EAB

Early Warning Systems

District Leadership Forum

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1) Executive Summary

Key Observations

To build an early warning system (EWS), test configurations of variables and analyses with past student data to identify a model that accurately and precisely identifies at-risk students at the district. To construct an EWS, administrators at profiled institutions hypothesize which combination of variables and analysis would correctly identify dropouts in their district. Then, administrators use data from past students (who have already dropped out or graduated) to determine (1) to what extent the selected combination of variables and analysis would have assigned high-risk status to past students who dropped out and (2) to what extent the selected combination of variables and analysis would have assigned high-risk status to students who did not drop out. Subsequently, administrators iterate to find a combination of variables and analysis that correctly identifies past dropouts and does not identify students who did not drop out. Administrators should iterate using past student data from their district because variables that predict dropout at one district may not do so at another district.

Balance predictive power with transparency to promote EWS engagement. Administrators at both District A and District B knowingly sacrificed some of their EWSs' predictive capabilities to decrease their systems' complexity. Administrators at District A opted to use fewer variables. Researchers at District B opted to use a simpler analytical model rather than multivariable linear regression. Contacts report that EWS creators must build transparent and understandable systems to promote buy-in from intervention teams and administrators.

Use EWS output to inform both single-student intervention and school-wide intervention. Administrators design EWSs primarily to identify and support at-risk students. When interventionists (e.g., social workers, counselors, specialists) at District B provide one-on-one support to students at high risk, they can prevent four to five times as many students from dropping out as they could if they focused primarily on students at low risk. In addition to single-student intervention, EWSs can also inform broader strategy. For example, administrators can use EWS results to help identify which schools struggle to support students to graduation. In response, administrators can provide extra support to those schools and deliver school-wide interventions aimed at supporting all students to graduation. For example, administrators could promote school-wide attendance by offering gift cards to each student with perfect attendance.

EWSs prove cost effective at profiled institutions. EWSs allow district administrators to optimize the impact of limited district resources by effectively targeting students that would most benefit from intervention. Further, contacts at District B report that EWSs can recoup the cost of implementation and operation through preventing drop out, which maintains district enrollment, which in turn maintains the district's funding allocation.

2) Early Warning System Structure

Overview

Build an Early Warning System that Uses Predictive Analytics to Assign Student Risk Status

Early warning systems use student data and predictive analytics to identify students who may go on to drop out or not graduate on time. Administrators employ EWSs to help interventionists (e.g., social workers, counselors, specialists) proactively support students to an on-time graduation. While EWSs differ significantly from institution to institution, EWS models include the following core components.

Archetypal Early Warning System Model Components

Predicted Outcome
EWSs predict either dropout or on-time graduation.

Variables
Administrators often use attendance, behavior, and course grades—known as the ABCs—to predict outcomes.

Administrators use student data from past years at their district to determine which variables best predict dropout or delayed graduation.

Thresholds/Analytics
An EWS flags a student as at-risk when their performance in a variable (e.g., behavior) reaches a certain threshold. For example, an EWS may flag a student as at risk after three discipline referrals.

Some EWSs do not use uniform thresholds. For example, the EWS at Department of Education A uses multivariable regression.

Student Risk Status
EWSs assign each student a risk status based on the system's variables and thresholds/analytics.

EWSs usually use three risk levels: high risk, medium risk, or low risk—often coded as red, yellow, and green.

EAB Profiled Districts, State Education Agencies, and a Nonprofit to Gather a Variety of EWS Perspectives

EAB interviewed contacts at four school districts, two state departments of education, and a non-profit to understand how institutions in various administrative positions operate EWSs. The profiled nonprofit, Nonprofit A, operates an EWS in 19 schools.

Predict Either Dropout or Four-Year Graduation

Contacts at all but one of the profiled institutions report that their EWS either predicts dropout or four-year graduation— Nonprofit A's EWS does not predict any outcome. Regardless of the outcome administrators choose to predict, EWSs can help improve graduation rates. Nonetheless, administrators must pick one to focus their predictive analytics on one dependent variable rather than two dependent variables.

The EWS at District B predicts dropout. Contacts at the district report that dropout—an event that could occur tomorrow for students in 11th or 12th grade—may feel more relevant to students and interventionists than graduation, which may occur a year or more in the future. Thus, contacts at District B report that predicting dropout encourages students and interventions to pay more attention to their EWS.

Administrators at District A, Department of Education A, and District C predict on-time graduation because their institutional goals include improving four-year graduation rates. The EWS at District A also predicts postsecondary matriculation. Contacts report that their EWS predicts matriculation to signal that students must not only graduate—they must graduate with the grades and skills necessary for future success. Through predicting matriculation, administrators send the message to students that they must work hard to achieve high grades—not just graduate.

Use Student Data from Past Years to Test the Predictive Power of EWS Variables and Thresholds/Analytics in Local Context

Contacts at profiled institutions report that using local data also enhances interventionist buy-in because intervention teams understand that researchers customized the system to their students.

To construct EWSs' predictive mechanisms (i.e., variables and thresholds/analytics) contacts at profiled institutions tested student data from past years (i.e., data from students who have already graduated or dropped out) to choose EWS variables and to customize analysis to their own state or district. Variables that predict on-time graduation at one district may not predict on-time graduation at another district. For example, though much research suggests that behavioral incidents (e.g., suspensions, discipline referrals) can help predict dropout, researchers at District B found that behavioral incidents (as measured by suspensions) did not significantly increase their EWS's predictive power. Therefore, researchers only included suspensions as a secondary variable. At other institutions, however, behavioral incidents may accurately predict the likelihood of dropping out.

Administrators should use student data from past years at their district to test how well various combinations of variables and analysis would have identified students who later dropped out or did not graduate on time. To do this, administrators should:

- Hypothesize which combination of variables and analysis would correctly identify dropouts in their district.
- Run the system analytics with data from past students.
- Examine (1) to what extent the selected combination of variables and analysis would have assigned high-risk status to past students who dropped out and (2) to what extent the selected combination of variables and analyses would have assigned high-risk status to students who did not drop out.

- Iterate to find a combination of variables and analysis that correctly identifies past dropouts. Ideally, administrators would craft a model that comes close to an EWS with perfectly sensitive and specific predictive power.

Qualities of A Perfect EWS

Perfectly sensitive: The EWS identifies *all* the students who will go on to drop out or not graduate on time. The model does not fail to identify any student who goes on to drop out or graduate late.

Perfectly specific: The EWS *only* identifies students who will go on to drop out or not graduate on time if no one intervenes. This model does not flag students who will not go on to drop out (given no intervention).

No EWS predicts dropout or graduation with perfect sensitivity and specificity. For example, District B accurately predicts 65 to 70 percent of the students who drop out each year.

District B and Department of Education A identify approximately **10 percent** of the student population as at risk.

Develop Thresholds to Only Identify Students the District Can Support

An EWS only generates impact through intervention. Once district intervention teams can no longer support the number of students identified as at high-risk, then that designation cannot help a student. As such, administrators should craft EWS thresholds/analytics to identify only as many students as their intervention teams can support. As district intervention capacity expands, administrators can shift thresholds.

Consider Using Attendance, Behavior, and Course Grades as Initial EWS Variables and then Iterate

Administrators often use attendance, behavior (often measured by discipline referrals or suspensions), and course grades—known as the ABCs—as EWS variables. Administrators often begin to craft their EWSs using the ABCs as research has shown these can accurately predict dropout and on-time graduation.[1] However, profiled institutions use a range of variables.

1) Elaine Allensworth and John Easton, "What Matters for Staying On-Track and Graduating in Chicago Public High Schools: A Close Look at Course Grades, Failures, and Attendance in the Freshman Year," *University of Chicago Consortium on Chicago School Research*, (2007), https://consortium.uchicago.edu/publications/what-matters-staying-track-and-graduating-chicago-public-schools; Robert Balfanz et al, "Preventing Student Disengagement and Keeping Students on the Graduation Path in Urban Middle-Grades Schools: Early Identification and Effective Interventions," *Educational Psychologist*, 42 (2007): 223–235.

EWS Variables at Profiled Institutions

Nonprofit A

- Attendance
- Discipline referrals
- Reading course grade
- Math course grade

Grades Monitored: K-12

District A

Primary:

- Credit attainment

Secondary:

- Grades within specific courses

Grade Monitored: 9

District B

Primary:

- Attendance
- Grade point average (GPA)

Secondary:

- Credit attainment
- Former dropout
- Grade retention
- State test scores
- Suspensions

Grades Monitored: K-12

District A's EWS uses two "on-track indicators" to predict graduation and matriculation. See **page 10** for these indicators.

District C

- Attendance
- Suspensions
- Over age
- Quality credit attainment

Department of Education A

- Attendance
- Discipline incidents
- State assessments
- Mobility (moving schools/districts)

Grades Monitored: 6-9

Department of Education B

- Attendance
- Behavior
- Course Grades

Grades Monitored: Secondary (grades vary depending on district definition)

Consider Excluding Demographic Factors as Variables

Contacts at both District C and District B consciously excluded demographic variables (e.g., race, economic status, family status) from their EWS. Contacts wished to only include factors that students can change (e.g., grades). Contacts acknowledge that certain demographic variables can lend significant predictive power to EWS models. However, administrators chose to exclude demographic factors to prevent labeling and creating self-fulfilling prophecies for students based on their demographics.

To Reduce Overidentification, Analyze Predictor Variables Simultaneously in Systems with Multiple Variables

To analyze EWS variables, profiled institutions use individual thresholds, proprietary models (e.g., the grid below), or multivariable regression.

Administrators at Nonprofit A and Department of Education B set individual thresholds for each variable. For example, if a student receives more than one discipline referral in a quarter, the EWS system will flag that student (see full model on page 11).

However, contacts at District B argue that treating each variable individually overidentifies students (i.e., identifies students who will not drop out given no intervention). In past years at District B, students with poor attendance but high GPAs have rarely dropped out. However, individual thresholds for each variable would likely identify these student as at high risk. Contacts at District B and Department of Education A report that systems that overidentify students lessen interventions teams' ability to provide intervention to the students who are truly at high risk.

Thus, researchers at District B analyze two highly predictive variables—attendance and GPA—simultaneously to reduce overidentification. Researchers at the district use the below matrix to determine preliminary dropout risk. After researchers establish preliminary dropout risk through this matrix, researchers use secondary variables, each with independently established thresholds, to further determine student risk using subsequent analytics.[2]

Grid Analysis at District B[3]

	GPA	<1.0 F	1.0-1.99 D	2.0-2.99 C	3.0-3.99 B	4.0+ A
Attendance Rate	<70%	High Risk	High Risk	High Risk	Moderate Risk	Low Risk
	70-80%	High Risk	High Risk	Moderate Risk	Moderate Risk	Low Risk
	80-90%	High Risk	Moderate Risk	Moderate Risk	Low Risk	Low Risk
	>90%	High Risk	Moderate Risk	Low Risk	Low Risk	Low Risk

Administrators at Department of Education A use a more complex model. They use multivariable regression to predict the percentage likelihood (zero to 100) that a given student will graduate on time based on their chosen variables (i.e., attendance, discipline incidents, state assessment scores, mobility). Multivariable regression mathematically examines the relationship between multiple independent variables (e.g., attendance, discipline incidents) and one dependent variable (e.g., on-time

2) National Center for Education Statistics, "Forum Guide to Early Warning Systems," *The U.S. Department of Education*, (2018) https://nces.ed.gov/pubs2019/NFES2019035.pdf.
3) "Transparency in Early Warning Systems," District B (2016).

graduation). Their EWS then assigns one of three risk tiers based on the student's likelihood of graduating on time.

Consider Using Few Variables and a Simple Analysis to Increase Transparency

Administrators at both District A and District B consciously opted to sacrifice some of their EWS's predictive capabilities to decrease their systems' complexity. Administrators at District A opted to use fewer variables—they use only credit attainment to predict on-track graduation—to increase EWS transparency. Contacts at District A acknowledge that adding a second primary variable (e.g., GPA) would increase their model's predictive power. However, administrators at the district judged that the improved predictive capability of their model would not compensate for the increased complexity of the model. Contacts at District A stress that simplicity and transparency promote system engagement. If stakeholders cannot understand an EWS, they will not use it.

On-Track Indicators for Graduation and College and Career Readiness at District A

On track to graduate

Indicator: Credit Attainment

Students have **attained credit in four core classes** (i.e., reading, math, science, social studies) and one additional class by the end of ninth grade.

On track for college and career readiness

Indicator: Course Grades

Students earn **As or Bs** in each of their four core courses and one additional class.

Similarly, administrators at Nonprofit A, Department of Education B, and District A use a simpler analytical model, which allows for system transparency. Rather than analyze variables together, administrators set individual thresholds for each variable.

Thresholds at Nonprofit A

The EWS flags a student for a variable if they meet its description

Attendance

- Less than 90 percent attendance

Behavior

- More than one discipline referral in a quarter

Reading Course Grade

- D or below

Math Course Grade

- D or below

The number of flags a student receives determines their risk level

Zero flags – low risk

One flag – moderate risk

Two or more flags – high risk

Similarly, contacts at District B opted to use the grid analysis rather than multivariable regression. Initially, district researchers thought to use multivariable regression and presented it to senior administrators. However, the concept was too complex to convey in a short presentation. So, district researchers opted to simplify the model and use the grid analysis. Contacts report that while a more complex model would increase their predictive power slightly, the added complexity would outweigh this benefit.

Contacts at both District A and District B report that EWSs must be transparent and understandable to promote buy-in from critical stakeholders, such as senior administrators and intervention teams. Lacking buy-in, even an extremely accurate and precise EMS would fail to help students.

Translate Variables and Adapt Thresholds to Suit School Level

Administrators at District B analyze grades K-12 with their EWS. However, their elementary schools do not assign letter grades or GPAs to students. Instead, elementary teachers grade student performance as excellent, satisfactory, or unsatisfactory. Researchers at the district translate these into numerical GPAs that align with secondary GPAs so that researchers can integrate elementary-school grade data into their EWS.

Further, researchers at the district customize their thresholds at each grade level using student data from past years. For example, at District B 90 percent attendance does not lead to high-risk status for a high school student, but—depending on "GPA"—may lead to high-risk status for an elementary school student.

Base EWS Results on One to Two Full Years of Student Data to Determine Student Risk Status

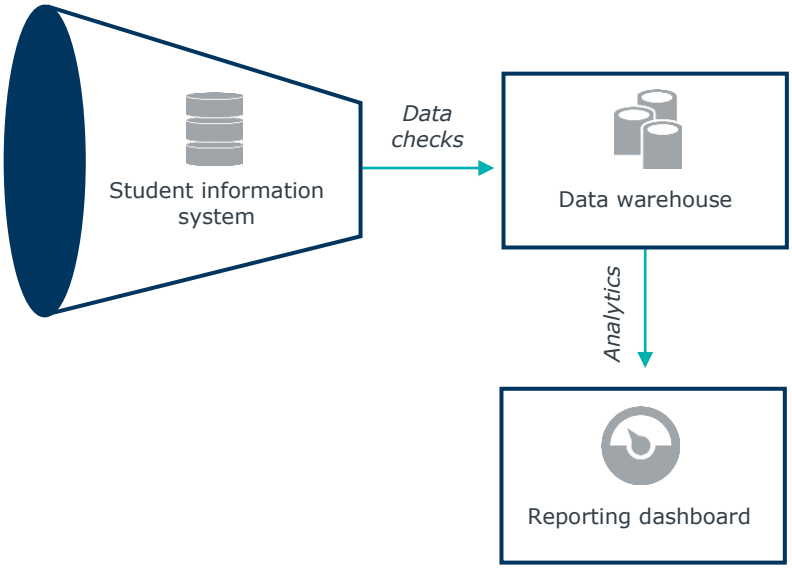
To gauge students' current risk status, EWSs should not draw upon data from more than one or two years ago—i.e., grade retention in kindergarten should not contribute to a student's risk status in high school. EWSs should also not analyze data from too short of a period, which may misrepresent student performance. For example, an EWS that draws upon only one month of student data may mistakenly flag a student that took a family trip and missed three days of school as at high risk. Therefore, the EWS at District B analyzes two to three years of student data. At the beginning of a year, the EWS draws upon the previous two years' worth of data. At the end of a school year, the EWS draws upon almost three years' worth of data. The EWS at Department of Education A draws upon the previous year's data.

Data Flow

Collect EWS Data Through District Student Information System; Store and Analyze Data in a Data Warehouse; Report Results in a Dashboard

Profiled districts collect EWS data through their district's student information system (SIS) and analyze and store data in a data warehouse, a type of data management software. Administrators can either source a data warehouse from a vendor, such as **BrightBytes**, or task district technology staff with building one. See the archetypal EWS data flow below.

Archetypal EWS Data Flow



District D partners with **Panorama Education** to implement and operate their EWS. Panorama Education collects data directly from District D's SIS, Synergy, into their proprietary data warehouse, runs the EWS analysis, and displays results through a reporting dashboard.

State-level entities can encounter issues collecting EWS data because districts may collect data differently and may use different SISs. In response to this issue, administrators at Department of Education A ensure each district uses an SIS compatible with the **Ed-Fi Data Model** so that they can pull congruent data from each district into their data warehouse.

Use Automated Data Checks to Ensure Data Integrity

Staff at District A, Department of Education A, District C, and Department of Education B use automated checks to verify the integrity of their data before it enters EWS data warehouses. Software connected to Department of Education A data warehouse analyzes the standard deviation of the data associated with each variable each year. If a school/district's data associated with a variable deviates significantly from one year to the next, the system flags it for review to the relevant district/school. For example, if the standard deviation in attendance rates jumps dramatically from one year to the next, the system would flag it for review. Further, software programs at both District A and Department of Education A flag datasets with missing or suspicious data for review to the relevant district/school. Staff at these districts program automated rules to verify whether a given dataset's values appear correct. For example, these rules would disallow a dataset of kindergartner's ages to include the value 40—the software would flag the dataset for review.

Offer Training to Ensure Data Handlers Understand District Data Policy

Contacts at District D and District C stress that data quality determines EWS effectiveness. Thus, contacts at profiled districts report that administrators require those who input or handle data (e.g., attendance secretaries, teachers) to attend data training to ensure they know their institution's data protocol. Further, these trainings reinforce the importance of high-quality data. Administrators at District A established an office of data governance to oversee the district's data initiatives and ensure data integrity across the district.

Reporting

Display EWS Results in Reporting Dashboards that Allows Users to Examine EWS Output by Levels

Contacts at District A report that highly visible EWSs prove more useful. For EWSs to produce impact, school personnel must consistently interface with the system. All profiled institutions except for District B display their EWS results through a reporting dashboard. Administrators, teachers, and interventionists can log into the reporting dashboard and look at EWS results as they wish.

External users will not be able to access most dashboard data, including EWS results.

Consider Sourcing Dashboard Software from Vendor

District administrators often source reporting dashboard software form vendors. Administrators at District A source their dashboard from **Qlik**. Administrators at Department of Education A source their dashboard from **Hoonuit**.

District staff should customize reporting dashboard platforms to allow users to examine EWS predicted outcomes by school, grade, and single student. At the single student level, dashboards should display student data for each variable and student risk status. Further, dashboards should include visualizations that synthesize class and grade EWS results. For example, dashboards should show administrators the proportion of student in each grade that register at each risk level.

Consider Integrating EWS Results into SIS to Increase Visibility

Researchers at District B integrate EWS results back into the district SIS so that administrators, teachers, and interventionists see students' risk status whenever they interact with students in their SIS. A green, yellow, or red dot, which corresponds to students' risk status, appears next to each student's name in the district's SIS.

Use Precise Language to Avoid Labeling Students

Contacts at District B, Department of Education A, and District C report that it is important to assign students a status rather than a label. Administrators worry that labeling student will lead to self-fulfilling prophecies and demotivate students. Administrators should refer to students as "students with high-risk status," or "students at high risk," and not as "high-risk students."

Avoid Labeling Students to Promote Growth Mindset

Frequently Run Data Through EWSs to Provide Real-Time Information on Student Risk Status

The EWS at District B automatically and continually processes data collected through the district's SIS and reports results to system users. Frequent EWS reporting helps immediately identify students as they begin to perform poorly in EWS indicators. EWSs that update less frequently—only once or twice per year—may miss students who experience challenges over a period of weeks or months.

Further, students and interventionists working to support students can see real-time progress with a continuously updating EWS. Contacts at District B report that when interventionists see one of their student's risk status lower, it brings them satisfaction and improves system engagement.

3) Intervention

Delivering Interventions

Consider Integrating EWS Results into a Multi-Tiered System of Supports (MTSS)

Under the MTSS framework, educators deliver tier one practices to all students. Students who need targeted support receive tier two intervention. Those who require intensive one-on-one intervention receive tier three support.

For more information on tiered intervention frameworks, see EAB's report **Response to Intervention**.

A multi-tiered system of supports (MTSS) provides a framework for educators to target students for academic and behavioral interventions, deliver interventions, and gauge student progress. Administrators at District C, District D, and Department of Education B integrate EWSs into their MTSS infrastructure since EWSs can both effectively identify students in need of tier two or three intervention and inform tier one school-wide intervention. Contacts at District D report that administrators use EWS results to proactively deliver interventions before students would traditionally receive tier two intervention. Contacts at District C and Department of Education B use their EWSs to group students into intervention tiers based on their risk level. Department of Education B helps districts replace universal screening with their EWS at the secondary level.

Provide Intervention Teams with a Strategy Bank to Guide their Intervention Delivery for Students at High Risk

For more information on interventions, see the following EAB briefs:

Serving Students with Histories of Trauma

Preventing Chronic Absenteeism

Improving Student Behavior in Middle Schools

Behavior Management and Disciplinary Strategies

Once a student receives high-risk status, intervention teams should review the student's data and determine which variables triggered the high-risk designation (e.g., low attendance, poor grades). While interventionists should consider which variables triggered a student's high-risk status, educators should not prescribe interventions to the student based solely on those variables. Contacts at District B and District D stress that symptoms, such as poor attendance and disruptive behavior, often indicate a problem—they are not the root cause. For example, a student may miss school days because of distress resulting from their parents' divorce. Matching students to interventions based solely on which variable triggered a high-risk status increases the likelihood that interventionists address symptoms and not a student's underlying problem.

Rather, administrators should encourage root-cause analysis and professional judgement. To that end, administrators at Department of Education B and Department of Education A provide their districts with 'strategy banks' that detail available evidence-based interventions in their state to guide intervention teams. Administrators at Department of Education B catalogue available interventions from the Institute of Education Sciences' **What Works Clearinghouse** and load them—along with their corresponding **ESSA-level evidence**—into the strategy bank. District-level administrators can customize their strategy banks. Administrators sort these interventions based on their focus (e.g., attendance, reading, behavior) so that intervention teams can quickly peruse relevant interventions based on which variable threshold the student's data crossed to receive high-risk status. At Department of Education B, administrators house the strategy bank within their dashboard so interventionists can access both EWS risk designation and evidence-based intervention in the same place.

Intervention Delivery Process at Profiled Institutions

Interventionists **log in to reporting dashboard** or SIS to identify students flagged as at high risk and review student data (e.g., attendance rates, grades).

Interventionists **engage in root cause analysis and review strategy bank** to determine best intervention(s) to deliver. Interventionists engage relevant stakeholders (i.e., other interventionists, parents, teachers, administrators) in the decision-making process.

Interventionists deliver agreed-upon intervention(s) and track student progress.

Use EWS Output to Inform School-Wide Intervention

Contacts at all profiled districts use EWS results to inform both single-student and school-wide intervention. While administrators design EWSs primarily to identify students at risk, EWSs can also inform whole-school strategy. For example, administrators can use EWS results to help identify school-wide trends, such as low attendance rates. In response, administrators may deliver a school-wide intervention aimed at promoting attendance, such as providing gift cards for perfect attendance. Further, District A uses their ninth grade on-track indicator to determine which schools require targeted assistance. For example, if a high school registers a significant portion of student as off-track, district administrators may provide additional support to that high school and its feeder middle schools.

Certain indicators can inform school administrators about practices that lead students off track. For example, at District A prior to the implementation of their EWS, many schools would enroll ninth graders in an uncredited math course to prepare student for Algebra I. The EWS showed that, unwittingly, administrators reduced these students' chances of graduating on-time. School administrators now understand that, to graduate on time, students should attain a math credit as a freshman. As a result, school administrators no longer encourage freshman to enroll in uncredited math courses.

Evaluating Interventions

Integrate Progress Monitoring Tool to Track Intervention Effectiveness

To assess individual student progress, administrators at District D and Department of Education B incorporate an intervention tracking and progress monitoring function into their reporting dashboard. Within District D's reporting dashboard, interventionists may assign a student an intervention and mark that student's progress with their assigned intervention. This allows interventionists to conveniently access important information regarding a student, such as which interventions interventionists currently deliver and have delivered along with student response to

those interventions. Contacts at District D report that that the district chose to partner with Panorama Education in part to combine an EWS with an intervention tracking and progress monitoring system.

Compare Outcome Rates Between Students That Receive Intervention and Students That Do Not to Determine Intervention Effectiveness

To assess intervention effectiveness more broadly, researchers at District B compare dropout rates among high-risk status students who did not receive intervention, those who received at least one intervention, and those who received intensive intervention. Each year, district researchers use propensity score matching to create comparison groups between high-risk status students who received intervention and those who did not. Propensity score matching matches each individual in the treatment group (in this case, those who received intervention) with a similar individual in the comparison group (those who did not receive intervention) based on characteristics like GPA, attendance, race, and economic status. Then, researchers compare the dropout rate of the groups.

Intervention Effectiveness with Students at High Risk at District B[4]

Data from the 2015-2016 school year

No intervention

21.1%

Dropout rate

Students at high risk who received no intervention dropped out at a rate of 21.1 percent across the district.

Intervention

10.8%

Dropout rate

Students at high risk drop out at roughly half that rate when supported with at least one intervention. In this case, researchers define intervention as at least a single one-on-one interaction with an interventionist.

However, many students in this group received multiple interventions.

24+ Intervention contacts

7%

Dropout rate

Students at high risk who receive 24 or more 15-minute (or longer) contacts over the course of a year drop out around one third less frequently than those who did not receive any intervention.

Since intervention teams at District B lack the capacity to intervene with each student at high risk, researchers do not need to exclude students from intervention to run this analysis. Researchers note that once district intervention capacity expands to reach all students at high risk, researchers must stop conducting this analysis, as it would be unethical to intentionally withhold interventions from students.

4) "Transparency in Early Warning Systems."

4) Optimizing System Usage

Training and Engagement

Provide On-Demand Technical Assistance and Professional Development to Charter Networks to Support Implementation and Engagement

Administrators should provide district and school staff with professional development on how to use EWSs, such as navigating the dashboard or interpreting EWS results. In addition, administrators should offer professional development to stakeholders (e.g., interventionists, senior administrators) to promote engagement.

Technical Assistance and Professional Development to Support Implementation and Engagement at Profiled Institutions

Department of Education B also recently launched a communication campaign targeted toward districts identified for improvement. The campaign informs district administrators of available supports, including the state's EWS.

Supporting Implementation

At District A, district staff hold **recurring professional development sessions** for school staff members who can access the district's EWS reporting dashboard. This training covers:

- The mechanics of the reporting dashboard, such as how to log in and navigate the dashboard.
- How to interpret the information represented on the reporting dashboard. For example, district staff may explain how they define college and career readiness.
- How to use the EWS results. For example, district staff may train school staff on how to engage in a productive conversation about a student who is off-track.

Administrators at Department of Education B offer districts **intensive technical assistance** to implement MTSS, which incorporates the EWS. This assistance comprises a state-led, four-year professional learning program for district staff. As a part of this series, state staff offer EWS coordinators training in which they cover:[5]

- EWS coordinator roles and responsibilities.
- How to communicate about an EWS.
- How to align EWS with other state supports (e.g., MTSS).
- How to establish a district-level EWS team.
- How to navigate the EWS dashboard and interpret EWS data.
- How to use EWS results for action planning through a SMART goal framework.

Promoting Engagement

During professional development sessions with intervention teams at District D, administrators emphasize the added value of an EWS compared to their traditional intervention system. For example, administrators showed intervention teams how they can more easily assign students an intervention and track progress in their new tool from Panorama Education compared to using a spreadsheet.

Researchers at District B deliver professional development presentations to stakeholders, including the school board, senior administrators, and intervention teams, in which researchers explain in detail the mechanics of their EWS (e.g., grid analysis) so that stakeholders understand how the system works. Contacts report that stakeholders must understand the system to engage with the system.

5) "[Training Document]," *Department of Education B*, accessed July 24th, 2020.

Use Return-on-Investment to Engage Interventionists

EWS implementation heavily impacts interventionists—after implementation, these school staff members may need to shift their focus from a wide range of students to only students at high risk. Contacts at District B report that some interventionists hesitate to devote significant time to students likely to drop out—working with students at high risk can feel unsuccessful since many of these students do drop out. Without proper framing, this high dropout rate can frustrate interventionists, who may feel more effective working with students at moderate or low risk.

To encourage interventionists to focus on students at high risk, contacts at District B frame their focus on students at high risk as a strategy that maximizes return-on-investment of interventionists' time.

Promoting Interventionist Buy-in at District B

Data from District B

Students with Low-Risk Status

Out of every 100 students with low-risk status, **1** will likely drop out.

Students with High-Risk Status

Out of every 100 students with high-risk status, **20-25** will likely drop out.

After interventionist works with 100 students…

1 Dropout Prevented

Working with 100 students at low-risk status, an interventionist can only prevent at most one dropout.

4-5 Dropouts Prevented

Working with 100 students at low-risk status, an equally effective interventionist typically prevents four to five dropouts.

To prevent the same number of students from dropping out at District B while working with students at low risk, an interventionist would have to reach significantly more students.

Clearly Communicate EWS's Value to New District Administrators to Promote Continued System Use

At District C, after district administrators who spearheaded the EWS initiative left the district, the newer administrators no longer promoted EWS use. These newer administrators viewed the district-level EWS as redundant with the state-level EWS available through Department of Education A. As a result—though contacts report that their EWS effectively predicted and prevented dropouts—the EWS fell out of use.

Accountability

Limit Imposing Accountability Measures Linked to EWS Predictions

No profiled institutions hold their districts or schools directly accountable for intervening based on EWS results. Administrators wish to separate predictions (i.e., the likelihood of a future outcome) from school or district accountability. They argue administrators should hold schools and districts accountable solely to demonstrated outcomes.

Instead of imposing accountability measures, contacts at Department of Education B report that state administrators developed a system to recognize districts that implement systems with fidelity and see improvements in their early warning indicators.

However, administrators at District A do use their primary EWS metric—attaining four core credits and one additional credit by the end of ninth grade—as one component of their school accountability system. Each year, district administrators deliver report cards to each school containing a performance grade. This overall grade considers how many students the EWS flags as off track. If a school scores too low on their report card for several consecutive years, the district's central office will take a more direct role in school operations and dedicate extra resources to support the school. Thus, the district indirectly holds schools accountable if they do not effectively respond to a large number of students who are off-track.

Cost Effectiveness

EWSs Allow Administrators to Target Resources Efficiently and May Prevent Funding Decline

Contacts at all profiled districts rate their EWSs as cost effective. Contacts report that EWSs can recoup the cost of implementation and operation through preventing dropout—thus maintaining district enrollment—and through promoting resource efficiencies.

EWS Cost-Effectiveness at Profiled Institutions

Maintains District Funding

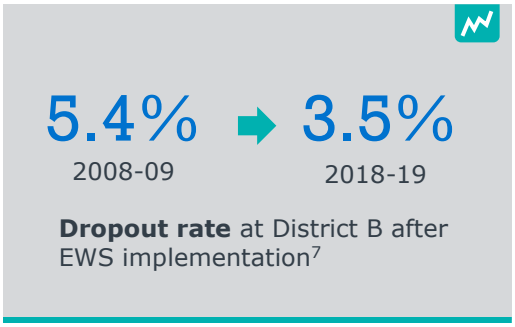
District B receives between $9,000-$10,000 per student each year in state funding. Because the district's EWS enables administrators to reduce student dropout rates (see box below), it maintains the number of students enrolled at the district, which in turn maintains district funding. Contacts report that well-implemented EWSs may pay for themselves.

Targets Resources Efficiently

Contacts at District A cite their EWS as effective because it increases their power to use their resources efficiently. With their EWS, administrators can more precisely target schools and students in need of intervention.

Enables Proactive Interventions

Contacts at Department of Education B report that their EWS allows administrators to deliver proactive interventions rather than responsive interventions. In other fields (e.g., medicine), investing in prevention leads to higher return than spending resources responding to issues.[6] Contacts argue that the same concept applies here—preventative intervention yields higher return than reactive interventions.



Dropout rate at District B after EWS implementation[7]

Consider Partnering with Vendor to Source EWS If District Lacks Technical Capacity

Administrators at District D partner with Panorama Education to implement and operate their EWS. Contacts at District D report that their district lacks the technical expertise and staff capacity to implement and operate an EWS without a vendor partnership. Rather than hire the two to three FTEs administrators estimate they would need to create an EWS, administrators pay approximately one FTE to Panorama Education to source their EWS. Further, administrators at District D source other products from Panorama Education and can thus access multiple district technology products in a centralized location.

6) Hueiming Liu et al., "Exploring the use of economic evidence to inform investment in disease prevention," *Australian and New Zealand Journal of Public Health* 42, no. 2 (2017): pp. 200-206, https://onlinelibrary.wiley.com/toc/17536405/2018/42/2.
7) District B, *Tableau Public*, accessed July 21, 2020.

Rationale for Vendor Partnership at District D

Cost-effectiveness

Administrators at District D source their EWS for the cost of around one FTE. Contacts report that they would need to hire multiple FTEs to build and operate a system themselves.

Centralized Information Access

In addition to their EWS, administrators at District D use the intervention tracking and progress monitoring tool as well as survey tools from Panorama Education. Contacts report the vendor partnership allows them to access these tools in one location.

5) Research Methodology

Project Challenges

Leadership at a partner district approached the Forum with the following questions:

- What variables do contact districts/states monitor in early warning systems to predict student outcomes?
- Through what systems do contact districts/states collect, organize, and store early warning data?
- What steps do contact districts/states take to ensure data integrity/validity for early warning systems?
- Do contact districts/states integrate longitudinal student outcomes data into early warning systems? If so, how?
- Which interfaces/platforms do contact districts/states use to display and analyze early warning system results?
- Did contact districts/states partner with vendors or other entities to build or maintain early warning systems? If so, why?
- How do administrators at contact districts/states rate the cost-effectiveness of early warning systems?
    - How much did it cost contact districts/states to build early warning systems?
    - How much does it cost contact districts/states to maintain early warning systems?
- How do contact districts/states match students to interventions using early warning system results?
    - Do contact districts/states catalog all interventions available at districts and individual schools? If so, how?
    - Do contact districts/states track the effectiveness of these interventions. If so, how?
- How do contact districts/states train system users to use early warning systems effectively?
- Do contact districts/states use accountability measures to ensure schools/districts act appropriately based on early warning system results? If so, what measures?

Project Sources

The Forum consulted the following sources for this report:

- EAB's internal and online research libraries (eab.com)
- BrightBytes. https://www.brightbytes.net/school-district-data-warehouse.
- Hoonuit. https://hoonuit.com/.
- Panorama Education. https://www.panoramaed.com/.
- Qlik. https://www.qlik.com/us/.
- What Works Clearinghouse. https://ies.ed.gov/ncee/wwc/.

- National Center for Education Statistics (NCES). http://nces.ed.gov/.
- Allensworth, Elaine and John Easton. "What Matters for Staying On-Track and Graduating in Chicago Public High Schools: A Close Look at Course Grades, Failures, and Attendance in the Freshman Year." *University of Chicago Consortium on Chicago School Research* (2007). https://consortium.uchicago.edu/publications/what-matters-staying-track-and-graduating-chicago-public-schools.
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- District B. *Tableau Public*. Accessed July 21, 2020.
- Frazelle, Sarah and Aisling Nagel. "A Practitioner's Guide to Implementing Early Warning Systems." *National Center for Education Evaluations and Regional Assistance* (2015). https://ies.ed.gov/ncee/edlabs/regions/northwest/pdf/REL_2015056.pdf.
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- National Center for Education Statistics. "Forum Guide to Early Warning Systems." *The U.S. Department of Education* (2018). https://nces.ed.gov/pubs2019/NFES2019035.pdf.
- "[Training Document]." *Department of Education B*. Accessed July 24, 2020.
- "Transparency in Early Warning Systems." District B (2016).

Research Parameters

The Forum interviewed district administrators, non-profit leaders, and state administrators at institutions that operate early warning systems.

A Guide to Institutions Profiled in this Brief

Institution	Location	Approximate Enrollment
District A	Mid-Atlantic	>100,000
District B	Pacific West	13,500
District C	Midwest	75,500
District D	Pacific West	12,000
Nonprofit A	Midwest	NA
Department of Education A	Midwest	NA
Department of Education B	Midwest	NA