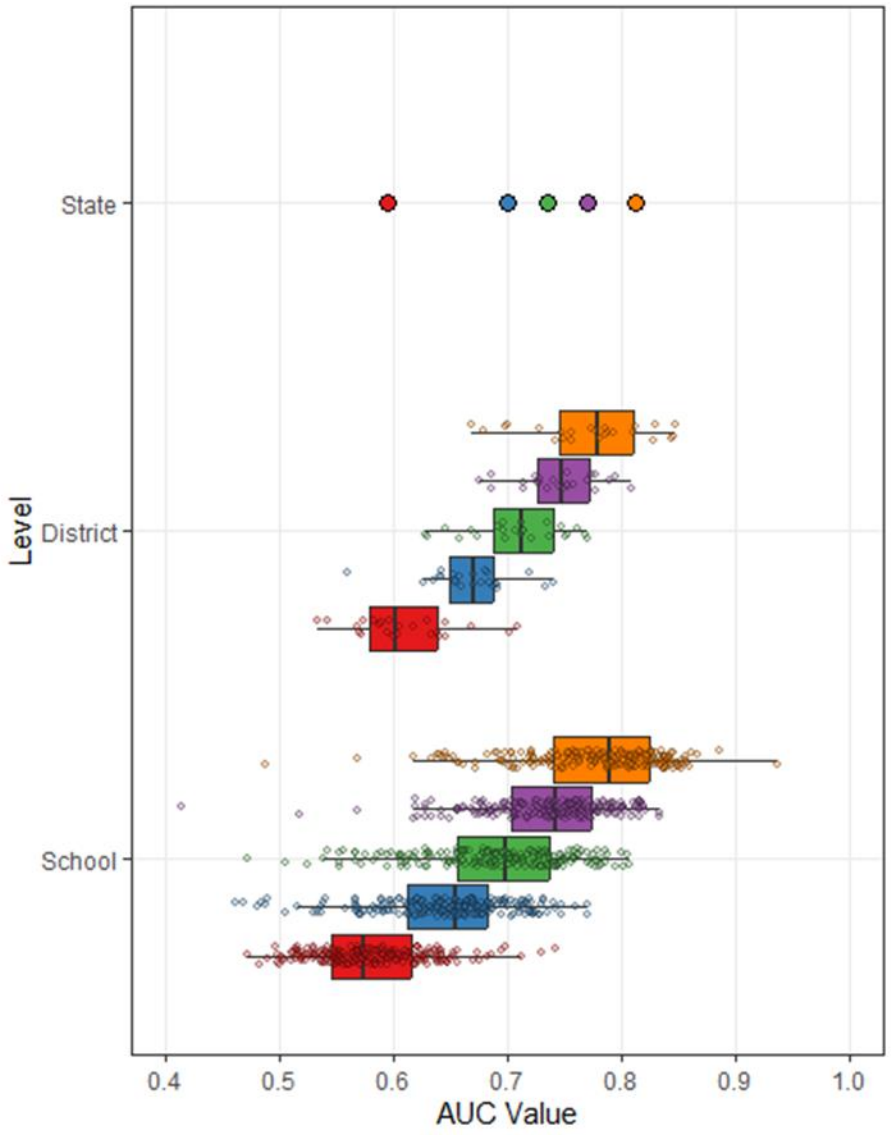


Measure:
Ninth Grade GPA

Outcome:
Did not graduate high school within four years

Note:
Gray lines represent different local school systems, red line represents state level

Variation in AUC by Education Level and Measure



Outcome:
Did not graduate high school within four years

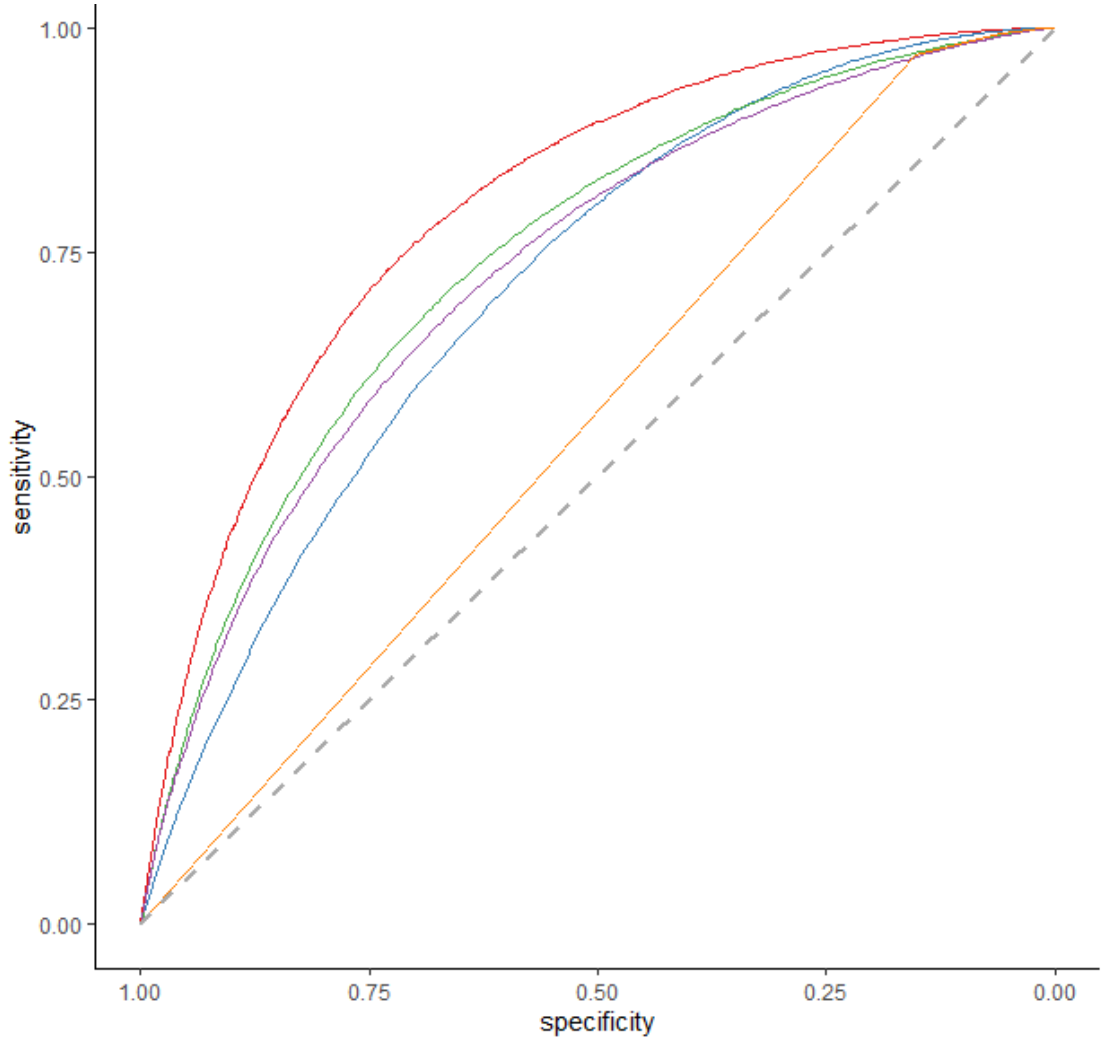
Measure
- GPA
- Attendance Rate
- Test Score - English
- Test Score - Algebra
- Suspension Count

Demographic Composition by School AUC Quartile

Demographic Composition	AUC Q1 (Lowest)	AUC Q4 (Highest)
Schools	52	51
First-Time, Ninth-Grade Students	53,627	53,700
Gender – Female	50.1%	50.0%
Race – Asian	8.5%	5.5%%
Race – Black	18.6%	45.6%
Race – White	66.1%	35.5%
Ethnicity – Hispanic or Latinx	6.8%	17.8%
Special Education	7.5%	11.5%
English Learner	0.9%	5.0%
FARMs	18.8%	55.0%
Grade 9 Average Attendance Rate	95.7	92.9
Grade 9 Average GPA	3.0	2.4
Grade 9 Percent Suspended	4.5%	10.8%
Average Algebra test z-score	0.7	0.1
Average English test z-score	0.4	-0.1
High School Graduation Rate	92.8%	82.6%

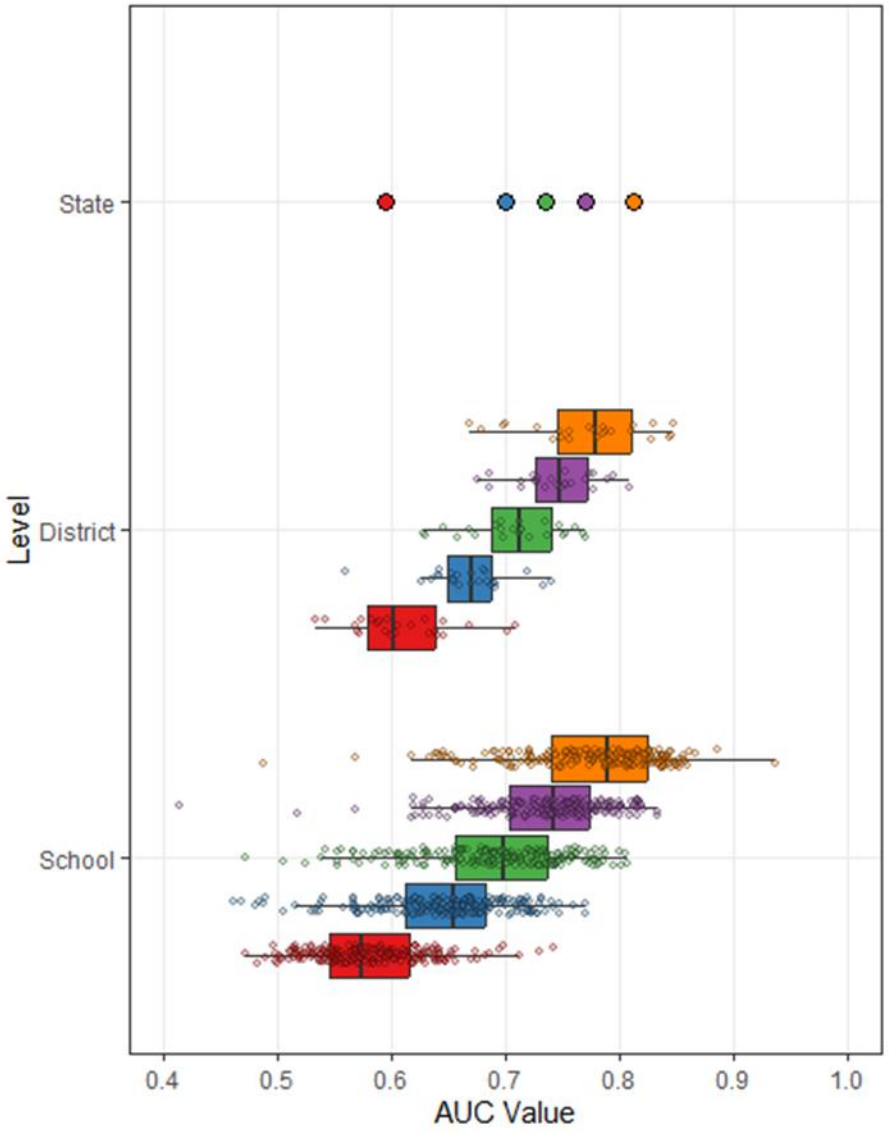
Measure: Ninth Grade GPA
Outcome: Did not graduate high school within four years

ROC Graph – Comparing Measures at State Level

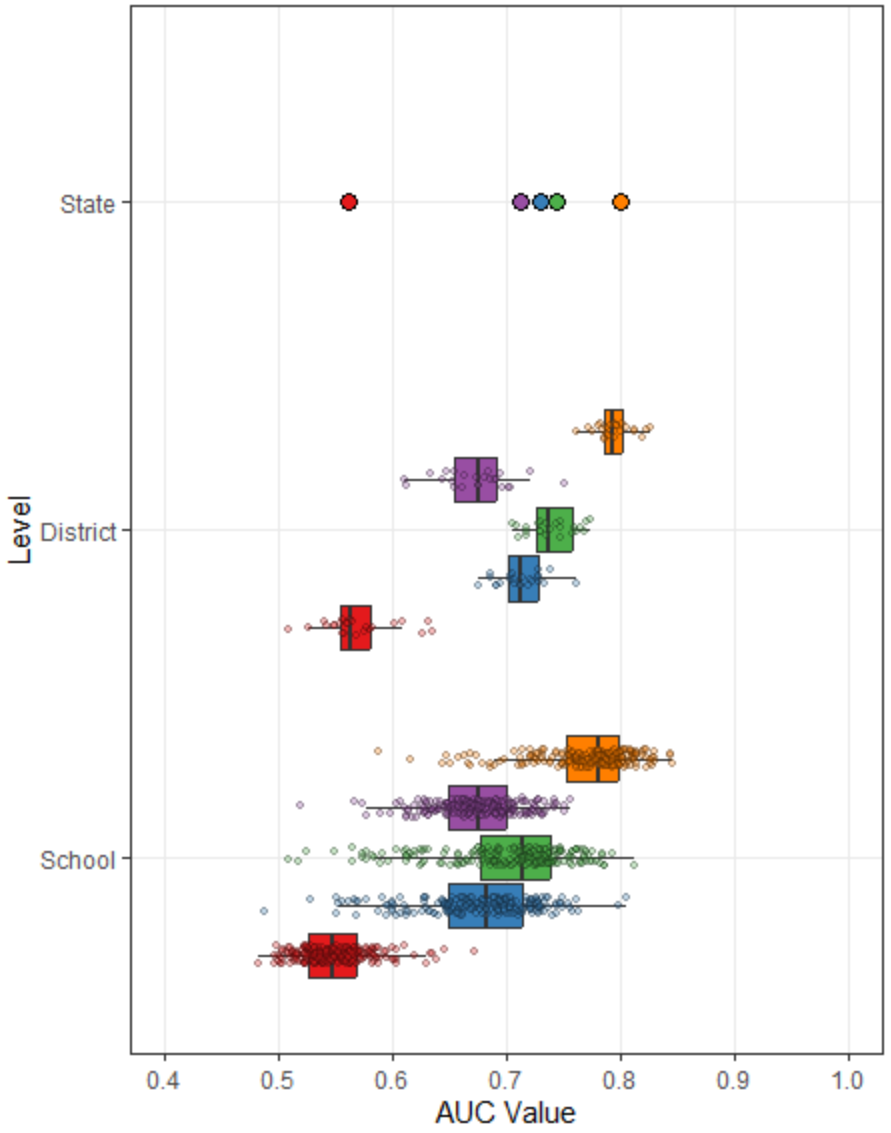


Outcome:
First-fall college enrollment

Variation in AUC by Education Level and Measure



Outcome:
Did not graduate high school within four years



Outcome:
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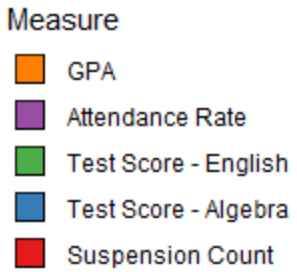

Summary of Findings

Early-Warning in High School

- There is notable and increasing variation in AUC values for all EWI measures as the level of analysis changes from state, to local school systems, to individual schools.
- Across levels, AUC values for GPA were typically highest, followed by attendance rates, and then test scores. AUC values for suspensions were typically lowest suggesting that this measure may not be as useful at providing an early-warning signal compared to other measures.
- AUC values were highest in schools where the overall student composition reflected greater student need and lower high school graduation rates.

Summary of Findings (continued)

First-Fall College Enrollment

- Also find increasing variation in AUC values for all measures as the level of analysis changes from state, to local school systems, to individual schools, though less so at the district level.
- Across measures, GPA continued to have the highest AUC values, but now test scores had higher AUC values than attendance rates.
- AUC values for suspensions were consistently lowest.

Next Steps

- Examine additional postsecondary outcomes:
  - college persistence
  - degree attainment
- Extend ROC analysis to examine optimal thresholds for measures at different levels and describe their variation
- For students who need support but who are not flagged by EWIs, examine characteristics of those students to better understand who is typically missed by EWI systems.

Thank you!

Any feedback or questions?

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