EVALUATING MONTANA'S EARLY WARNING SYSTEM (EWS)

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ONLINE EWS TOOLS

- School level report - Summarizes data and creates visualizations for school level dropout risk, and specific trends including grades, attendance, behavior, and mobility.
- Student summary report - Generates a spreadsheet containing all student data for the school, including risk rankings, percentage risk, change in risk, and odds ratios for specific risk factors.
- Student detail report - Provides data and visualizations for a single student within that school, including their current dropout risk, change in risk over time, information on missing data, and predominant risk factors where interventions may be warranted.
- Dropout Probability- In grade 9-12 an at-risk student is identified as having a > 15% probability to drop out. Extreme at-risk student have a > 40% probability.

EWS Early Warning System

School Dashboard :
School Name (masked)

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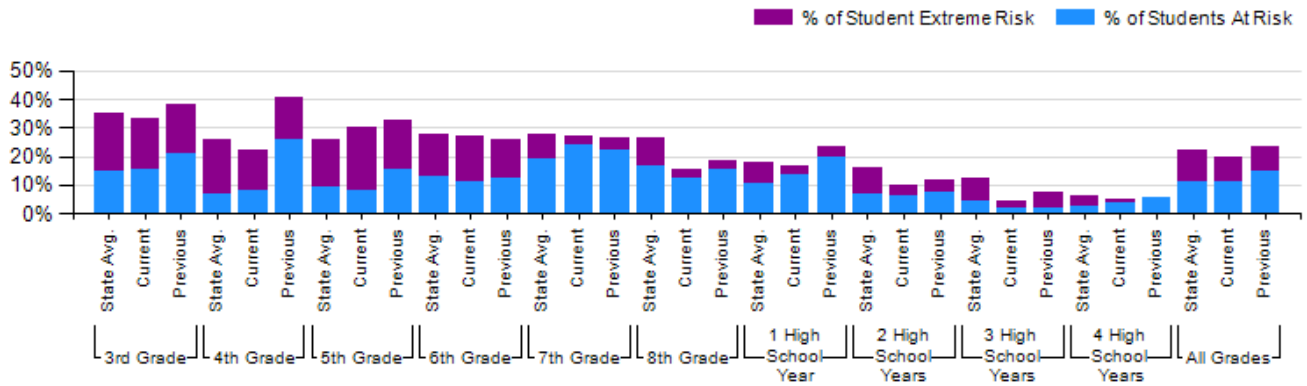
Category	Total	Percent of Total Students Enrolled	State Average
Students Missing Data	161	15.5%	3.9%
Students Identified	203	19.6%	22.2%
Students At - Risk	114	11.0%	10.9%
Students Extreme - Risk	89	8.6%	11.3%

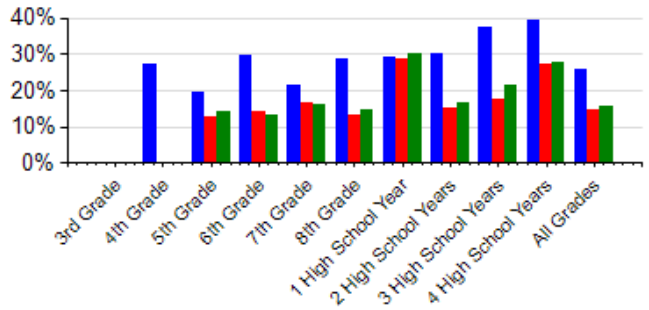
Total Students Enrolled	Masked
Current EWS Run	10/03/2018
Previous EWS Run	08/08/2018

Student Summary

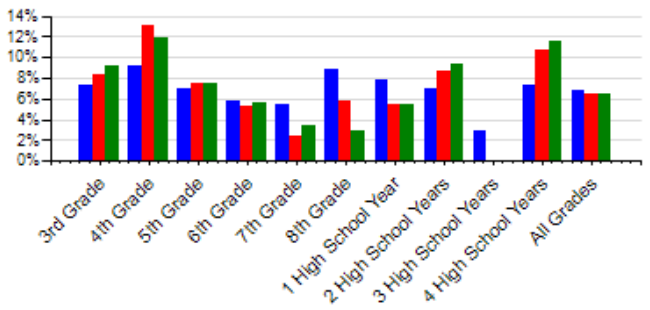
% Students Identified as At Risk



% Students flagged for Grades Risk Factor



% Students flagged for Behavior Risk Factor



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Student Level Report
Student Name: Jess Thompson - UDJEHEGDB

Jess Thompson	UDJEHEGDB	Extreme Risk

State ID	UDJEHEGDB
Grade	08
Age	15
Gender	F
Birth Date	Jun 5 1999
Previous Dropout	N
Repeater K-8 Grade	N
Age Difference	Over 2 Up
Moved This School Year	N
Moved From Out Of State	N
More Than 2 School Systems Attended	N
Number of HS years	N/A
Attendance Rate	0.912
Previous Term F's	
Previous Term A's	
Behavior Events In Last 120 Days	1
Out Of School Suspension Events In Last 3 Years	1
Credit/Yr	
On Track	Y
Absences Last 60 days	2.5
Absense last 90 days	4.75

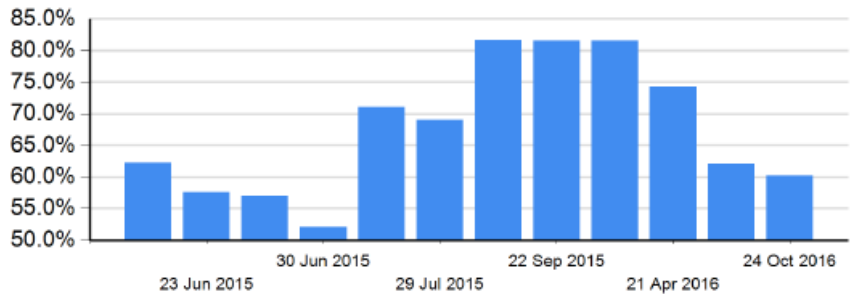
Dropout Probability	60.2% *

Dropout Risk Factors	
Older Student	Y
Off Track	N
Previous Dropout	N
Attendance Risk Factor	1.34
Grades Risk Factor	1.00
Behavior Risk Factor	1.34
Mobility Risk Factor	1.00

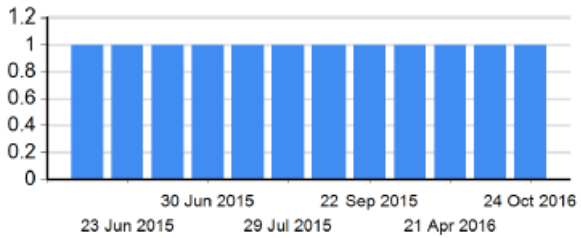
Dropout Probability Summary

Dates Early Warning System Ran	Dropout Probability	Change
24 Oct 2016	60.2%	↘
21 Oct 2016	62.1%	↑
19 Oct 2016	51.0%	↓
21 Apr 2016	74.3%	↑
19 Apr 2016	67.5%	↘
17 Mar 2016	70.4%	↘
08 Mar 2016	73.5%	↘
04 Mar 2016	76.3%	
17 Nov 2015	76.4%	↘
14 Oct 2015	80.2%	↘
23 Sep 2015	81.5%	
22 Sep 2015	81.5%	

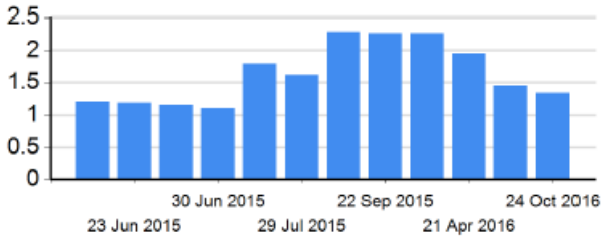
Dropout Probability



Grades Risk Factor



Attendance Risk Factor



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Study Design

‘USING SLDS’ NCER STUDY RESEARCH QUESTIONS

1. How well does the model predict graduation?
2. Has access to EWS data inspired increases in targeted interventions with identified students or interventions and policy modification at the school-level?
3. What has been the impact on graduation and postsecondary enrollment?

RESEARCH QUESTION 1 : DOES EWS ACCURATELY PREDICT GRADUATION?

- Early Warning System model was based on pilot school data
- Currently uses attendance, grade retention, moves across schools, behavior incidents (suspensions, expulsions) to predict dropout probability.
- 15% or greater flagged as “At Risk”, 40% or greater “Extreme at Risk”

	EWS predicted graduation	EWS predicted dropout
Actual high school graduate		“False negatives”
Actual high school dropout	“False positives”	

- Analysis will focus on “False Positives”

RESEARCH QUESTION 2: WHAT IS THE DEGREE OF IMPLEMENTATION OF EWS MODEL IN PARTICIPATING SCHOOLS?

We know a great deal about the implementation of the pilot schools (18)

Know less about how the other 122 schools are using the system.

Surveys and interview school leaders in Montana in schools that participate in EWS. Surveys were distributed in Spring 2022 by the Montana Office of Public Instruction.

Create an implementation index (on a scale from 1-4)

We will refine this index with the results of 45 interviews conducted with school officials in Year Two of the research study.

RESEARCH QUESTION 3: DOES THE EWS IMPROVE STUDENT OUTCOMES?

Examine attendance, high school graduation, and college attendance

Use staggered rollout of EWS to trace out effects

- Compare students in schools before and after EWS was adopted
- Compare students in EWS schools to students in schools not using EWS
- Compare students who were “exposed” to EWS longer than others. Students graduating in 2012 only “exposed” for 1 year, by 2020 exposed since elem/middle school

Does the EWS improve student outcomes for specific subgroups of students?

- Gender, race/ethnicity, school size, school locale, intensity of EWS use
- Detailed analysis focusing on students identified as “at risk”

GETTING TO KNOW THE DATA

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OUR TASK: FOCUS ON USING SLDS DATA AND ON IMPLEMENTATION

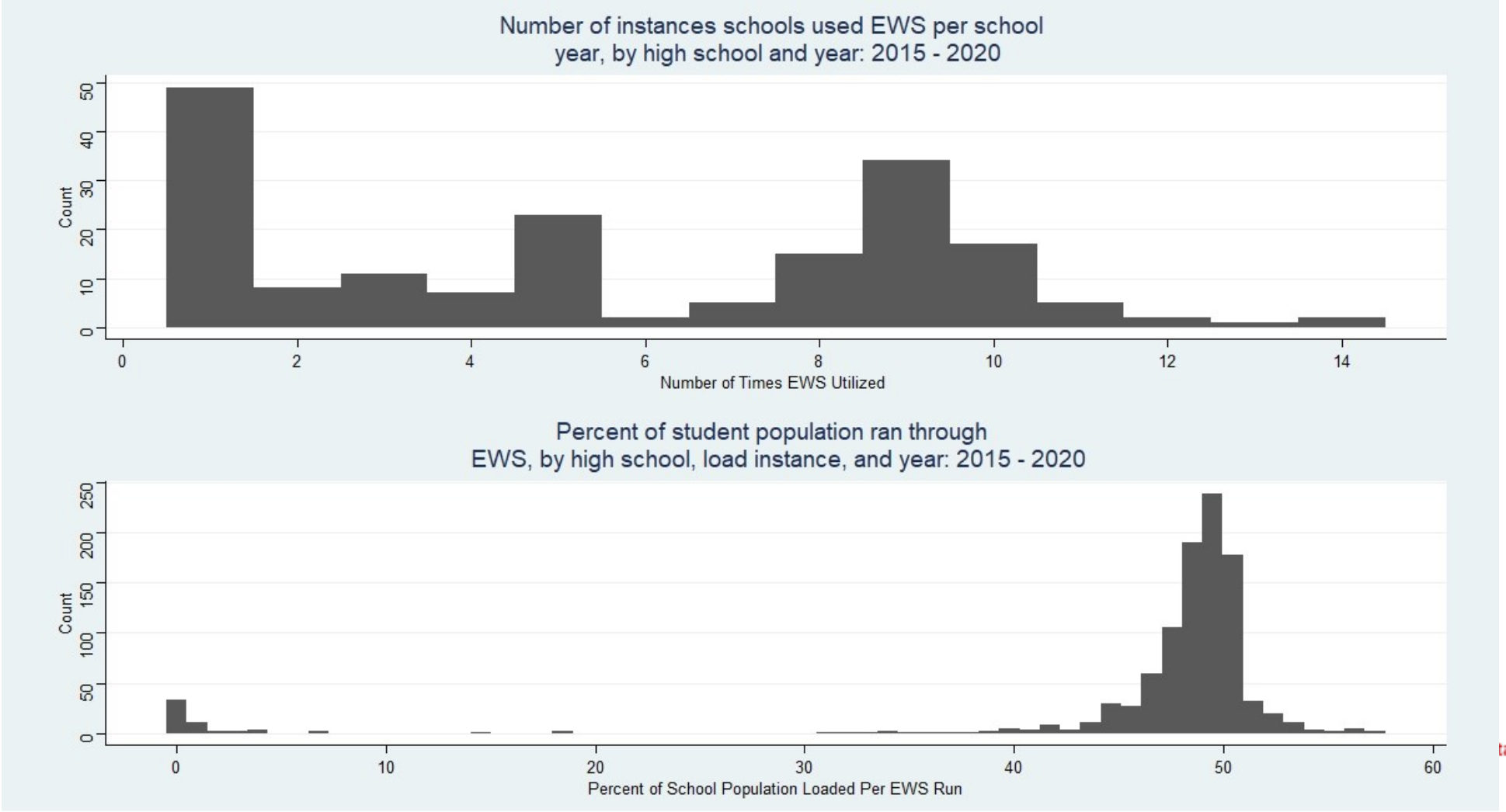
- MT OPI has delivered the first round of data to MSU. This round included records on all students since 2008 and related datapoints about EWS students since 2011.
- MSU has completed tasks for Year One of the NCER research study. While results are preliminary, they highlight challenges and opportunities with the data management and analysis. Year Two of the study for MSU will focus on research question 1 and 3.

How much do schools use EWS?

NUMBER OF SCHOOLS EVER USING EWS BY YEAR

Year	Number of schools using EWS system	Percent of Montana Schools Using EWS
2014	64	7.8%
2015	64	7.8%
2016	68	8.2%
2017	129	15.7%
2018	93	11.2%
2019	107	13.0%

SCHOOLS' USE OF EWS VARIED CONSIDERABLY



ABOUT TWO THIRDS OF USING SCHOOLS PULL SIGNIFICANT FRACTIONS OF STUDENTS

Year	Number of schools using EWS for at least 30% of their students by year	Percent of schools using EWS who pull at least 30% of their students by year
2014	36	56.3%
2015	45	70.3%
2016	45	66.2%
2017	77	59.7%
2018	63	67.8%
2019	63	58.9%

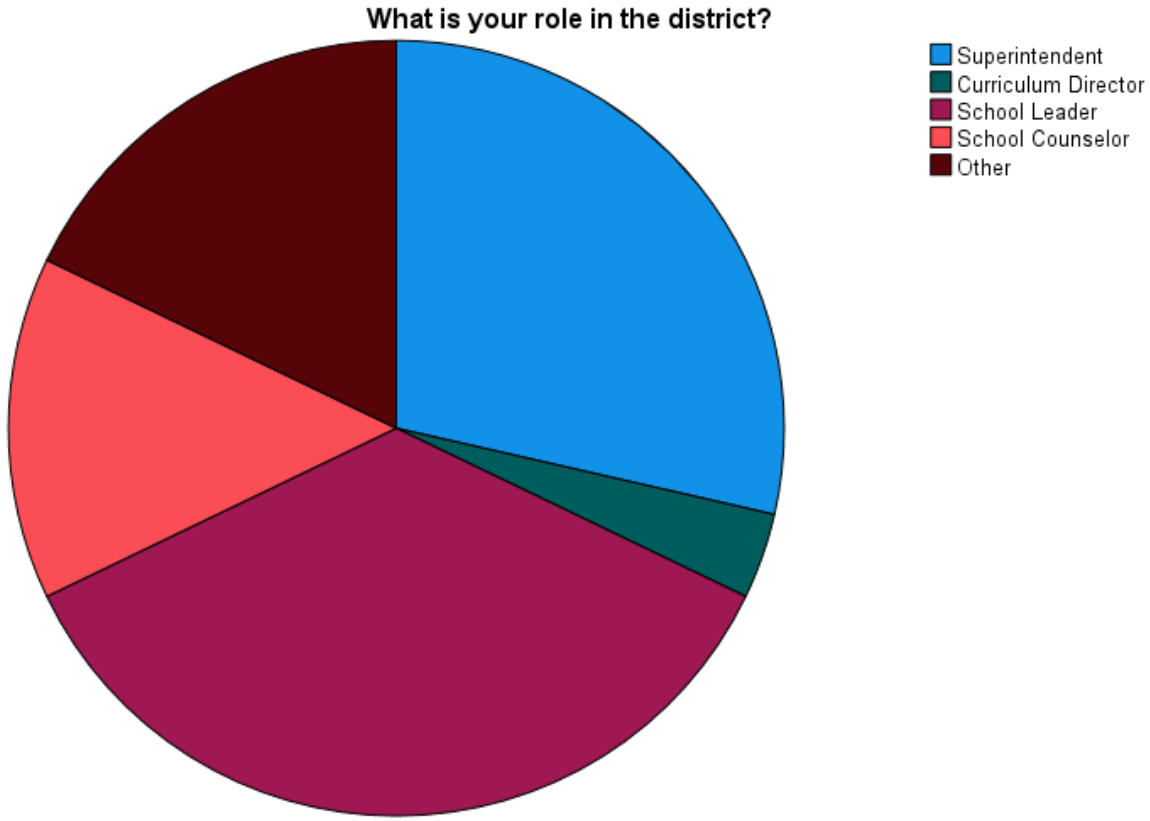
OVERALL, A MINORITY OF STUDENTS HAVE BEEN SCORED

Year	Students in school ever using the EWS system	Students given an EWS score
2014	11.4%	6.4%
2015	34.8%	9.8%
2016	18.6%	13.5%
2017	17.5%	11.4%
2018	33.3%	20.3%
2019	18%	13.1%

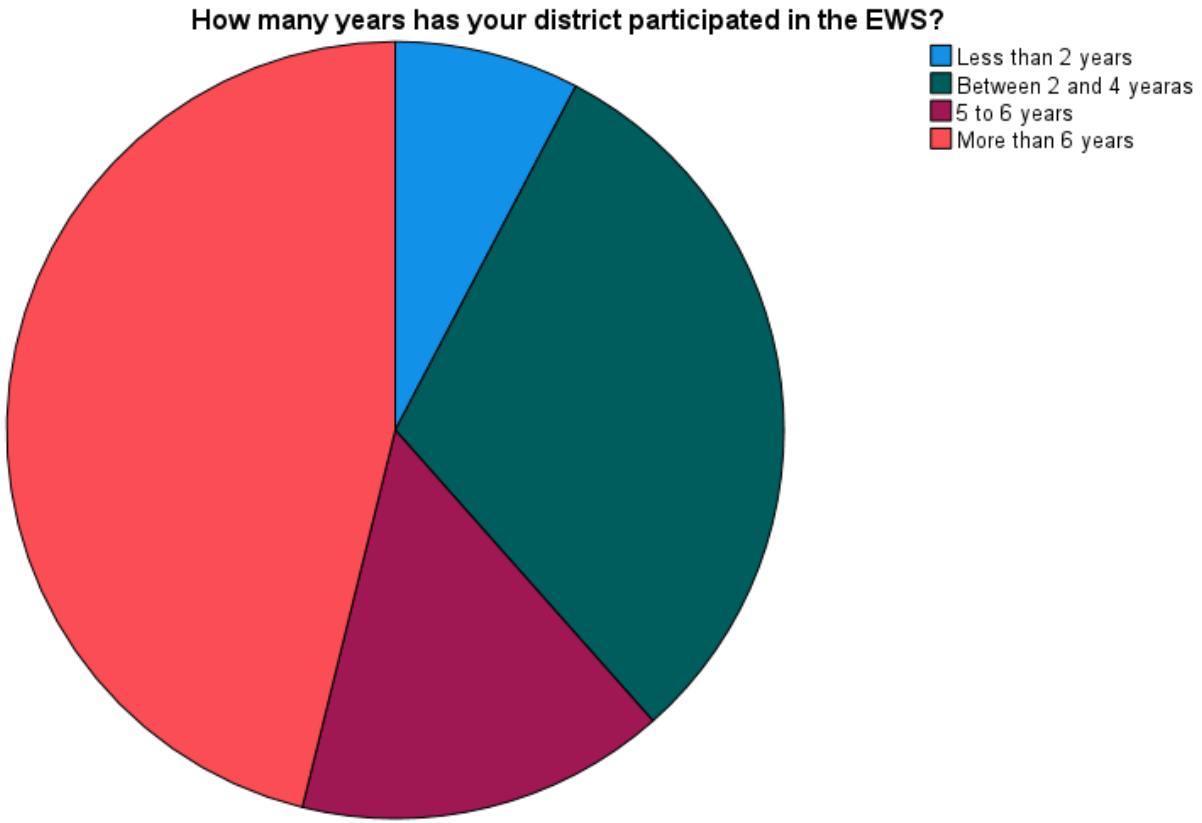
SCORING VARIES BASED ON CHARACTERISTICS

For students who eventually could have graduated based on cohort						
	White	Hispanic	AIAN	Black	Title I	Not Title 1
Ever loaded into EWS	31.6%	28.7	50.3	24.1	36.8	31.4

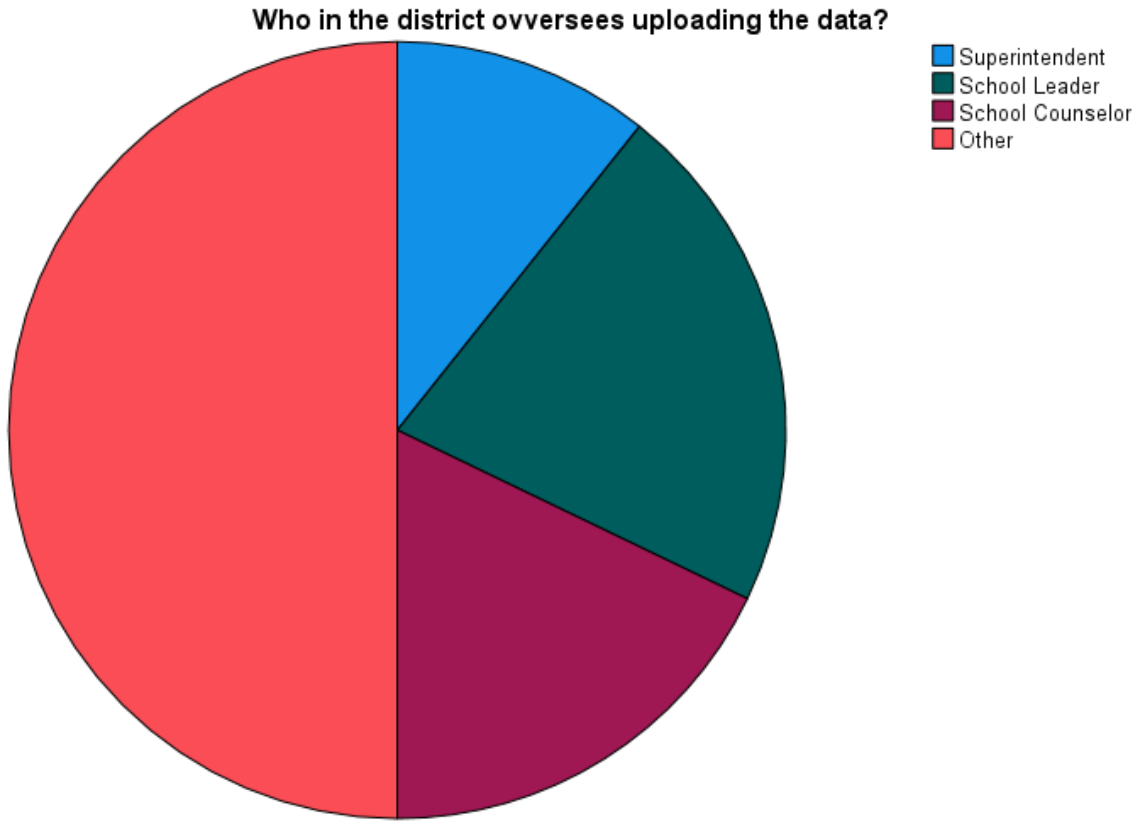
IMPLEMENTATION SURVEY: RESPONDENTS



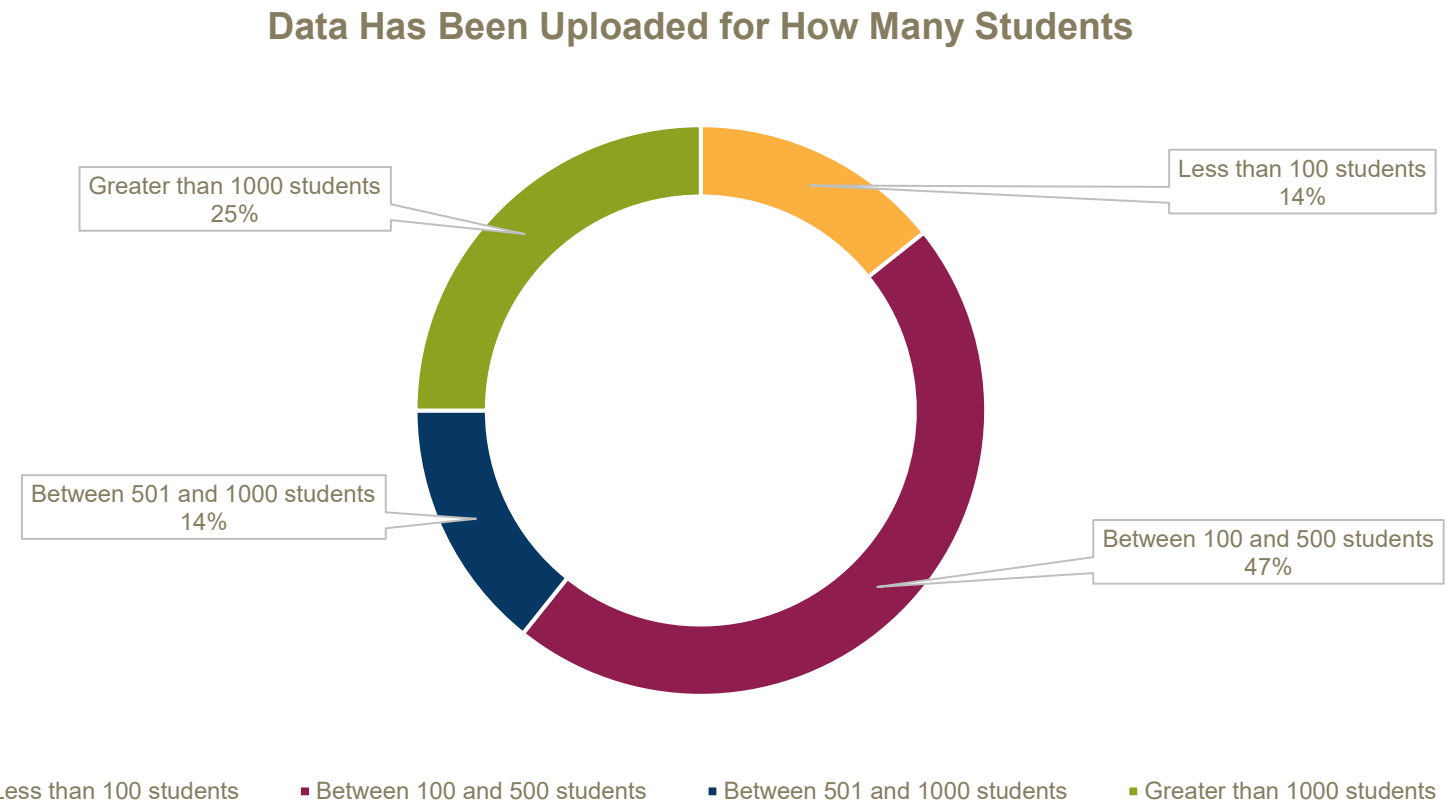
YEARS INVOLVED



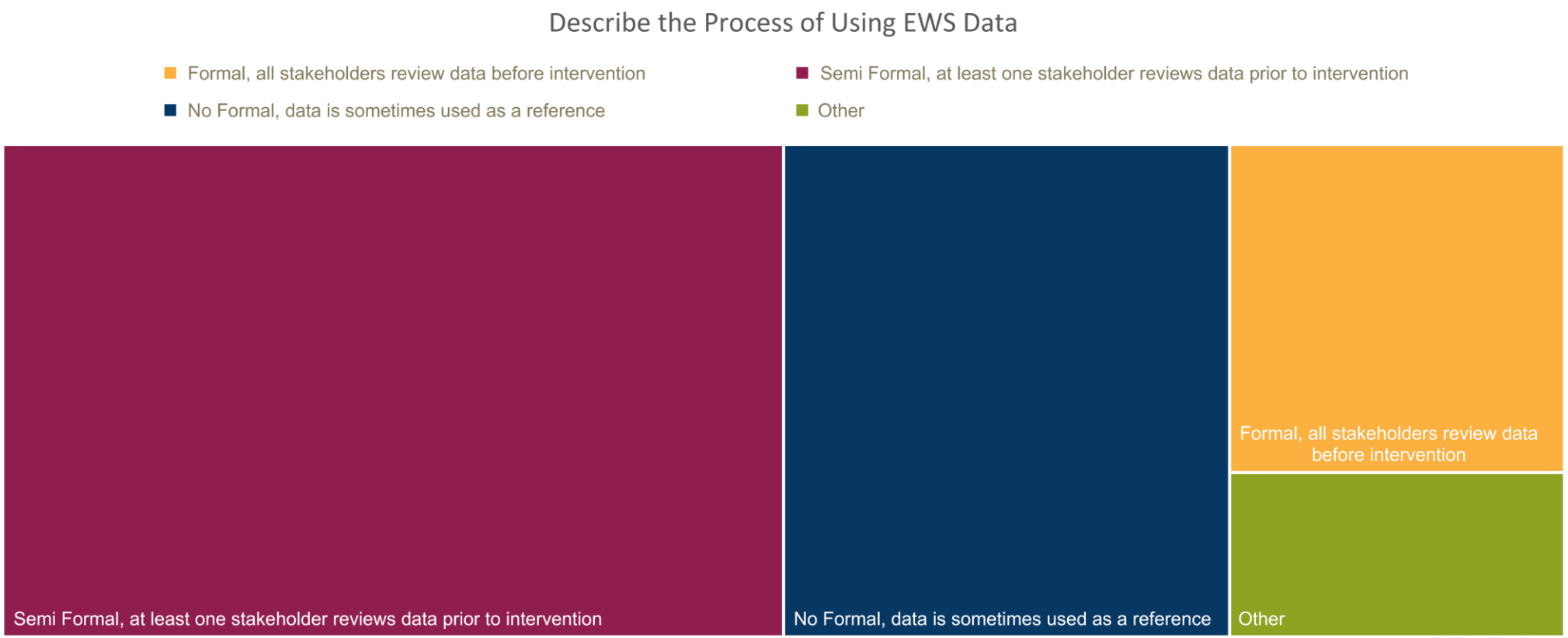
DATA MANAGEMENT



FOR HOW MANY STUDENTS?



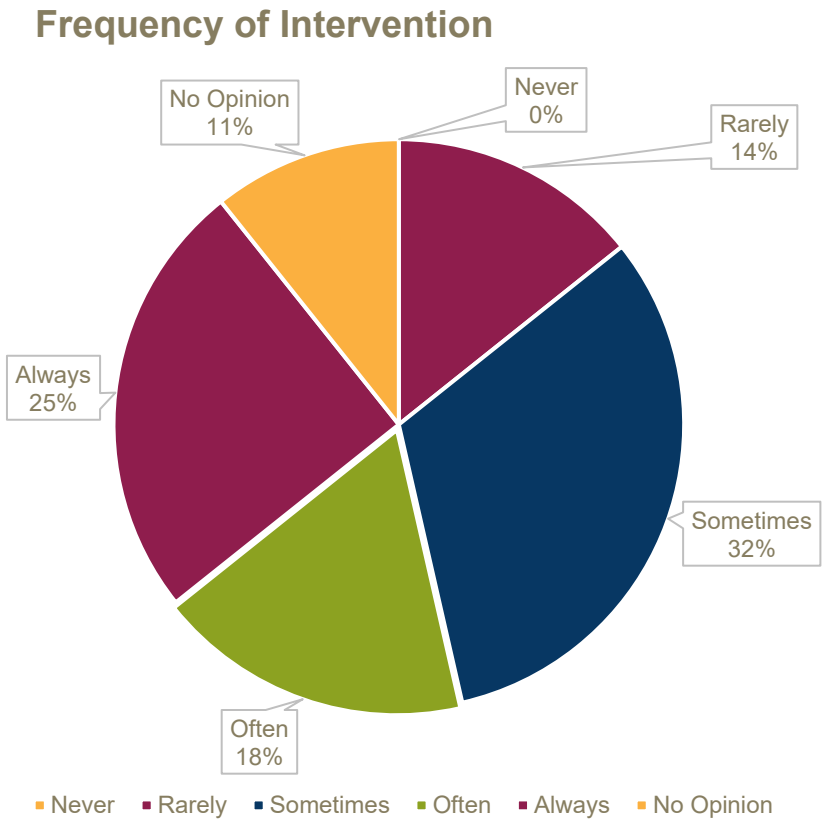
EWS FOLLOW UP



STUDENT SUPPORT

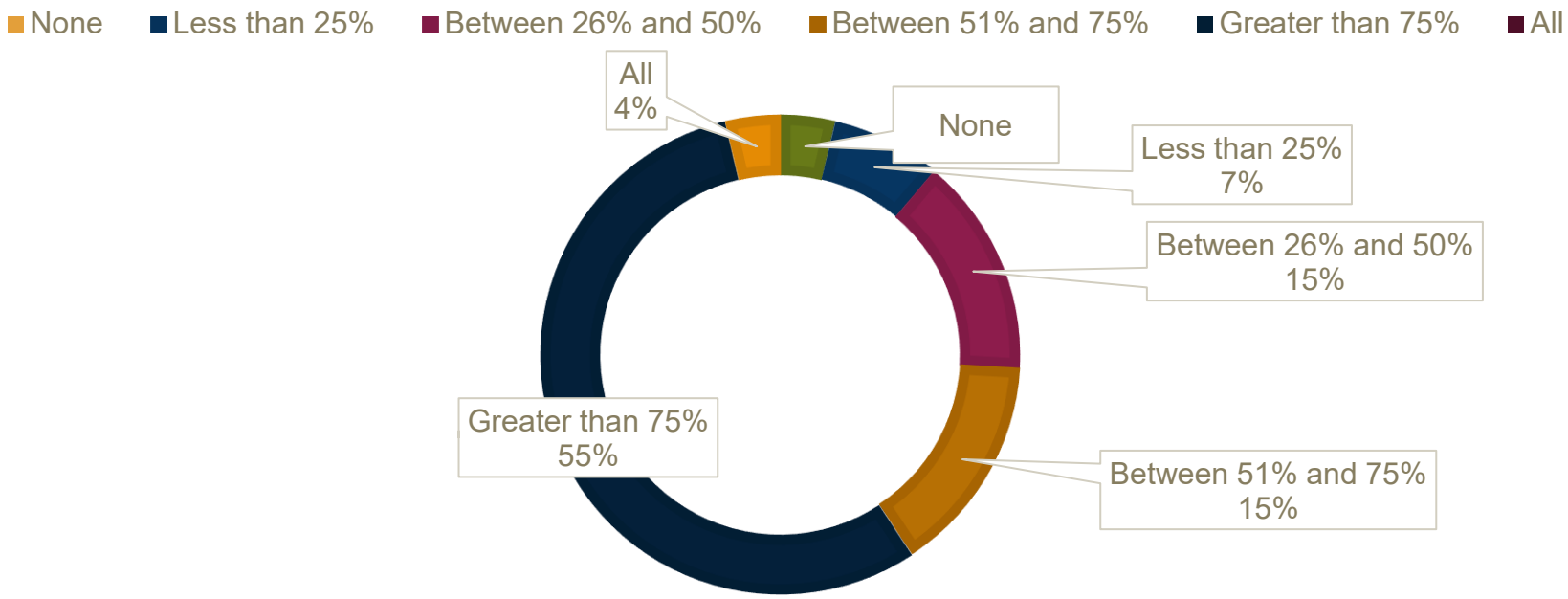
	Do Identified Students Receive Support		Do Students Not Identified Receive Support		Do Identified Students Receive EWS Based Support	
None	2	7.4%	4	14.8%	2	7.4%
Less than 25%	5	18.5%	9	33.3%	7	25.9%
Between 26% and 50%	6	22.2%	7	25.9%	5	18.5%
Between 51% and 75%	1	3.7%	4	14.8%	4	14.8%
Greater than 75%	7	25.9%	3	11.1%	6	22.2%
All	6	22.2%			3	11.1%

HOW INTENSE IS THE FOLLOW UP?



OUTCOME

WHAT PERCENTAGE OF IDENTIFIED STUDENTS GO ON TO GRADUATE OR TO NEXT GRADE



COMPARING PILOT SCHOOL RESPONSES WITH RESPONSES FROM SCHOOLS THAT HAVE IMPLEMENTED LESS THAN 4 YEARS

	Mean	SD	N	df	F	Sig
Of the students identified by the EWS at 'at risk' or 'high risk,' what percentage receive some kind of support or targeted intervention?						
Less than 4 years	3.000	1.764	10	1	5.822	0.024
4 or more years	4.533	1.407	15			
Total	3.920	1.706	25			
What is the percentage of interventions with your at risk students that are made using EWS data?						
Less than 4 years	2.600	1.350	10	1	7.886	0.010
4 or more years	4.200	1.424	15			
Total	3.560	1.583	25			

How well Does EWS Predict Dropout rates?

How well did EWS predict final dropout rates?

4-year graduation rate based on 9th grade cohorts from 2008 to 2018; students with an EWS score	
	Graduated on time
Students ever scored at extreme risk of dropping out (N=3,726)	59.8%
Students ever scored at risk of dropping out but never at extreme risk (N=3,291)	89.6%
Students never flagged as at risk (N=15,228)	97.3%

How well did EWS predict final dropout rates?

Year-on-year (end status) dropout rates; 9th grade and higher; 2007 to 2019	
	Year-on-year dropout rate
Student-years ever scored at extreme risk of dropping out in year (N=8,146)	12.8%
Student-years ever scored at risk of dropping out in year but never at extreme risk (N=7,057)	3.0%
Student-years never flagged as at risk in year (N=48,407)	0.7%

How did EWS predictions compare to final dropout rates?

4-year graduation rate based on 9th grade cohorts from 2008 to 2018; students with an EWS score			
	Average EWS dropout prediction (p)	Implied EWS graduation probability (1-p)	Actual graduated on time
Students ever at extreme risk of dropping out (N=3,726)	40.8%	59.2%	59.8%
Students ever scored at risk of dropping out but never at extreme risk (N=3,291)	9.7%	90.3%	89.6%
Students never flagged as at risk (N=15,228)	1.5%	98.5%	97.3%

Model to assess predictive accuracy of EWS

$$Drop_{\{ist\}} = \alpha_0 + \alpha_1 EWSPP_{\{it\}} + \alpha_2 X_{\{it\}} + \lambda_s + \delta_t + \epsilon_{\{ist\}}$$

- $Drop_{\{ist\}}$ =1 if drop out in year t
- $EWSPP_{\{it\}}$ EWS predicted probability across all years observed
- X background characteristics
- λ_s school fixed effects -- control for all factors in common to a school
- δ_t academic year fixed effects --account for changes that affect all students in t
- Standard errors are clustered at the school level
- α_1 the relationship between predicted probability and the actual graduation outcome.
  =1 if model perfectly predicts dropout outcomes.

	Ever drop out (9th grade cohorts from 2008 to 2018; students with an EWS score)		
EWS predicted dropout probability: time-varying, year-to-year	0.851*** (0.030)		
EWS predicted dropout probability: mean over all years		1.017*** (0.016)	1.013*** (0.016)
Female			-0.013*** (0.003)
Hispanic			0.025** (0.012)
Native American			-0.008 (0.009)
Asian			-0.025** (0.012)
Black			0.004 (0.024)
Other race category			0.016* (0.010)
Unit of observation	Student-year	Student	Student
Fixed effects	School, year, grade	School, Cohort entry grade, cohort entry year	School, Cohort entry grade, cohort entry year
N	58,576	22,155	22,155

Did using EWS affect graduation rates?

Graduates were more likely to have been in the EWS system

Among students who could have graduated based on cohort	
Of those who eventually dropped out	Of those who eventually eventually graduated
28.7% had been scored at some point	34.3% had been scored at some point

How did dropout rates compare for students in EWS adopting and non-adopting schools ?

4-year graduation rate based on 9th grade cohorts from 2008 to 2018	
	Graduated on time
All students (N=116,053)	87.2%
Students with any EWS score (N=22,245)	89.9%
Students never with an EWS Score (N=93,808)	86.6%

How did dropout rates compare for students in EWS adopting and non-adopting schools ?

Year-on-year (end status) dropout rates; 9th grade and higher; 2007 to 2019	
	Year-on-year dropout rate
All student-years (N=619,536)	3.6%
Student-years with any EWS score (N=63,610)	2.5%
Student-years without any EWS Score (N=555,926)	3.7%

Assessing effect of EWS use on graduation

$$Y_{\{igst\}} = \beta_0 + \beta_1 EWS_{\{st\}} + \beta_2 X_{\{igst\}} + \beta_3 S_{\{igst\}} + \beta_s + \gamma_g + \delta_t + \epsilon_{\{igst\}}$$

- $Y_{\{igst\}}$ measured as cohort graduation status
  or year enrollment end status
- $EWS_{\{st\}}$ = 1 if school *s* ever used the EWS system in academic year *t*
  Or share of years school loaded EWS
- β_1 effect of the school's EWS use on the respective student outcome.

Overall effectiveness of EWS: cohort graduation status

	Ever graduate (9th grade cohorts from 2008 to 2018; All MT students)		
School loaded EWS: time-varying, year-to-year	0.010***		
	(0.003)		
Share of years school loaded EWS		0.081***	0.085***
		(0.010)	(0.009)
Female			0.031***
			(0.002)
Hispanic			-0.042***
			(0.007)
Native American			-0.139***
			(0.008)
Asian			0.050***
			(0.008)
Black			-0.024**
			(0.012)
Other race category			-0.091***
			(0.007)
Unit of observation	Student-year	Student	
Fixed effects	School, year, grade	School, Cohort entry grade, cohort entry year	
N	925,205	116,001	114,224

Year-to-year effectiveness of EWS: enrollment end status

	Stayed in school	Other enrollment end status	Dropped out	Graduated (12th grade students only)
School loaded EWS: time-varying, year-to-year	0.002***	-0.001**	-0.002*	-0.003
	(0.001)	(0.001)	(0.001)	(0.006)
School fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
Grade fixed effects	Y	Y	Y	Y
Unit of observation	Student-year	Student-year	Student-year	Student-year
Observations	2,080,557	2,080,557	2,080,557	144,394
R-squared	0.739	0.046	0.049	0.050

What do these preliminary results indicate?

- EWS model is strongly correlated with actual graduation experiences.
  - Very few students never flagged by the system as at risk ever drop out.
  - Predicted probability of dropout is strongly related to actual dropout.
- Students without an EWS score have higher dropout rates than students in the EWS system. Use of EWS increases cohort graduation rate by 1%
- Future research will survey schools about EWS—how were adopters and non-adopters different?
- Current understanding is adopters tended to be comprehensive schools receiving extra support due to low performance
- Future analysis will examine issue of selection in more detail