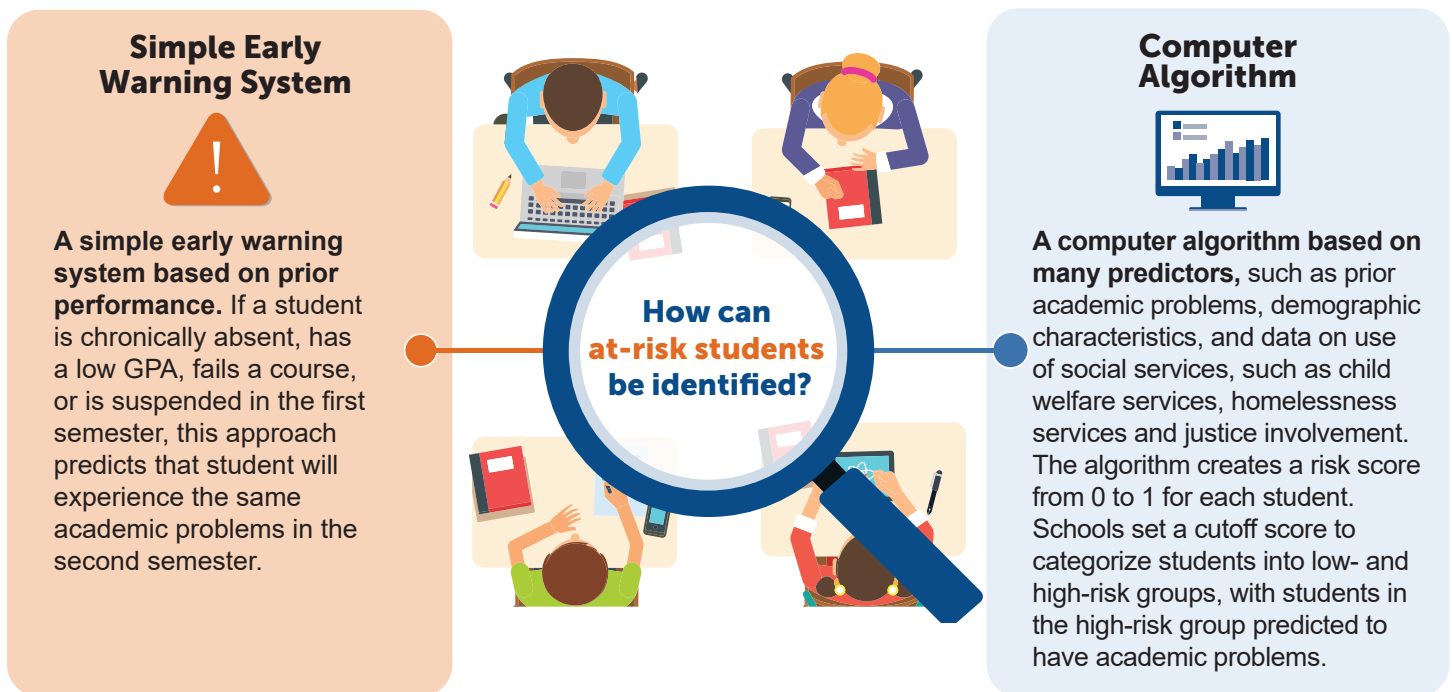# Simple early warning system vs. computer algorithms: Does one more accurately identify students at near-term academic risk?

By accurately identifying students at risk of near-term academic problems, districts can target services for these students to prevent problems before they lead to even more serious consequences, such as dropping out of school. A recent REL Mid-Atlantic study assessed two approaches for identifying students with near-term academic risk.

Simple Early Warning System

A simple early warning system based on prior performance. If a student is chronically absent, has a low GPA, fails a course, or is suspended in the first semester, this approach predicts that student will experience the same academic problems in the second semester.

How can at-risk students be identified?

Computer Algorithm

A computer algorithm based on many predictors, such as prior academic problems, demographic characteristics, and data on use of social services, such as child welfare services, homelessness services and justice involvement. The algorithm creates a risk score from 0 to 1 for each student. Schools set a cutoff score to categorize students into low- and high-risk groups, with students in the high-risk group predicted to have academic problems.
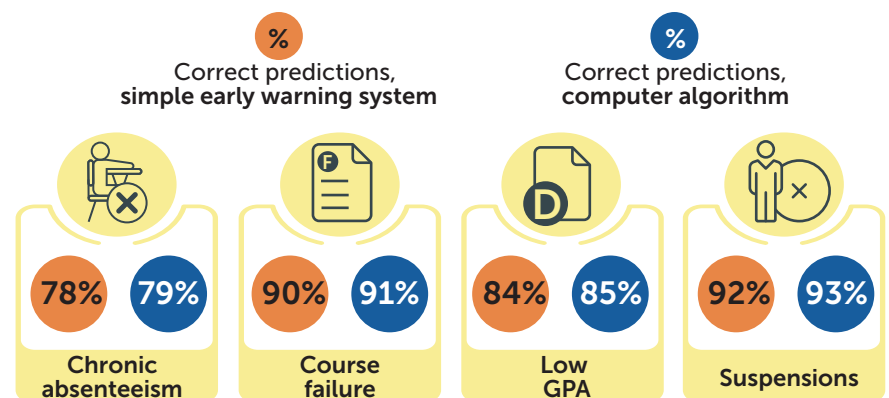
Methods

We used historical data from Pittsburgh Public Schools and the Allegheny County Department of Human Services to assess the accuracy of these approaches by answering the following questions:

• How often was the prediction right?
• Are at-risk students falling through the cracks?
• Are lower-risk students receiving services that they don't need?
• Are the resources expended on at-risk students going toward students who actually need them?

What did we find? Both approaches predict academic outcomes with similar accuracy.

% Correct predictions, simple early warning system

% Correct predictions, computer algorithm

Chronic absenteeism	Course failure	Low GPA	Suspensions
78% 79%	90% 91%	84% 85%	92% 93%

How can schools or districts decide which approach to use?

	Simple early warning system ⚠️	Computer algorithm 📊
How accurate is the approach?	☑ Good accuracy	☑ Good accuracy
What resources are required to set up and maintain it?	☑ Less cost and staff time	☑ Significant cost and staff time
What data are required?	☑ Readily available administrative data	☑ Extensive administrative data
Can it rank students by risk in order to target resources to the most at-risk students?	☑ No	☑ Yes

How can districts using algorithms choose the cutoff for the risk scores?

Schools or districts only need to select a cutoff if they are using the computer algorithm. When selecting the cutoff, schools or districts must choose between over-including and under-including students who will also go on to experience an academic problem.

⬆ **Selecting a cutoff higher than the outcome rate** will capture more students that experience an academic problem, but will also capture many students that will not go on to experience an academic problem.

⬇ **Selecting a cutoff lower than the outcome rate** will target the students most likely to experience an academic problem, but miss many other students who will go on to experience an academic problem.

The district should ask themselves two questions when choosing the risk score cutoff:

- Is there a reason besides cost to under-include students, such as a stigmatizing intervention or one that takes students out of class?
- What is the cost effectiveness of the interventions?

$ Low cost, very effective intervention	$ Low cost, somewhat effective intervention	$$$ High cost, very effective intervention
⬆ **Over-include students**	**Neither under- or over-include students**	⬇ **Under-include students**
Select cutoff higher than outcome rate	**Select cutoff similar to outcome rate**	**Select cutoff lower than outcome rate**
Example: to improve GPAs, select the 40% of students with the highest risk to receive an email reminding them of the resources available to help them improve their course performance *(in a school where 30% of students have a low GPA)*	**Example:** to improve GPAs, select the 30% of students with the highest risk to receive access to online tutorials *(in a school where 30% of students have a low GPA)*	**Example:** to improve GPAs, select the 10% of students with the highest risk to receive intensive tutoring *(in a school where 30% of students have a low GPA)*

⬆ Over include   Neither   ⬇ Under include

Computer algorithm risk score

0 — Lowest risk   0.7   1 — Highest risk

● students without an academic problem   ○ students with an academic problem