

Implementation of an Early Warning Indicator and Intervention System

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To appear in *Preventing School Failure*:

Davis, M. H., Mac Iver, M., Balfanz, R., Stein, M., & Fox, J. (2018). Implementation of an early warning indicator and intervention system. *Preventing School Failure*, 63(1), 77-88.
<https://doi.org/10.1080/1045988X.2018.1506977>

Preventing School Failure peer review process: Manuscripts submitted to this journal undergo editorial screening and peer review by anonymous reviewers.

This research was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305A120677 to the Johns Hopkins University. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education. Correspondence regarding this article should be addressed to Marcia Davis, 2800 North Charles Street, Suite 420, Center for Social Organization of Schools, Johns Hopkins University, Baltimore, MD 21218, marcy@jhu.edu

Abstract

This study focuses on the implementation of an early warning indicator and intervention system in 20 southern high schools. This model included a team of teachers, counselors, and student support services personnel who analyzed ninth grade student-level data and implemented and monitored interventions. The team was led by a half-time coach who established protocols for team operations and provided updated early warning indicator data. Findings indicated variability in the frequency and scale of the interventions initiated and monitored by the promotion coaches and early warning indicator teams. This study further demonstrates that higher levels of implementation of early warning and intervention components in the treatment schools were associated with improved levels of ninth grade student attendance and course performance even after controlling for prior attendance.

Implementation of an Early Warning Indicator and Intervention System

Although high school graduation rates across the United States have risen for all students, including low-income and minority students, ethnic and income disparities persist. Compared to the national overall graduation rate of 82.3%, sixteen states have graduation rates below 70% for African American and low-income students, and 11 states have graduation rates below 70% for Hispanic students (DePaoli, Balfanz, & Bridgeland, 2016). Lower rates of graduation for these groups have been linked to higher levels of disengagement from school, as measured by attendance, behavior, and course performance indicators (Kemple, Segeritz, & Stephenson, 2013). These indicators have been shown to predict future dropout as early as sixth grade (Balfanz, Herzog, & MacIver, 2007; Neild, 2009; Neild & Balfanz, 2006). Student behaviors during the ninth grade year in particular have been shown to be predictive of subsequent dropout. Early research revealed that failing no more than one semester of a core course in ninth grade and earning credits necessary for promotion to tenth grade predicted graduation with 80% accuracy. This on-track measure was even more predictive than test scores (Allensworth & Easton, 2005, 2007) and other student background factors (Allensworth, 2013).

Part of the reason why ninth grade performance in particular is so predictive of dropout is that both engagement and achievement declines over the ninth grade year result in failure to earn course credits required for graduation. Allensworth (2013) noted that these declines were not due to the greater difficulty of ninth grade work compared to eighth grade work, but were instead related to a decline in ninth graders' study habits and attendance. Interviews with ninth grade students suggested that these declines were related to students' receiving less adult monitoring of behavior and less adult support in high school compared to middle school. Without the oversight of caring adults, ninth grade students took advantage of increased freedom to attend less often

and put in less effort. It was clear that ninth grade students needed more systematic monitoring and encouragement to ensure they attended school every day and did the work needed to pass their courses and earn the credits required to stay on track to graduation.

Early Warning Systems

In response to research on attendance, behavior and course performance as early warning indicators of students being off-track to graduation, much attention was given nationwide to the development of early warning systems (e.g., Dynarski et al., 2008; Pinkus, 2008; Therriault, O’Cummings, Heppen, Yerhot, & Scala, 2013). Over half of public U.S. high schools (U.S. Department of Education, 2016) now implement some type of early warning system using early warning indicator data to identify students who are at risk of dropping out of school. According to data gathered in a national survey on Early Warning Systems, data commonly used by most schools include attendance and truancy records, course grades, and disciplinary incidents (U.S. Department of Education, 2016). Other data less commonly used include state achievement test scores, homelessness, involvement with the criminal justice system, and indicators of limited English proficiency. Those who monitor these data are primarily school administrators and guidance counselors. Almost half of responding school leaders reported monitoring these data weekly.

Although early warning systems are helpful for identifying students who have fallen off the path to graduation, they do not necessarily provide a structure for getting students back on this path. Research teams have recently examined early warning and intervention systems that include both early warning indicators to identify students and a process for matching, conducting, and monitoring student interventions (Davis, Mac Iver, & Fox, 2017; Faria et al., 2017).

One of these systems, the Early Warning Intervention and Monitoring System (EWIMS), is a seven-step process that includes establishing roles and responsibilities of team members, using an early warning data tool provided by the project, reviewing early warning data, assigning and providing interventions, monitoring interventions, and evaluating and refining the early warning process (Faria et al., 2017). A technical assistance liaison helps treatment schools establish an EWIMS team, with one person responsible for using the early warning tool and three to five other school staff to implement interventions. After a random assignment of 73 American high schools to either the seven-step process or business as usual, the research team examined differences in attendance, behavior, and course performance between ninth and tenth grade students in treatment and control schools. The results showed significant differences between the treatment schools and control schools with regard to chronic absences and course failures, with the treatment school students having fewer absences and failures.

Although the early warning and intervention system was found to have a significant impact, the authors of the report stated that schools found implementation in their first year difficult (Faria et al., 2017). Seven of the 37 treatment schools stopped implementing the program during the study year. Attendance at implementation strategy training sessions declined over the year as well, from 97% of schools participating in the first regional training to 59% participating in later trainings. Of the 37 schools, only two schools achieved moderate or high levels of implementation of all seven steps. Further findings suggest that school staff had difficulty using the early warning data tool, did not have a consistent staff person to extract the data from the tool, and did not assign all students with early warning indicators to an intervention. The authors suggested that higher implementation could possibly have been realized if each school had been in the project for more than one year.

Another early warning and intervention system, the “Early Warning Intervention (EWI) Team” model, developed at the Center for Social Organization of Schools at Johns Hopkins University, is increasingly being employed by low graduation rate high schools and their feeder middle schools as part of the Diplomas Now (DN) School Transformation/ Turnaround model (Corrin et al., 2014, 2016; Sepanik et al., 2015). In comparison to “case management” approaches such as “Check and Connect” (Sinclair, Christenson, Evelo, & Hurley, 1998; Sinclair, Christenson, Lehr, & Anderson, 2003; Sinclair, Christenson, & Thurlow, 2005) or the graduation coach model (summarized in Georgia Department of Education, 2009; SERVE, 2008), in which an individual has a specific role of providing or organizing direct supports to students identified as off-track to high school graduation, the EWI team model engages all important school adults, both academic and non-academic, who are in contact with a potential dropout, and provides guidelines and training in a sequenced approach, with frequent monitoring and revision, as a high school dropout prevention strategy. Similar to the EWIMS team (Faria et al., 2017) the EWI team approach shifts responsibility from an individual adult to a team of adults in a collective and collaborative approach joining academic and non-academic functions. One coordinator (the on-site graduation facilitator) works closely with school administrators to organize teams of teachers and adults providing supports to off-track students, but the responsibility rests with the teams rather than a single individual. Examining data for the same students across different classrooms, as occurs in the team meeting approach, has been shown to create an atmosphere of shared responsibility (Allensworth, 2013). Teacher teams focused on data across classrooms share strategies that are working for students in one class, such as English, that could be applied in another class, like math. Teachers can share information about struggling students and work together on a plan for each student across all of his or her classes.

In a prior study, Davis, Herzog, & Legters (2013) visited ten DN schools in seven cities across the United States, observed 13 team meetings, and conducted 75 team member interviews. Findings indicated that typical DN team meetings were 30–60 minutes in length, held bi-weekly, and were facilitated by the on-site graduation facilitator. The typical team meeting started with a quick follow-up discussion of students discussed in the previous team meetings. This discussion was followed by the team working through a focus list of about 5 to 11 students with early warning indicators prepared by the on-site graduation facilitator prior to the meeting. Team member interviews revealed challenges with the team meeting approach that included scheduling time for team meetings, absenteeism of key members, and occasions when the conversation about one student took up too much meeting time. Despite these challenges, the teachers were quite positive about the team meetings, stating that their teams communicated well, shared information readily, and were solution-focused.

Study Overview

The current study examines a version of the EWI Team model that does not include the additional staff and supports included in the DN model (professional development supports, additional staff from the Americorps-type City Year program, and a social worker from Communities in Schools), as well as a full-time school transformation facilitator to organize the EWI Team and interventions (Corrin et al., 2014; Corrin, Sepanik, Rosen, & Shane, 2016). In this more modest EWI Team model, the only level of support provided to schools was a part-time promotion coach focused on implementing the model in the school. The goal of the study was to examine how levels of implementation in this more modest EWI Team model are associated with ninth grade student outcomes.

This study is part of a larger randomized control study of this EWI team-based approach

with 41 schools across a southern state conducted to determine whether the intervention improved ninth grade student attendance and course performance (Davis et al., 2017). To be eligible for participation in the study, schools had to have at least 100 ninth grade students and a graduation rate below 75%. All eligible schools within the state were contacted through their local district, and an initial pool of 77 schools agreed to participate. A researcher unrelated to the development of the program was asked to form 20 matched pairs (with one group of three, a treatment school matched to two control schools) according to school size and graduation rate. The goal was to obtain the closest matches possible from among the eligible schools. Following the initial matches, the researcher made adjustments to improve the balance on school-level variables (percentage of African American students and percentage eligible for free or reduced price lunch). She then randomly assigned the schools to the treatment condition (having a grant-funded half-time promotion coach for two years) or to the control condition (receiving a \$5000 payment each year for two years). The promotion coach “treatment” was expected to ensure that the school was 1) monitoring ninth grade student-level data on attendance, behavior, and course performance at least weekly; 2) holding meetings of ninth grade teachers and other staff members at least bi-weekly to discuss early warning indicator data and design interventions; and 3) providing students exhibiting early warning indicators with appropriate interventions.

As previous research has indicated, implementation of early warning systems with fidelity can be difficult (Faria et al., 2017). Further, scaling back the DN model to a part-time promotion coach represents a significant reduction in the supports provided to the school. Compared to a full-time DN facilitator with the additional DN supports, the part-time promotion coach would have significantly less resources and time to support implementation of the early warning intervention system. In this article we examine data gathered from the treatment schools

to assess the extent to which promotion coaches implemented early warning and intervention components and guided interventions in their schools during a school's second year in the program. In addition, we analyze to what extent intervention implementation levels were related to student outcomes. Questions guiding our study included:

- 1) What percentage of promotion coaches and Early Warning Indicator Teams met the thresholds for each characteristic of an early warning system (holding bi-weekly meetings, connecting with teachers, accessing and analyzing student data, and leading class-wide and student-based interventions)?
- 2) To what extent was meeting these thresholds different for promotion coaches who worked less than 20 hours per week, 20 hours per week, or more than 20 hours per week?
- 3) To what extent did promotion coaches and Early Warning Indicator Teams' implementation of these practices predict students' attendance and course passing?

Method

Participants

The 20 treatment schools were located in 15 districts throughout the state, and ranged in size from about 350 to 2,350 students. Five of the schools were in urban (mid-size city) districts, three in small cities or suburbs, five in towns, and seven in rural areas. The percentage of minority students in treatment schools ranged from 1% to 100% (five schools had 97% or more). The free/reduced price lunch rate ranged from 41% to 90%.

In the 20 treatment schools a half-time staff member was hired and assigned as a "promotion coach." There were 22 coaches over the two-year time span due to one coach who was placed at two successive schools and three coaches who had to be replaced after the first year. Of these 22 coaches, 11 were recommended by their particular school or district and 11

were recommended by the state facilitator at the department of education. These 22 coaches had previously served in one or more positions related to education, including as a teacher (math, science, social studies, reading, language arts, art, technology, drama, special education), school principal, assistant principal, assistant superintendent, assessment administrator, adjunct professor, chief academic officer, student service coordinator, career coach, school counselor, mental health case manager, at-risk instructor or coordinator, school improvement facilitator, STEM director for the district, family intervention specialist, child welfare worker, academic coach, or media specialist. Many had held more than one of these positions. All candidates had to apply for the position and be interviewed by both the state facilitator and University team member.

Promotion coaches received three days of training at the start of the project, four additional one-day trainings during the year, and bi-monthly visits from the state facilitator and implementation leader throughout the project. Implementation was rolled out in phases, with 10 schools (Cohort 1) beginning in 2012–13 and 10 more schools (Cohort 2) beginning in 2013–14. During the first year of the project, Cohort 1 coaches had been recruited and received training by November 2012 and began working in schools generally by December 2012. Cohort 2 coaches had been recruited and received training the summer of 2013 and began working with their schools in August 2013. Implementation occurred over two school years for each cohort, with a shorter implementation time during the first year for Cohort 1. Our pre-specified analysis plan focused only on the second year of implementation for each cohort because of anticipated delays in getting implementation underway during the first year.

Coaching Responsibilities

Promotion coaches were half-time employees, although promotion coach schedules varied by school. Most coaches were at their school two to three days per week, for a total of 20 hours per week on average. Because these were additional staff members for the schools, they were not supposed to have any other responsibilities at the school other than those outlined below. Their responsibilities were aligned to characteristics of the “Early Warning Intervention (EWI) Team” model, developed at the Center for Social Organization of Schools at Johns Hopkins University. These characteristics, listed below, provided a focus for the summer promotion coach training.

1. Promotion coaches were expected to hold biweekly early warning indicator (EWI) team meetings throughout the school year or at least every two to three weeks.
2. Coaches were encouraged to meet with teachers individually outside of the team meetings to provide support and encouragement related to implementing the interventions determined during the team meetings.
3. Coaches were to have administrator level access to data in order to present student level data on attendance, behavior, and course performance at the early warning intervention team meetings.
4. Coaches were expected to examine student level data at least weekly to identify trends and to have the data ready to present at the early warning intervention team meetings.
5. Promotion coaches were to lead the EWI team on implementing student interventions. Interventions used by teams fell into one of seven different categories including four types of grade-wide interventions (professional development for teachers, classroom talks, report card conferences, attendance initiatives); small group interventions; and two

types of individual student interventions (talks with parents and talks with students).

Data

Implementation data were collected through two main sources: a weekly log of activities kept by each promotion coach and submitted to program developers, and hour-long interviews of promotion coaches conducted at the end of each year. The weekly logs kept by the coaches included a list and description of their initial and follow-up activities, their thoughts and reflections, a summary of the “challenge of the week,” their perceptions of the support they needed, and details relating to any EWI meetings held that week, including the time and date of the meeting, number of students discussed, materials used, list of attendees, list of interventions discussed or assigned, and identification of focus students’ early warning indicators, whether poor attendance, behavior, and/or course performance.

Interviews included questions pertaining to the initial and subsequent follow-up training from the developer team, data access and management (8 items); EWI team meetings and interventions (6 items); and lessons learned (5 items). These questions are provided in the Appendix.

Administrative student data were obtained from each district, including outcome measures of attendance and course grades for the ninth grade year as well as demographic and status background variables and a measure of prior year’s attendance. Data on school level characteristics were obtained from the Common Core of Data (2013–2014 school year).

Measures

Each school was assigned a score on each of 11 binary fidelity thresholds listed in Table 1. These 11 scores aligned to characteristics of the “Early Warning Intervention (EWI) Team” model, developed at the Center for Social Organization of Schools at Johns Hopkins University.

The threshold indicating whether or not the coach met a certain level of activity within each category was determined based on the early warning intervention model, with a 0 indicating that they did not meet the threshold and a 1 that they did meet the threshold. Scores on these thresholds were determined through analysis of data from the coach interviews and weekly logs. Details for each threshold are summarized in Table 1.

Interrater agreement. Two raters were used to assess interrater agreement. First the raters coded one randomly selected school out of the twenty treatment schools and coded the coach at the school on each of the 11 thresholds listed in Table 1. The coders met again and adjusted the coding sheet for codes that were rated differently. The raters did this process with three more coaches. The raters indicated the same code for these four coaches 83% of the time. Finally, the raters individually rated a set of 5 coaches. The raters indicated the same code for these four coaches 89% of the time. Details on what constituted meeting each threshold can be found in Table 1.

Composite fidelity scores. Three composite scores were calculated. First, total Early Warning System (TOTAL) composite fidelity score was calculated as the average of the 11 different threshold scores (items 1–11 from Table 1). A Team and Data (TEAM) composite fidelity score was calculated as the average of the four early warning team and data thresholds (items 1–4 from Table 1). A Use of Interventions (INTERVENTION) composite fidelity score was calculated as the average of the final seven threshold items (items 5–11 from Table 1).

Coach rating on proportion of time devoted to EWI team model duties. Based on site visits and interviews with coaches, the project field manager rated each coach on whether the time each devoted to specified duties was below the expected 20 hours per week, at the expected level, or above the expected level.

Student attendance. The number of days each ninth grade student attended was divided by the number of school days for their district to obtain an attendance rate. In addition to the attendance rate, two thresholds were examined. Dichotomous variables were created for at least 95% attendance rate and for at least a 90% attendance rate. Students' previous year's attendance rate (eighth grade attendance for first-time ninth graders; previous year's ninth grade attendance for repeat ninth-graders) was used as a covariate in the data analysis.

Course passing. Course grades were included in student administrative data. The percentage of courses passed was obtained by dividing the number of courses passed by the number of courses taken. In addition, two thresholds were examined: passing all ninth grade classes (vs. failing one or more classes), and failing no more than one class (vs. failing more than one class)

Data Analysis

Descriptive statistics. The first research question was, "What percentage of promotion coaches and Early Warning Indicator Teams met the thresholds for each characteristic of an early warning system (holding bi-weekly meetings, connecting with teachers, accessing and analyzing student data, and leading class wide and student based interventions)?" To address this question, the number of coaches meeting each of the 11 thresholds was examined. In addition, the average score across all of the Early Warning System characteristics, the four characteristics related to team meetings and data, and the seven characteristics related to student interventions were examined. Further, correlations and scatterplots using SPSS software were conducted to determine the relationships among these three average scores.

The second question was, "To what extent was meeting these thresholds different for promotion coaches who worked less than 20 hours per week, 20 hours per week, or more than 20

hours per week?” To address this question we examined the percent meeting each threshold for the 11 thresholds and three total scores. Using SPSS software, we conducted a one-way analysis of variance to determine if there were significant differences between schools with a coach supporting the EWS teams less than 20 hours per week, 20 hours per week, or more than 20 hours per week. We used Fisher’s Least Significant Difference in order to determine which of the three groups were significantly different from each other.

Multilevel models. The third research question was, “To what extent did promotion coaches and Early Warning Indicator Teams’ implementation of these practices predict students’ attendance and course passing?” To address this question we used multilevel logistic regression and hierarchal linear modeling using HLM6 software (Raudenbush, Bryk, & Congdon, 2004).

Using logistic regression, each total score (three scores at the bottom of Table 2) was used to predict two ninth grade attendance indicators (at least 95% attendance or at least 90% attendance) and two course performance indicators (passing all classes, failing no more than one class) while controlling for the previous year’s attendance.

Mathematically, we specified the model as follows:

Level-1 Model (Student)

$$\text{Prob}(Y_{ij}=1 \mid \beta_j) = \emptyset_{ij}$$

$$\log[\emptyset_{ij} / (1 - \emptyset_{ij})] = \eta_{ij}$$

$$\eta_{ij} = \beta_{0j} + \beta_{1j}*(X_{ij})$$

Y_{ij} = attendance or course performance score of student i in school j

X_{ij} = previous year attendance of student i in school j

Level-2 Model (School)

$$\beta_{0j} = \gamma_{00} + \gamma_{01}*(E_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

Level-1 variance – $1 / [\phi_{ij} (1 - \phi_{ij})]$

E_j = total, team, or intervention score of school j

At level 1 (student level), we specified the models to predict binary variables for attendance and course failure (Y_{ij}) controlling for the student attendance in the previous year (X_{ij}). At level 2 (school level), we included (in separate analyses for each predictor) the school implementation score for the EWI team components, the EWI intervention components, or the total combined implementation score (E_j). The model for predicting the dichotomous measures using the log odds of students being chronically absent or failing one or more courses included a constant (β_{0j} at level 1, γ_{00} at level 2), a coefficient term estimated for each variable (β_{1j} at level 1, γ_{01} at level 2), and an error term at level 2 (u_{0j}).

In addition, the total, intervention, and team scores were used in a hierarchical linear model to predict continuous variables of ninth grade attendance (percent attendance) and course performance (percent of credits earned) while controlling for previous year attendance.

Mathematically, we specified the model as follows:

Level-1 Model (Student)

$$Y_{ij} = \beta_{0j} + \beta_{1j} * (X_{ij}) + r_{ij}$$

Y_{ij} = attendance or course performance score of student i in school j

X_{ij} = previous year attendance of student i in school j

Level-2 Model (School)

$$\beta_{0j} = \gamma_{00} + \gamma_{01} * (E_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

E_j = total, team, or intervention score of school j

At level 1 (student level), we specified the model to predict attendance and course failure (Y_{ij}) controlling for the student attendance in the previous year (X_{ij}). At level 2 (school level), we included (in separate analyses for each predictor) the school implementation score for the EWI team components, the EWI intervention components, or the total combined implementation score. The model equation included a constant (β_{0j} at level 1, γ_{00} at level 2), a coefficient term estimated for each variable (β_{1j} at level 1, γ_{01} at level 2), and an error term (r_{ij} at level 1, u_{0j} at level 2).

Results

Promotion Coach Use of Early Warning System Strategies

In an examination across all 11 thresholds, two of the 20 coaches met every threshold, five of the 20 met at least nine of the thresholds, and 12 of the 20 coaches met at least seven of the thresholds. Table 2 reports the means and standard deviations of the 11 thresholds and the 3 composites.

The first four thresholds on Table 2 represent activities related to EWI team meetings, data use and access, and talks with teachers. A high percent of coaches (75–90%) met the thresholds for three of these activities (teacher conversations, early access to data, and examining data weekly). Although 18 of the coaches reported accessing data at least weekly, further analysis found that 11 coaches stated they looked at data every day they were at the school. The only threshold in this group of four activities that a majority of coaches in this group did not meet was team meetings. Only 9 of the 20 coaches held meetings every two to three weeks focused on students with early warning indicators. Seven coaches reported holding early warning team meetings monthly. Only two coaches held meetings less than monthly.

The next set of seven thresholds on Table 2 represents activities related to class-wide,

group, and individual student interventions. Of these interventions, the most widely used were classroom talks (70%), attendance incentives (75%), and talking with students (75%). Some coaches mentioned meeting with students every time they were in the building. The least-used interventions were teacher mentoring (25%), student groups (35%), and more than one report card conference (35%). Although only 5 coaches reported consistent use of report card conferences over the year, 18 of the 20 coaches reported at least one report card or progress report conference.

The three average scores can be found at the bottom of Table 2. The total Early Warning System (TOTAL) score ranged from .09 to 1.00, the Team and Data (TEAM) score ranged from 0.00 to 1.00, and the Use of Interventions (INTERVENTION) composite fidelity score ranged from 0.00 to 1.00. Of the three total scores, the team score (average of thresholds 1–4) had the highest overall mean (.70) followed by the total score (.577), then the intervention score (.507). Correlations among the scores showed significant high correlations between total and team scores (.819) and total and intervention scores (.936), which was unsurprising since the team and intervention scores were a subset of items that comprised the total score. However, the team and intervention scores were also significantly correlated at .565. In examining a scatterplot of the relationship between the team and intervention variables, we saw that the six promotion coaches with high intervention scores (greater than 0.6) also had high team scores (greater than 0.6). However, the twelve coaches with high team scores (greater than 0.6) did not necessarily have high intervention scores (from 0.29 to 1.00); six coaches had high team scores but low (less than 0.6) intervention scores. None of these three scores correlated significantly to school characteristics of percent minority students, percent of students receiving free or reduced meals, or number of ninth grade students in the school.

Finally, we examined the differences among coaches who met, did not meet, or exceeded the 20 hour per week standard. Table 3 shows the percentage of coaches meeting each of the 11 thresholds and the three average scores for each of these three groups. As can be seen, most coaches who worked at least 20 hours per week had higher scores than those who worked less than 20 hours per week. Those who worked more than 20 hours per week had higher scores on most of the thresholds than the other two groups of coaches. One-way analysis of variance results show that there were only significant differences among groups on the thresholds relating to teacher conversations, examining data weekly, talks with students, and the team score. There was a marginally significant finding for total early warning system score. Fisher's Least Significant Difference revealed significant differences between coaches who worked 20 hours a week or more than 20 hours per week compared to those who worked less than 20 hours a week. There were no significant differences between those who worked 20 hours a week and those who worked more than 20 hours a week.

Impact of Early Warning Systems on Attendance and Course Performance

Attendance. First time ninth graders had better attendance (16% of students with attendance less than 90%) than did all ninth graders including repeaters (20% of students with attendance less than 90%), as show in Table 4. Findings from multilevel logistic regressions predicting the two attendance scores (above 95% or 90% attendance) for all ninth grade students and for just first time ninth grade students, totaling 12 separate regressions, can be found in the left columns of Table 5. Results show that the team, intervention, and total scores were not significant predictors of attendance of 95% or greater. However, the intervention and total scores predicted attendance of 90% or greater for all ninth grade students ($p < .05$). The relationship for first-time ninth graders was significant only at $p < .10$.

More specifically, the odds ratio indicates that the odds of a ninth grade student at a school with a total score of 1 (all 11 components in place) having 90% or higher attendance were 2.6 to 1, compared to a student at a school with a total intervention score of 0 (no components in place). Therefore, students at the highest implementation schools are more than 2½ times as likely to be on track in attendance as students at schools with no implementation at all. The odds ratio for the intervention score is similar, but the odds ratio for the team score (just the data and EWI meeting components) is not significantly different than 1 (even odds).

Findings from six separate HLM regression analyses predicting the continuous variable percent attendance for all ninth grade students and for first time ninth grade students can also be found in Table 5. The intervention score significantly predicted percent ninth grade attendance for both first time ninth grade students ($p < .05$) and all ninth grade students ($p < .01$). The total score significantly predicted percent ninth grade attendance for all ninth grade students ($p < .05$).

Course passing. First time ninth graders had better course performance (85% of students failing one or fewer courses) than did all ninth graders including repeaters (80% of students failing one or fewer courses), as shown in Table 4. Findings from multilevel logistic regressions predicting the two course passing scores (passed all courses or failed no more than one course) for all ninth grade students, and for just first time ninth grade students, totaling 12 separate regressions, can be found in the left columns of Table 6. The intervention and total scores significantly predicted both passing all courses and failing no more than one course for all ninth grade students ($p < .05$). Several other relationships were significant only at $p < .10$, including the team score on failing no more than one course for the full group of ninth grade students. None of the relationships from the multilevel logistic regression analyses were significant at $p < .05$ for the somewhat smaller group of first-time ninth grade students.

Further, the odds ratio indicates that the odds of a ninth grade student at a school with a total intervention score of 1 (all 11 components in place) passing all courses were 3.2 to 1, compared to a student at a school with a total intervention score of 0 (no components in place). Therefore, students at the highest implementation schools were more than 3 times as likely to pass all their courses as students at schools with no implementation at all. The odds ratio for the intervention score is similar, but the odds ratio for the team score (just the data and EWI meeting components) is not significantly different than 1 (even odds). The odds ratios are even higher for the less stringent outcome of failing no more than one course in ninth grade.

In addition, findings from six separate HLM regression analyses predicting the continuous variable percent credits earned for all ninth grade students and for first time ninth grade students can also be found on Table 6. The intervention and total scores significantly predicted percent ninth grade credits earned for both first time ninth grade students ($p < .05$) and all ninth grade students ($p < .01$). The team score significantly predicted percent ninth grade credits earned for all ninth grade students ($p < .05$).

Discussion

Although national findings indicate that over half of public high schools in the U.S. now implement some type of early warning systems using early warning indicator data to identify students who are at risk of dropping out of school (U.S. Department of Education, 2016), just identifying students at risk for dropping out may not be enough. These systems could be improved with an additional intervention process, as are used in early warning intervention systems such as the Early Warning Intervention and Monitoring System (EWIMS) (Faria et al., 2017) and the “Early Warning Intervention (EWI) Team” model (Davis et al., 2017).

The analyses detailed in this paper examined the use of these separate system

components within an Early Warning Indicator and Intervention system, including a process to monitor data on indicators (particularly attendance, behavior, and course grades) that students may be falling off track to graduation, and an emphasis on providing appropriate interventions to students who were struggling. As previous research has shown, fidelity to an early warning indicator and intervention system may be difficult to maintain (Faria et al., 2017).

The current study examined the extent to which a part-time promotion coach supporting the DN early warning indicator team could help the model be implemented with fidelity and to what extent fidelity was associated with student outcomes. Findings indicate variability in the frequency and scale of the interventions initiated and monitored by the promotion coach and EWI team. However, promotion coaches in the current system were held to a less stringent standard than that required by the seven-step process of the EWIMS; instead, they were directed only to fulfill basic requirements including 1) holding EWI meetings every two to three weeks, 2) examining data weekly, and 3) providing grade-wide and student level interventions; otherwise, coaches were encouraged to adapt the system to their particular schools and students. Although most coaches examined data weekly and led interventions, many did not hold meetings every two to three weeks. Many coaches had to cope with the time provided by the school, which in many cases meant longer meetings held monthly. Some coaches were also better than others at implementing interventions, whether because of their prior experiences or thanks to greater freedom provided by the administration.

Our analyses also examined to what extent separate system components (data monitoring/team meetings and the various interventions) related to student outcomes. The findings suggest that the implementation of EWI interventions may be more strongly related to improved student attendance and course passing than simply examining data and holding EWI

meetings. The average intervention score correlated significantly with two measures of attendance and all three measures of course passing. Students at schools where interventions were implemented at higher levels tended to have significantly lower levels of chronic absence and were significantly more likely to stay on track in earning credits by passing their ninth grade courses, even when controlling for past attendance. The intervention score was just as useful a predictor of student outcomes as was the total implementation score (which combined the data monitoring and regular team meetings with the various interventions).

The team score, focused specifically on the regular examination of student data and regular meetings with teachers to discuss struggling students and plan interventions, was not a significant predictor of student outcomes in attendance and course performance, except that it significantly predicted the percent of credits earned when the entire sample of ninth grade students was examined. However, one cannot conclude from these analyses that monitoring data and team meetings are not an important part of the initiative, as the pattern of implementation among the 20 study schools did not include any schools that scored high on interventions and low on the team data monitoring component. Further, the limited sample size precludes explicitly testing this. In addition, it should be noted that interventions could only be put in place using the information accrued through data monitoring and planned during the team meetings. Therefore, without data monitoring and team meetings, the interventions would probably have been less likely to occur or less effective.

Although this implementation study does not provide any causal evidence, it does appear that data monitoring and team meetings may not be sufficient, in and of themselves, to have an impact on student outcomes. These data suggest that certain activities of a part-time promotion coach, particularly directing and monitoring interventions for struggling students, are related to

student attendance and course performance. Further, these data suggest that a diverse range of interventions, as indicated by the total intervention score averaging use of seven different interventions, is related to improved attendance and course performance. These findings suggest that those implementing early warning systems should make sure that teachers and counselors be provided time and space to plan and implement interventions.

Study results also indicated that the relationship between the interventions and student outcomes was more likely to be significant for the full group of ninth grade students (including repeat ninth graders) than for the group of just first-time ninth graders. Data from coaches' logs and interviews suggest that coaches paid particular attention to ninth graders who were struggling most and had the greatest number of indicators early in the year; these also tended to be repeat ninth graders. One of the challenges in implementation of early warning systems appears to be ensuring that interventions occur early enough to ensure that problems in attendance and failing grades are prevented for first-time ninth graders, rather than addressed after they have occurred. This will require careful attention to attendance in the first couple of months in the school year, and to Quarter 1 grades, to give students enough time to recover from a bad first quarter and still pass their classes.

This study also suggests that students with severe problems who have already failed ninth grade have the potential to consume much of the energy of the staff available to intervene. It is critically important to help schools devote resources and energy to doing a good job of preventative intervention, rather than waiting to help students recover from failure after it has already had a negative impact on their chances of graduating on time.

Some may question how many hours a week are necessary for a coach to meet the expectations of convening a team bi-weekly, examine data, and support direct interventions. The

data from this study indicated that no significant differences between the coaches who worked at least 20 hours a week and those who worked more than 20 hours. However, coaches who worked less than 20 hours per week were less likely than the other groups to meet the expectations. This suggests that at least a half-time (20 hours/week) staff member is needed to implement the model with fidelity. Because the study did not include comparisons of full-time and part-time coaches, we cannot draw any conclusions about how much more effective coaches working a 40-hour week might have been. However, it is likely that differences among the coaches' ability to meet the thresholds could also relate to their prior working experience and the working relationship with the school administration and staff that enabled them to schedule team meetings and implement interventions.

Researchers and practitioners have already made great strides in determining the early warning indicators and establishing early warning systems to identify students in need of intervention. The work ahead lies in ensuring that students actually receive needed interventions to help them turn around patterns of poor attendance and poor classroom performance. The findings of the current study indicate that an early warning system may not be effective without an organized intervention plan. Educators must identify students in need of support and work as a team to select and implement interventions to help students back on the path to graduation. Table 7 provides a summary of the components of the early warning system discussed above for school personnel to consult in planning implementation of such a system in their own context. Elsewhere, we provide a how-to guide for schools to use in implementing an early warning intervention system (Davis, 2012). Discovering the barriers to implementing effective interventions and the necessary steps for addressing those barriers is the next agenda item for researchers focused on improving high school outcomes.

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Table 1

List of Early Warning System Characteristics and Evaluation Thresholds

EWS Component	Source of Information	Threshold
1. Biweekly EWI Meetings	Interview and weekly coach logs	Schools were coded: (1) if the coach held EWI team meetings more than monthly (every two to three weeks) and those meetings were dedicated to matching interventions to a focus group of students; (0) if the coach did not.
2. Teacher Conversations	Weekly coach logs	Schools were coded: (1) if the coach had two or more conversations with teachers noted in their weekly logs; (0) if the coach did not.
3. Early Access to Data	Interview	Schools were coded: (1) if the coach had administrator level access within the first month of the school year; (0) if the coach did not.. ¹
4. Examine Data Weekly	Interview	Schools were coded: (1) if the coach looked at data at least weekly; (0) if the coach did not.
5. Mentoring to Teachers	Weekly coach logs	Schools were coded: (1) if the coach mentioned at least once in the log talking with a teacher or a group of teachers on how to improve their teaching;(0) if the coach did not.
6. Classroom Talks	Interview and weekly coach logs	Schools were coded: (1) if the coach mentioned talking with a class on the importance of attendance, behavior, or course performance at least once in the weekly logs or in the interview; (0) if the coach did not.
7. Report Card Conference	Interview and weekly coach logs	Because nearly every coach completed at least one report card conference, schools were coded (1) for report card conferences if it could be determined that more than one report card or progress report conference was held during the year; (0) if this did not occur more than once.

¹ Note that coding was conducted on data from the second year of implementation and not on data from the first year when implementation began later in the year.

8. Attendance Incentive	Interview and weekly coach logs	Schools were coded: (1) if the coach provided some type of attendance incentive; (0) if the coach did not.
9. Student Groups	Interview and weekly coach logs	Schools were coded: (1) if the coach initiated a group of students that met more than once during the year; (0) if the coach did not.
10. Talk with Parents	Interview and weekly coach logs	Schools were coded: (1) if the coach mentioned calling or meeting with parents more than once during the year; (0) if the coach did not.
11. Talk with Students	Interview and weekly coach logs	Schools were coded: (1) if the coach mentioned meeting with students at least weekly; (0) if the coach mentioned meeting with students less than weekly.
Total Early Warning System (TOTAL)	An average of all threshold scores related to the Use of an Early Warning System (Thresholds 1–11)	
Team and Data (TEAM)	An average of all threshold scores related to the Use of an Early Warning Team and Data (Thresholds 1–4)	
Use of Interventions (INTERVENTION)	An average of all threshold scores related to the Use of Interventions (Thresholds 5–11)	

Table 2

Promotion Coach Use of Early Warning System Actions and Interventions

Threshold	Mean	SD	Number of Coaches Implementing
1. Biweekly EWI Meetings	0.450	0.510	9
2. Teacher Conversations	0.750	0.444	15
3. Early Access to Data	0.750	0.470	15
4. Examine Data Weekly	0.900	0.308	18
5. Teacher Mentoring	0.250	0.444	5
6. Classroom Talks	0.700	0.470	14
7. Report Card Conference	0.350	0.489	7
8. Attendance Incentive	0.750	0.444	15
9. Student Groups	0.350	0.489	7
10. Talk with Parents	0.400	0.503	8
11. Talk with Students	0.750	0.444	15
Total Early Warning System (TOTAL)	0.577	0.245	-
Early Warning Team and Data (TEAM)	0.700	0.288	-
Use of Interventions (INTERVENTION)	0.507	0.268	-

Table 3

Promotion Coach Use of Early Warning System Actions and Interventions

Threshold	Less than 20 Hours N=3	Twenty Hours N=11	More than 20 Hours N=6	ANOVA Sig.
1. Biweekly EWI Meetings	0.00	0.45	0.67	ns
2. Teacher Conversations	0.00	0.91	0.83	.001
3. Early Access to Data	0.67	0.55	1.00	ns
4. Examine Data Weekly	0.33	1.00	1.00	.000
5. Teacher Mentoring	0.00	0.27	0.33	ns
6. Classroom Talks	0.67	0.64	0.83	ns
7. Report Card Conference	0.33	0.27	0.50	ns
8. Attendance Incentive	0.67	0.73	0.83	ns
9. Student Groups	0.00	0.91	0.83	ns
10. Talk with Parents	0.00	0.45	0.50	ns
11. Talk with Students	0.00	0.91	0.83	.001
Total Early Warning System (TOTAL)	0.33	0.75	0.75	.096
Early Warning Team and Data (TEAM)	0.33	0.60	0.62	.006
Use of Interventions (INTERVENTION)	0.33	0.65	0.67	ns

Table 4

Means and Standard Deviation of Dependent Variables for First Time Ninth Graders and All Ninth Graders

	First Time Ninth Graders (N = 2,815)		All Ninth Grade Students (N = 3,107)	
	Mean	SD	Mean	SD
Attendance 95% or Higher	0.584	0.493	0.552	0.497
Attendance 90% or Higher	0.835	0.371	0.797	0.402
Percent of Days Attended	93.816	6.839	92.832	8.586
Passed All Courses	0.704	0.456	0.651	0.477
Failed 1 or 0 Courses	0.848	0.359	0.798	0.402
Proportion of Ninth Credits Earned	0.924	0.162	0.894	0.204
Previous Year's Attendance	94.308	5.371	93.365	7.226

Table 5

Hierarchical Modeling Results of Team, Intervention, and Total Scores Predicting More than 95% and 90% Ninth Grade Attendance, and Percent of Ninth Grade Attendance, While Controlling for Previous Year's Attendance.

	<u>95% Attendance or Higher</u>		<u>90% Attendance or Higher</u>		<u>% Attendance</u>
	Coefficient (SE)	Odds Ratio	Coefficient (SE)	Odds Ratio	Coefficient (SE)
First Time Ninth Grade					
Team	0.098 (0.355)	1.103	0.345 (0.148)	1.412	0.521 (0.815)
Intervention	0.211 (0.376)	1.235	0.836† (0.408)	2.306	1.914* (0.761)
Total	0.209 (0.411)	1.232	0.808† (0.459)	2.244	1.716† (0.875)
All Ninth Grade					
Team	0.199 (0.33)	1.221	0.493 (0.382)	1.638	1.210 (0.964)
Intervention	0.274 (0.350)	1.315	0.927* (0.375)	2.528	2.796** (0.854)
Total	0.307 (0.382)	1.359	0.949* (0.417)	2.582	2.730* (0.983)

Note. †Significant at the .10 level. *Significant at the .05 level. **Significant at the .01 level.

Table 6

Hierarchical Modeling Results of Team, Intervention, and Total Scores Predicting Passing All or Failing Only One Course, and Percent of Ninth Grade Credits Earned, While Controlling for Previous Year's Attendance.

	<u>Passed All Courses</u>		<u>Failed 1 or 0 Courses</u>		<u>% Credits Earned</u>
	Coefficient (SE)	Odds Ratio	Coefficient (SE)	Odds Ratio	Coefficient (SE)
First Time Ninth Grade					
Team	0.466 (0.474)	1.594	0.889 (0.614)	2.432	0.053 (0.027)
Intervention	0.869† (0.471)	2.383	1.231† (0.623)	3.424	0.070* (0.027)
Total	0.890 (0.523)	2.434	1.377† (0.677)	3.962	0.080* (0.029)
All Ninth Grade					
Team	0.707 (0.492)	2.028	1.081† (0.614)	2.947	0.089* (0.035)
Intervention	1.086* (0.490)	2.963	1.430* (0.629)	4.179	0.105** (0.036)
Total	1.176* (0.536)	3.243	1.627* (0.672)	5.090	0.124** (0.037)

Note. †Significant at the .10 level. *Significant at the .05 level. **Significant at the .01 level.

Table 7

Key Components of an Early Warning Indicator and Intervention System

EWI Team Coach Practices

Regular access to Early Warning Indicator Data (Attendance, Behavior, Course Grades)

Examine data weekly

Hold bi-weekly EWI team meetings with teachers, counselors, student support staff

Hold informal conversations with teachers regularly

Important Interventions to Implement to Help Struggling Students

Student-focused

School-wide attendance initiatives

Classroom talks to students about how to stay on-track

Quarterly report card conferences

Meetings with small groups of struggling students

Talks with individual students

Teacher-focused – Peer mentoring of teachers to encourage restorative intervention practices

Parent-focused – Contact with parents of struggling students
