THE SCHOOL DISTRICT OF PHILADELPHIA

School-wide Positive Behavioral Interventions & Supports (PBIS): Five-year School-wide Outcome Trends

Molly Schlesinger,
Statistician

Melissa Karakus,
Senior Research Associate

Ji Eun Park,
Senior Statistician

Office of Research and Evaluation

September 2021

Key Findings

- The percentage of students attending 95% or more days and the percentage of students with zero suspensions both increased at PBIS schools between 2014-15 and 2018-19. However, PBIS and non-PBIS schools in the study sample followed the same patterns for most school-wide outcomes.
- Overall, the violent incident rate and number of serious incidents decreased in PBIS schools more than in non-PBIS schools from 2014-15 to 2018-19.
- There was a decrease in the *sense of belonging* and *school safety* sub-construct District-Wide Survey scores among both the PBIS schools and the non-PBIS schools in the study sample.
- PBIS schools had slightly larger gains than non-PBIS schools on PSSA performance over time, although student performance at both PBIS and non-PBIS schools increased over time.

Contents

Acknowledgements

The authors would like to acknowledge the hard work and contributions of our colleagues in the School District of Philadelphia's Office of School Climate and Culture's Positive Behavior Interventions and Supports (PBIS) program, especially Steven Rufe and Tynara Blount. We would also like to thank Joy Lesnick and Katie Carter in the Office of Research and Evaluation (ORE) for their valuable feedback and guidance in writing this report.

Background

School-wide Positive Behavioral Intervention & Supports (PBIS) in the School District of Philadelphia (SDP)

PBIS is an individualized, adaptable, school-wide framework for supporting schools in transforming the school environment by adopting evidenced-based interventions that enhance academic and social behavior outcomes for all students.[1]

In 2014-15, 24 schools began implementing PBIS programs, and 37 more followed in the years since. As of 2018-19, there were 61 PBIS schools in SDP (Table 1). The list of PBIS schools and their implementation years are provided in Appendix A (Table A1); the analyses in this report focus on schools that started implementing PBIS in 2014-15 to look at changes at this first cohort over time.

Table 1. Summary of schools included in the analyses by first year of implementation

Grade Levels	PBIS schools as of 2018-19 by first year of implementation				
	2014-15	2015-16	2016-17	2017-18	2018-19
Elementary	4	3	1	3	3
K-8	18	3	9	7	5
Middle	2	0	0	1	2
Total	**24**	**6**	**10**	**11**	**10**

Research Question

This study examines how PBIS schools changed compared to non-PBIS schools on the following key school-wide outcomes over five years:

- Attendance rates,
- Suspension rates,
- Serious incidents,
- Violent incidents,
- *Sense of Belonging* sub-construct on the District-Wide Survey,
- *School Safety* sub-construct on the District-Wide Survey,
- Achievement on the ELA PSSA, and
- Achievement on the Math PSSA.

[1] For more information see: https://www.philasd.org/schoolclimate/programs-services/pbis/

Methods

Determining matched schools

Twenty-four schools that had not implemented PBIS as of 2018-19 were selected as matched comparison schools in order to examine the potential impact of implementing school-wide PBIS on the selected school-wide outcomes. This matched comparison group is important because PBIS schools were explicitly selected in response to the significant climate challenges in those schools. By definition, schools that did not have PBIS by 2018-19 did not have the same climate challenges as PBIS schools. Therefore, our analyses examine PBIS schools compared against matched schools with characteristics as similar as possible in 2014-15.

We used propensity score matching to identify 24 comparison schools from the original 99 non-PBIS schools that had not implemented PBIS by 2018-19. This is a mathematical procedure that identifies an appropriate comparison group, in this case a set of comparison schools that had similar baseline characteristics to the 24 PBIS schools. (See Appendix A, Table A2 for more information about the matched schools.)

PBIS schools compared to non-PBIS schools

In order to assess the school-wide outcomes of PBIS, we first focused on examining changes from 2014-15 to 2018-19 on seven school-wide indicators. We chose school-wide indicators that are widely used for accountability purposes at SDP and are especially important to PBIS schools.[2] By comparing PBIS schools' 2018-19 school-wide outcomes, as measured by these seven indicators, with the school-wide outcomes from non-PBIS schools in our sample, we evaluated whether PBIS interventions may have effects on the different school-wide outcomes of interest.

School-wide Indicators

Attendance: The percentage of students attending 95% or more instructional days.

Suspensions: The percentage of students with zero suspensions, the number of Out-of-School Suspensions, and the number of In-School Suspensions.

Violent Incidents: The rate of violent incidents per 100 students.

Serious Incidents: The number of serious incidents per year.

Sense of Belonging: A sub-construct score on the annual District-wide Survey. [3]

[2]Although there are various ways to measure suspension rates, we used the percentage of students with zero suspensions because it is one of the major climate indicators used in SDP.

[3] The Sense of Belonging Sub-construct score includes averages and rescaled responses to District-wide Survey questions related to the Sense of Belonging Sub-construct within a particular school. Example survey items include: *I feel welcome at my school and I am treated with respect by other students*.
The School Safety Sub-construct score includes averages and rescaled responses to District-wide Survey questions related to the School safety Sub-construct within a particular school. Example survey items include: *I feel safe in the hallways* and *I feel safe in my classes*. For more information about the District-wide Survey,

School Safety: A sub-construct score on the annual District-wide Survey. [3]

ELA Achievement: The percentage of students scoring proficient/advanced on the ELA PSSA.

Math Achievement: The percentage of students scoring proficient/advanced on the Math PSSA.

School-wide indicators at PBIS schools and non-PBIS schools rarely differed in 2014-15.

In both PBIS and non-PBIS schools in our sample, about 30% of students had 95% or higher average daily attendance and about 85% of students had zero suspensions. Additionally, District-Wide Survey sub-construct average scores of Sense of Belonging and School Safety were at about 7 out of 10; that is, roughly 70% of students said they belonged and felt safe, respectively, in school. PSSA Math achievement was similar at both PBIS and non-PBIS schools (around 7% proficient/advanced). However, the percentage of students who scored at proficient/advanced on the ELA PSSA was significantly higher at non-PBIS schools (Table 2) (see Table A5 for statistical outputs).

Table 2. Indicators of PBIS schools and non-PBIS schools in 2014-15

Indicator	PBIS schools (n = 24)	Non-PBIS Schools (n = 24)
Percentage of students with Average Daily Attendance (ADA) of 95% or above	31%	32%
Percentage of students with zero suspensions	85%	86%
Number of Out-of-School Suspensions (OSS)	837	885
Number of In-School Suspensions (ISS)	24	2
Violent Incident Rate	8	6
Number of Serious Incidents	41	34
Sense of Belonging Sub-construct on the District-wide Survey	7.2	7.4
School Safety Sub-construct on the District-wide Survey	7.6	7.9
Percentage of students scoring proficient or advanced on the ELA PSSA (Grades 3-8)	17%	21%
Percentage of students scoring proficient or advanced on the Math PSSA (Grades 3-8)	7%	7%

Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.
Note: See Appendix A, Table A4 for the Independent Samples *t*-tests comparing the average indicators between PBIS and non-PBIS schools. See Appendix C for definitions of Independent Samples *t*-tests.

PBIS schools and non-PBIS schools in our sample did not differ in their 2014-15 demographic characteristics.

In both PBIS and non-PBIS schools in our sample, over 55% of students were Black/African American, and about one quarter were Hispanic/Latinx, while less than 10% of students were Multi-Racial/Other, White, or Asian/Pacific Islander. In both groups, 16-17% of students had

and survey sub-constructs, see: https://www.philasd.org/research/wp-content/uploads/sites/90/2020/10/2019-20-District-Wide-Survey-Technical-Report-October-2020.pdf

Individualized Education Plans, or IEPs, and about 6-7% of students were English Learners (ELs) (Table 3).

Table 3. Demographic Characteristics of PBIS schools and non-PBIS schools in 2014-15

Demographic characteristics	PBIS schools (n = 24)	Non-PBIS Schools (n =24)
Gender		
Male	52%	53%
Female	48%	47%
Race/Ethnicity		
Black/African American	59%	65%
Hispanic/Latinx	28%	24%
Multi-Racial/Other	7%	6%
White	5%	3%
Asian/Pacific Islander	2%	2%
Special Education Status		
Students with IEPs	17%	16%
Students without IEPs	83%	84%
English Learner Status		
English Learners	7%	6%
Non-English Learners	93%	94%

Source: Open Data - School Enrollment and Demographics SY 2014-15.
Note: See Appendix A, Table A3 for the Independent Samples *t*-tests comparing the average demographic rates between PBIS and non-PBIS schools. See Appendix C for definitions of Independent Samples *t*-tests. The Students with IEPs category does not include students who are Gifted with no other disability.

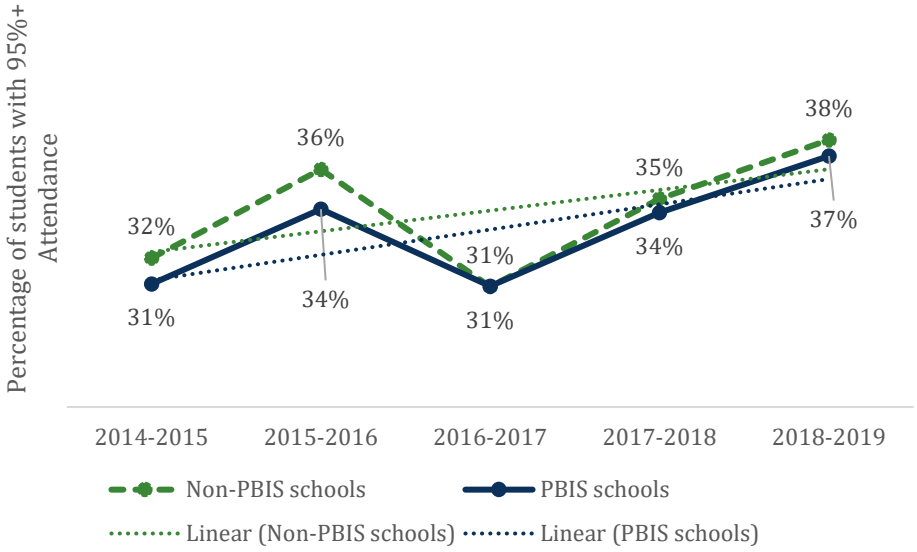
Results

Attendance

The percentage of students with Average Daily Attendance (ADA) of 95% or more increased in both PBIS and non-PBIS schools in our sample from 2014-15 to 2018-19.

There was little difference in the five-year trend between the non-PBIS schools and the PBIS schools, as both groups increased the percentage of students attending 95% of days by about six points between 2014-15 and 2018-19 (Figure 1).

Figure 1. Trends in the percentage of students with ADA of 95% or more, 2014-15 to 2018-19



Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.
How to read this figure: The figure displays the percentage of students with average daily attendance (ADA) of 95% or higher in 2014-15 through 2018-19 on the solid blue line for PBIS schools and the dashed green line for non-PBIS schools. The dotted linear lines represent the rate of change from 2014-15 to 2018-19. The slope of the PBIS (blue dotted linear) line does not differ from the non-PBIS (green dotted linear) line, signifying that the PBIS schools did not significantly differ from non-PBIS schools.
Note: The 2016-17 year included a SEPTA strike during which attendance decreased throughout the city. This anomaly primarily impacted high schools, although it likely contributed to the attendance rates during 2016-17.

Increases in percentage of students 95%+ or higher Average Daily Attendance (ADA) from 2014-15 to 2018-19 were observed among only 14 of the 24 PBIS schools (Table 4). Overall, PBIS schools demonstrated a statistically significant increase in ADA from 2014-15 to 2018-19, $t(23) = 2.65$, $p = 0.014$, Cohen's $d = 0.74$. Similarly, non-PBIS schools in our sample demonstrated a statistically significant increase in ADA from 2014-15 to 2018-19, $t(23) = 2.28$, $p = 0.026$, Cohen's $d = 0.68$.

Table 4. 2014-15 to 2018-19 changes in the percentage of students with ADA of 95% or above

PBIS Schools	% of students with ADA of 95%+ in 2014-15	% of students with ADA of 95%+ in 2018-19	Percentage point change from 2014-15 to 2018-19
Clemente, Roberto Middle Schl	19.8%	55.6%	35.8
Tilden Middle School	17.7%	51.0%	33.3
Roosevelt Elementary School	18.9%	43.4%	24.5
Morrison, Andrew J. School	34.0%	48.8%	14.8
Arthur, Chester A. School	37.1%	49.6%	12.5
Hartranft, John F. School	25.9%	37.0%	11.1
Meade, Gen. George G. School	21.1%	30.4%	9.3
Richmond School	36.8%	45.0%	8.2
Stearne, Allen M. School	24.5%	31.8%	7.3
Kelley, William D. School	24.8%	30.1%	5.3
Blankenburg, Rudolph School	26.7%	31.6%	4.9
Welsh, John School	37.9%	41.6%	3.7
Lea, Henry C.	42.3%	44.7%	2.4
Penrose School	42.0%	42.7%	0.7
Taylor, Bayard School	32.3%	31.8%	-0.5
Wright, Richard R. School	29.6%	28.9%	-0.7
Comegys, Benjamin B. School	34.0%	33.0%	-1
Sheridan, Philip H. School	33.8%	32.7%	-1.1
De Burgos, J. Elementary	27.5%	25.4%	-2.1
Marshall, Thurgood School	39.2%	36.2%	-3
Dick, William School	33.0%	28.9%	-4.1
McKinley, William School	39.3%	35.1%	-4.2
Blaine, James G. School	37.4%	32.7%	-4.7
Duckrey, Tanner School	26.1%	20.4%	-5.7

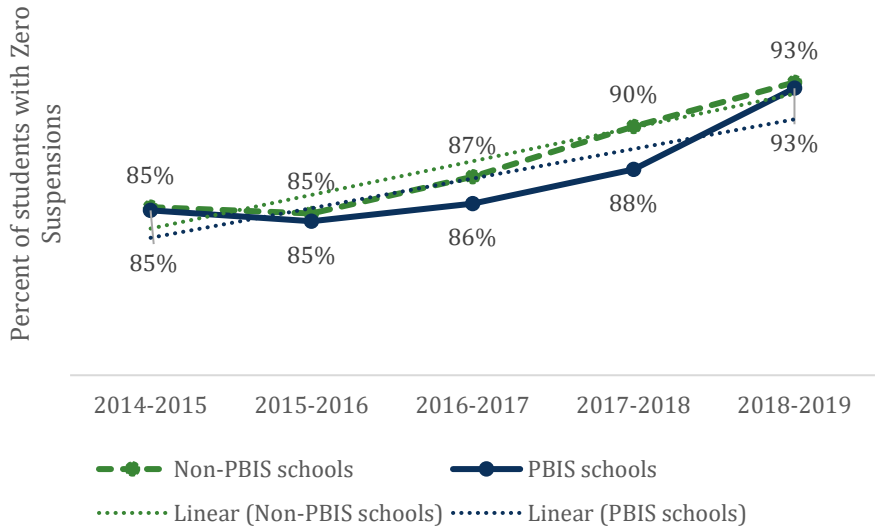
Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.

Suspensions

The percentage of students with zero suspensions increased in both the PBIS and non-PBIS schools in our sample at a similar rate.

Both PBIS and non-PBIS schools increased the average percentage of students with zero suspensions from 85% to 93% between 2014-15 and 2018-19 (Figure 2).

Figure 2. 2014-15 to 2018-19 trends in the percentage of students with zero suspensions



Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.
How to read this figure: The figure displays the percentage of students with zero suspensions in 2014-15 through 2018-19 on the solid lines for PBIS schools in blue and the dashed lines for non-PBIS schools in green. The dotted linear lines represent the rate of change from 2014-15 to 2018-19. The slope of the PBIS (blue dotted linear) line does not differ from the non-PBIS (green dotted linear) line, signifying that the PBIS schools did not significantly differ from non-PBIS schools.
Note: Some of the markers may appear lower or higher than other than markers with the same percentages due to rounding.

Table 5 provides school-level changes in the percentage of students with zero suspensions from 2014-15 to 2018-19 at the PBIS schools. Twenty-one (21) of the 24 PBIS schools experienced changes in the percentage of students with zero suspensions in the intended direction. Overall, PBIS schools demonstrated a statistically significant increase in the percentage of students with zero suspensions from 2014-15 to 2018-19, $t(23) = 5.79$, $p < 0.001$, Cohen's $d = 1.18$. Similarly, non-PBIS schools demonstrated a statistically significant increase in the percentage of students with zero suspensions from 2014-15 to 2018-19, $t(23) = 5.13$, $p < 0.001$, Cohen's $d = 1.00$.

Table 5. 2014-15 to 2018-19 changes in percentage of students with zero suspensions

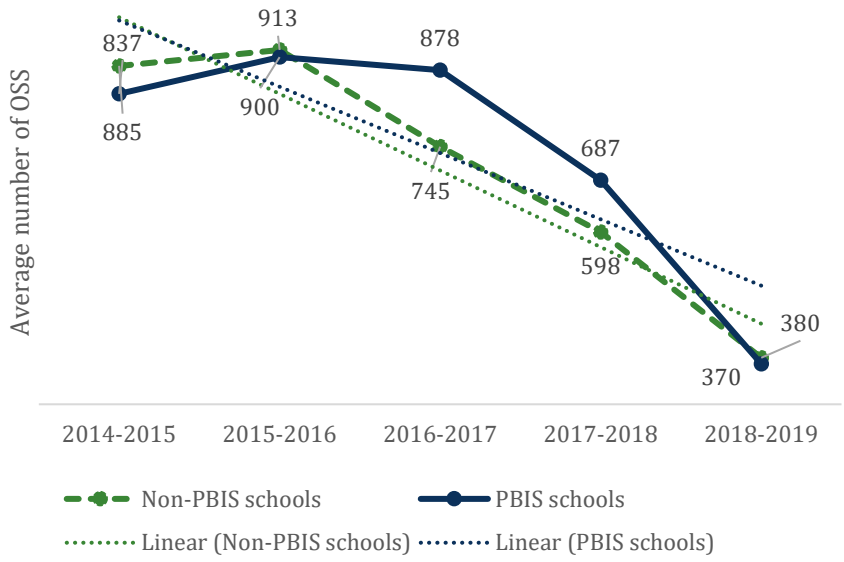
PBIS Schools	% of students with 0 suspensions, 14-15	% of students with 0 suspensions, 18-19	Percentage point change, 14-15 to 18-19
Kelley, William D. School	69.9%	95.4%	25.5
Wright, Richard R. School	75.4%	92.4%	17
Marshall, Thurgood	76.7%	93.2%	16.5
Roosevelt Elementary	74.8%	86.6%	11.8
Duckrey, Tanner School	83.3%	94.9%	11.6
Dick, William School	87.5%	98.9%	11.4
Penrose School	85.7%	95.7%	10
Blankenburg, Rudolph	83.0%	91.8%	8.8
Arthur, Chester A. School	84.1%	92.6%	8.5
Clemente, Roberto Middle	87.1%	95.4%	8.3
Hartranft, John F. School	86.0%	94.0%	8
Blaine, James G. School	85.8%	92.9%	7.1
McKinley, William School	89.7%	96.6%	6.9
Sheridan, Philip H. School	93.1%	99.9%	6.8
Morrison, Andrew J.	88.3%	94.3%	6
De Burgos, J. Elementary	86.4%	91.8%	5.4
Tilden Middle School	74.6%	79.2%	4.6
Meade, Gen. George G.	85.6%	89.9%	4.3
Welsh, John School	89.5%	93.3%	3.8
Taylor, Bayard School	92.7%	95.4%	2.7
Richmond School	97.2%	99.1%	1.9
Comegys, Benjamin B.	94.2%	93.1%	-1.1
Lea, Henry C.	89.1%	87.3%	-1.8
Stearne, Allen M. School	85.9%	83.4%	-2.5

Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.

The average number of Out-of-School Suspensions (OSS) decreased at a similar rate from 2015-16 to 2018-19 in both the PBIS and non-PBIS schools in our sample.

Both PBIS and non-PBIS schools declined by more than half in the average number of Out-of-School Suspensions (OSS) from 2014-15 to 2018-19 (from 837 to 370 for PBIS schools and from 885 to 380 for non-PBIS schools; see Figure 3). Although the path of PBIS schools differed from non-PBIS schools, in that PBIS schools had about 100 more OSS than non-PBIS schools on average in 2016-2017 and 2017-2018, both groups ended up with similar averages in 2018-19.

Figure 3. 2014-15 to 2018-19 trends in the average number of Out-of-School Suspensions (OSS)



Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.
How to read this figure: The figure displays the average number of out of school suspensions (OSS) in 2014-15 through 2018-19 on the solid lines for PBIS schools in blue and the dashed lines for non-PBIS schools in green. The dotted linear lines represent the rate of change from 2014-15 to 2018-19. The slope of the PBIS (blue dotted linear) line does not differ from the non-PBIS (green dotted linear) line, signifying that PBIS schools did not significantly differ from non-PBIS schools.

Twenty-one (21) of the 24 PBIS schools experienced decreases in the number of OSS from 2014-15 to 2018-19. Overall, PBIS schools demonstrated a statistically significant decrease in the number of OSS from 2014-15 to 2018-19, $t(23) = 4.83$, $p < 0.001$, Cohen's $d = 1.18$ (Table 4). Additionally, non-PBIS schools demonstrated a statistically significant decrease in the number of OSS from 2014-15 to 2018-19, $t(23) = 3.42$, $p = 0.002$, Cohen's $d = 0.84$.

Table 6. 2014-15 and 2018-19 number of Out-of-School Suspensions in PBIS schools

PBIS Schools	# of students with Out-of-School Suspensions in 2014-15	# of students with Out-of-School Suspensions in 2018-19
Arthur, Chester A. School	376	129
Blaine, James G. School	655	295
Blankenburg, Rudolph School	930	331
Clemente, Roberto Middle Schl	618	132
Comegys, Benjamin B. School	550	601
De Burgos, J. Elementary	1170	688
Dick, William School	814	48
Duckrey, Tanner School	1141	335
Hartranft, John F. School	715	292
Kelley, William D. School	1838	148
Lea, Henry C.	349	658
Marshall, Thurgood School	1996	565
McKinley, William School	401	147
Meade, Gen. George G. School	746	399
Morrison, Andrew J. School	830	483
Penrose School	840	223
Richmond School	204	58
Roosevelt Elementary School	1957	794
Sheridan, Philip H. School	394	2
Stearne, Allen M. School	637	858
Taylor, Bayard School	379	290
Tilden Middle School	871	857
Welsh, John School	607	213
Wright, Richard R. School	1065	335

Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.

The average number of In-School Suspensions increased at a higher rate for PBIS schools than non-PBIS schools.

PBIS schools increased in the average number of In-School Suspensions (ISS) from nearly 25 in 2014-15 to close to 100 in 2018-19. However, non-PBIS schools only increased from an average of two per year in 2014-15 to 11 per year in 2018-19. This finding may be demonstrating a difference in systematic recording of ISS at PBIS schools that is not occurring in the same manner in non-PBIS schools. [4] Table 7 provides school-level rates of the number of In-School Suspensions (ISS) in 2014-

[4] We do not have any evidence that the increase in ISS is a reflection in the decrease in OSS (Figure 3), whereas we have anecdotal support that record-keeping for ISS was very different for PBIS and non-PBIS schools beginning in 2014-15 and is the likely cause for the increase in PBIS schools.

15 and 2018-19 at PBIS schools. One (1) out of the 24 PBIS schools experienced a decrease in the number of ISS from 2014-15 to 2018-19. Overall, PBIS schools demonstrated a statistically non-significant, moderate increase in the number of ISS from 2014-15 to 2018-19 (see Appendix A, Table A5 for statistical output).

Table 7. 2014-15 and 2018-19 number of In-School Suspensions in PBIS schools

PBIS Schools	# of students with In-School Suspensions in 2014-15	# of students with In-School Suspensions in 2018-19
Arthur, Chester A. School	0	0
Blaine, James G. School	0	26
Blankenburg, Rudolph School	0	42
Clemente, Roberto Middle Schl	54	155
Comegys, Benjamin B. School	0	0
De Burgos, J. Elementary	0	10
Dick, William School	0	27
Duckrey, Tanner School	0	14
Hartranft, John F. School	0	60
Kelley, William D. School	194	0
Lea, Henry C.	45	379
Marshall, Thurgood School	106	260
McKinley, William School	0	0
Meade, Gen. George G. School	0	18
Morrison, Andrew J. School	14	32
Penrose School	0	16
Richmond School	0	0
Roosevelt Elementary School	0	0
Sheridan, Philip H. School	145	150
Stearne, Allen M. School	3	789
Taylor, Bayard School	0	25
Tilden Middle School	0	7
Welsh, John School	8	20
Wright, Richard R. School	14	237

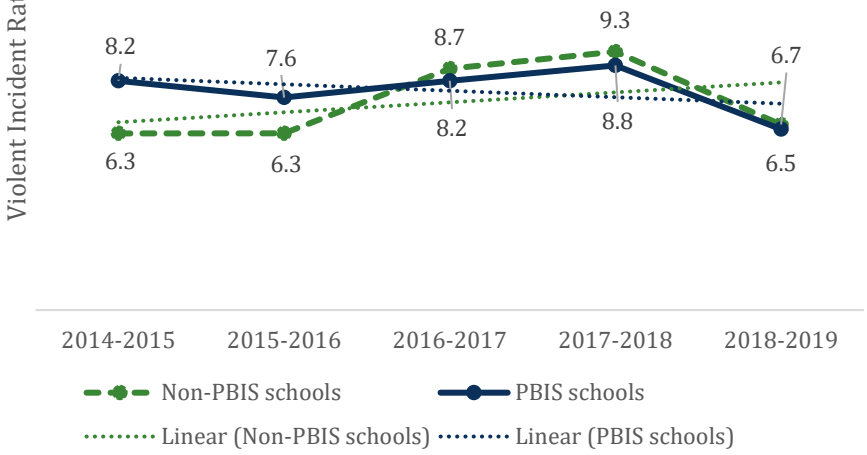
Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.

Violent and Serious Incidents

The violent incident rate decreased in PBIS schools, but increased slightly at non-PBIS schools.

The violent incident rate decreased more in PBIS schools compared to non-PBIS schools between 2014-15 and 2018-19 (Figure 4). The violent incident rate of about seven represents seven violent incidents per 100 students.

Figure 4. 2014-15 to 2018-19 trends in the Violent Incidence Rate



Source: Data from Qlik L1_QV_DM_INCIDENTS, pulled February 25, 2021.
How to read this figure: The figure displays the violent incident rate in 2014-15 through 2018-19 on the solid lines for PBIS schools in blue and the dashed lines for non-PBIS schools in green. The dotted linear lines represent the rate of change from 2014-15 to 2018-19. The PBIS (blue dotted linear) line has a negative slope, signifying a decline in the violent incident rate, whereas the non-PBIS (green dotted linear) line has a positive slope that displays an overall increase in violent incidents.

When examining each PBIS school separately, 16 out of the 24 PBIS schools experienced decreases in the violent incident rate (Table 8). Overall, the violent incident rate in PBIS schools did not significantly differ in 2014-15 from 2018-19, $t(46) = 1.21$, $p = 0.23$, Cohen's $d = 0.035$.

Table 8. Changes in the violent incident rate (the number of violent incidents per 100 students), 2014-15 to 2018-19

PBIS Schools	Violent Incident Rate: 2014-15	Violent Incident Rate: 2018-19	Rate change 2014-15 to 2018-19
Lea, Henry C.	12.5	17.7	5.2
Taylor, Bayard School	4	9.2	5.2
Sheridan, Philip H. School	2.1	6.8	4.7
Comegys, Benjamin B. School	5.8	8.9	3.1
Meade, Gen. George G. School	5.2	7	1.8
Marshall, Thurgood School	2	2.7	0.7
Tilden Middle School	16.5	16.9	0.4
McKinley, William School	4	4	0
Blaine, James G. School	11.6	11.3	-0.3
Stearne, Allen M. School	7.6	7.1	-0.5
Kelley, William D. School	3.7	2.5	-1.2
Duckrey, Tanner School	3.3	1.5	-1.8
Roosevelt Elementary School	13.8	12	-1.8
Dick, William School	6.1	4.2	-1.9
Richmond School	3.8	1.7	-2.1
De Burgos, J. Elementary	3.7	1.2	-2.5
Hartranft, John F. School	6.7	3.6	-3.1
Penrose School	6.1	2.9	-3.2
Arthur, Chester A. School	9.7	6.3	-3.4
Morrison, Andrew J. School	5.4	1.3	-4.1
Clemente, Roberto Middle Schl	15.3	9.3	-6
Blankenburg, Rudolph School	15	8.8	-6.2
Welsh, John School	12.3	4.6	-7.7
Wright, Richard R. School	21.2	4.3	-16.9

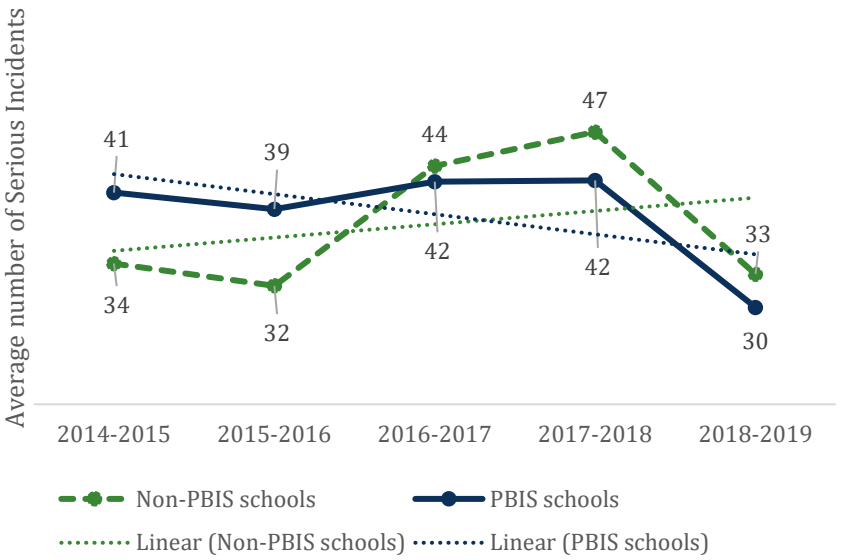
Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.

Note: Violent incidents represent a rate of the number of violent incidents per 100 students.

There was a larger increase in the number of serious incidents in PBIS schools than in non-PBIS schools in our sample.

The number of serious incidents decreased more in PBIS schools compared to non-PBIS schools between 2014-15 and 2018-19 (Figure 5).

Figure 5. 2014-15 to 2018-19 trends in the number of serious incidents



Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.
How to read this figure: The figure displays the number of serious incidents in 2014-15 through 2018-19 on the solid lines for PBIS schools in blue and the dashed lines for non-PBIS schools in green. The dotted linear lines represent the rate of change from 2014-15 to 2018-19. The PBIS (blue dotted linear) line has a negative slope, signifying a decline in the number of serious incidents, whereas the non-PBIS (green dotted linear) line has a positive slope that displays an overall increase in number of serious incidents.

When examining each PBIS school separately, 17 out of the 24 experienced decreases in the number of serious incidents (Table 9). Overall, PBIS schools demonstrated a statistically significant decrease in the number of serious incidents from 2014-15 to 2018-19, $t(23) = 2.54$, $p = 0.018$, Cohen's $d = 0.52$. Alternatively, non-PBIS schools did not demonstrate a statistically significant decrease in the number of serious incidents from 2014-15 to 2018-19, $t(23) = 0.51$, $p = 0.61$, Cohen's $d = 0.22$.

Table 9. 2014-15 to 2018-19 changes in the Number of Serious Incidents

PBIS Schools	Number of Serious Incidents in 2014-15	Number of Serious Incidents in 2018-19	Change from 2014-15 to 2018-19
Sheridan, Philip H. School	15	45	30
Lea, Henry C.	62	89	27
Taylor, Bayard School	23	47	24
Meade, Gen. George G. School	19	27	8
Comegys, Benjamin B. School	36	42	6
Marshall, Thurgood School	14	19	5
Blaine, James G. School	48	49	1
McKinley, William School	19	15	-4
Stearne, Allen M. School	42	36	-6
Kelley, William D. School	16	9	-7
Arthur, Chester A. School	25	17	-8
Duckrey, Tanner School	20	7	-13
Dick, William School	34	20	-14
Richmond School	25	9	-16
De Burgos, J. Elementary	28	11	-17
Roosevelt Elementary School	77	59	-18
Hartranft, John F. School	36	17	-19
Penrose School	37	14	-23
Morrison, Andrew J. School	37	9	-28
Tilden Middle School	88	60	-28
Clemente, Roberto Middle Schl	67	37	-30
Blankenburg, Rudolph School	73	37	-36
Welsh, John School	62	16	-46
Wright, Richard R. School	79	19	-60

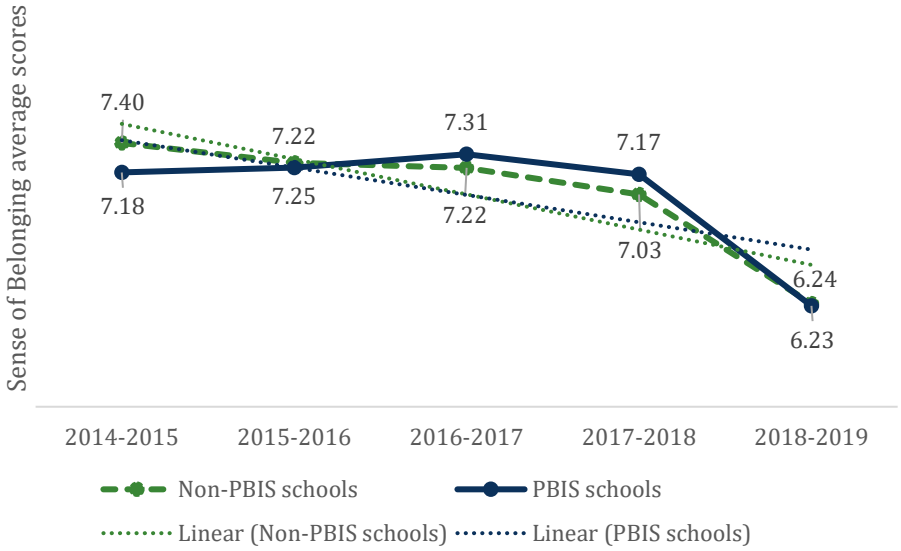
Source: Data from Qlik Climate Matters [v2.4.2], pulled February 23, 2021.

Sense of Belonging

Both PBIS schools and non-PBIS schools in our sample experienced a decrease in their average *Sense of Belonging* sub-construct score on the District-wide Survey.

Both PBIS and non-PBIS schools had about a one-point decrease in their average Sense of Belonging score from 2014-15 to 2018-19 (Figure 6).

Figure 6. 2014-15 to 2018-19 trends in Sense of Belonging sub-construct on the District-wide Survey



Source: Data from Qlik District Wide Surveys [v1.6.2], pulled February 23, 2021.
How to read this figure: The figure displays students' average Sense of Belonging score in 2014-15 through 2018-19 on the solid lines for PBIS schools in blue and the dashed lines for non-PBIS schools in green. The dotted linear lines represent the rate of change from 2014-15 to 2018-19. The slope of the PBIS (blue dotted linear) line does not differ from the non-PBIS (green dotted linear) line, signifying that the PBIS schools did not significantly differ from non-PBIS schools.

When examining each PBIS school separately, five out of the 18 PBIS schools with survey data available experienced increases in their Sense of Belonging average score (Table 10). Overall, PBIS schools demonstrated a statistically significant decrease in Sense of Belonging from 2014-15 to 2018-19, $t(23) = 8.27$, $p < 0.001$, Cohen's $d = 2.08$. Additionally, non-PBIS schools demonstrated a statistically significant decrease in Sense of Belonging from 2014-15 to 2018-19, $t(23) = 9.50$, $p < 0.001$, Cohen's $d = 2.60$.

Table 10. 2014-15 to 2018-19 changes in the Sense of Belonging sub-construct on the District-wide Survey

PBIS Schools	Sense of Belonging Score in 2014-15	Sense of Belonging Score in 2018-19	Change from 2014-15 to 2018-19
Dick, William School	6.4	7.3	0.9
Duckrey, Tanner School	6.2	7	0.8
Hartranft, John F. School	6.7	7.5	0.8
Morrison, Andrew J.	6.6	7.4	0.8
Meade, Gen. George G.	7.4	7	-0.4
Taylor, Bayard School	7.7	7.3	-0.4
Tilden Middle School	7.2	6.6	-0.6
McKinley, William School	8.1	7.4	-0.7
Sheridan, Philip H. School	8	7.3	-0.7
Kelley, William D. School	7.8	7	-0.8
De Burgos, J. Elementary	8.3	7.4	-0.9
Lea, Henry C.	7.8	6.9	-0.9
Stearne, Allen M. School	7.6	6.7	-0.9
Arthur, Chester A. School	9	7.9	-1.1
Marshall, Thurgood	7.7	6.6	-1.1
Richmond School	8.5	7.4	-1.1
Blaine, James G. School	7.6	6.4	-1.2
Welsh, John School	7.8	6.6	-1.2
Blankenburg, Rudolph	n/a	6.8	n/a
Clemente, Roberto Middle	n/a	7.6	n/a
Comegys, Benjamin B.	n/a	6.9	n/a
Penrose School	n/a	6.8	n/a
Roosevelt Elementary	n/a	6.3	n/a
Wright, Richard R. School	n/a	7.9	n/a

Source: Data from Qlik District Wide Surveys [v1.6.2], pulled February 23, 2021.

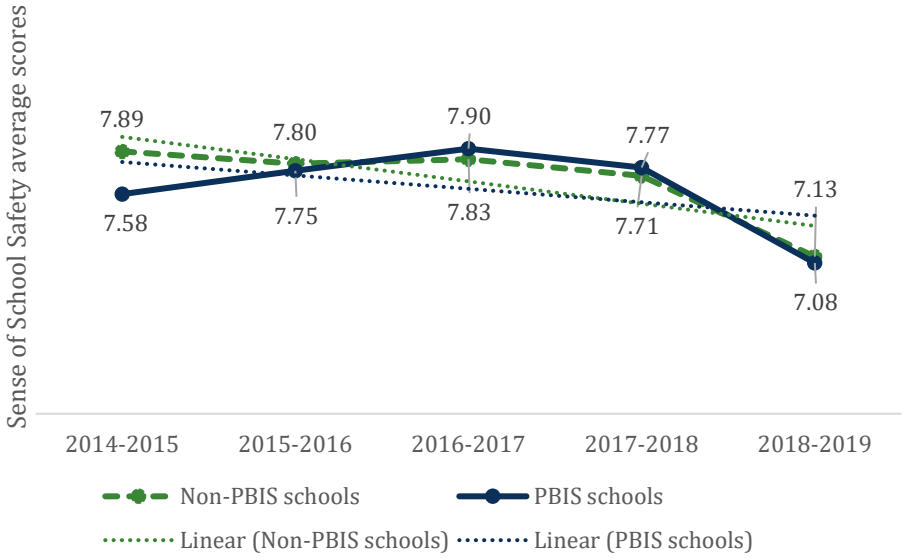
Note: The Sense of Belonging Sub-construct score is the average response to the questions on the District-wide Survey asking about students' sense of belonging (e.g., feeling welcome, etc) at their school.

School Safety

Both PBIS schools and non-PBIS schools experienced a decrease in their average *School Safety* sub-construct score on the District-wide Survey.

The average decrease in perceptions of School Safety was larger among the non-PBIS schools than the PBIS schools in our sample from 2014-15 to 2018-19 (Figure 7).

Figure 7. 2014-15 to 2018-19 trends in the School Safety sub-construct on the District-wide Survey



Source: Data from Qlik District Wide Surveys [v1.6.2], pulled February 23, 2021.
How to read this figure: The figure displays students' average School Safety scores in 2014-15 through 2018-19 on the solid lines for PBIS schools in blue and the dashed lines for non-PBIS schools in green. The dotted linear lines represent the rate of change from 2014-15 to 2018-19. The PBIS line has a steeper slope than the non-PBIS line, signifying that School Safety at PBIS schools decreased at a lower rate than non-PBIS schools.

When examining each PBIS school separately, one out of the 18 PBIS schools with survey data available experienced increases in their average School Safety score (Table 11). Overall, PBIS schools demonstrated a statistically significant decrease in their average School Safety score from 2014-15 to 2018-19, $t(23) = 2.71$, $p = 0.015$, Cohen's $d = 0.88$. Additionally, non-PBIS schools in the sample demonstrated a statistically significant decrease in their average School Safety score from 2014-15 to 2018-19, $t(23) = 5.72$, $p < 0.001$, Cohen's $d = 1.45$.

Table 11. 2014-15 to 2018-19 changes in average School Safety sub-construct scores on the District-wide Survey

PBIS Schools	School Safety Sub-construct Score in 2014-15	School Safety Sub-construct Score in 2018-19	Change from 2014-15 to 2018-19
Hartranft, John F. School	6.6	6.7	0.1
Dick, William School	6.8	6.8	0
Duckrey, Tanner School	6.5	6	-0.5
Kelley, William D. School	6.6	6.1	-0.5
Meade, Gen. George G.	6.9	6.2	-0.7
Tilden Middle School	6.6	5.7	-0.9
Morrison, Andrew J.	7	6	-1
Sheridan, Philip H. School	7.3	6.3	-1
Stearne, Allen M. School	6.9	5.9	-1
De Burgos, J. Elementary	7.7	6.6	-1.1
Taylor, Bayard School	7.1	6	-1.1
Lea, Henry C.	7.3	6.1	-1.2
McKinley, William School	7.5	6.3	-1.2
Blaine, James G. School	7	5.6	-1.4
Marshall, Thurgood	7.5	6.1	-1.4
Arthur, Chester A. School	8.6	7.1	-1.5
Richmond School	8.1	6.5	-1.6
Welsh, John School	7.3	5.6	-1.7
Blankenburg, Rudolph	n/a	6.1	n/a
Clemente, Roberto Middle	n/a	6.8	n/a
Comegys, Benjamin B.	n/a	5.9	n/a
Penrose School	n/a	5.8	n/a
Roosevelt Elementary	n/a	5.7	n/a
Wright, Richard R. School	n/a	7.5	n/a

Source: Data from Qlik District Wide Surveys [v1.6.2], pulled February 23, 2021.
Note: The School Safety Sub-construct score is the average response to the questions on the District-wide Survey asking about students' sense of safety (e.g., feeling safe, etc) at their school.

Achievement

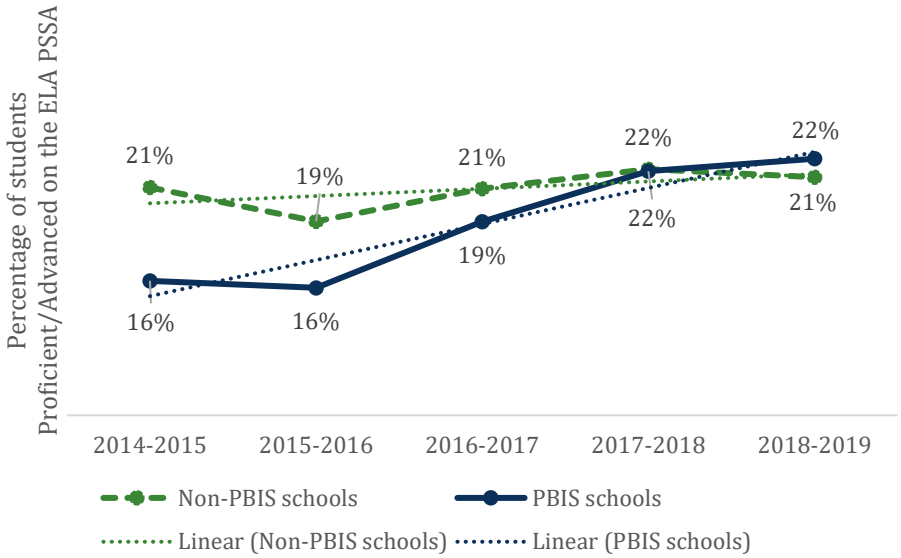
PBIS schools had greater increases in the percentage of students performing at Proficient or Advanced on the ELA PSSA than non-PBIS schools in our sample.

PBIS schools experienced a six-percentage-point increase in the percentage of students in the proficient/advanced category on the ELA PSSA between 2014-15 and 2018-19, whereas the percentage of students scoring in those categories did not change from 2014-15 to 2018-19 in non-PBIS schools (Figure 8).[5] The percentage of students in the proficient/advanced category on the ELA PSSA in 2018-19 did not significantly differ between PBIS and non-PBIS schools (see Table A6

[5] To see patterns for individual grades, see Appendix B, Figures B1-B6.

for statistical output). However, the percentage of students in PBIS schools in the proficient/advanced category on the ELA PSSA in 2014-15 was significantly lower than the percentage of students in the proficient/advanced category at non-PBIS schools, $t(46) = 2.05$, $p = 0.04$, Cohen's $d = 0.55$ (more information is in Table A4). This demonstrates that although PBIS schools started out significantly lower in their percentage of students performing in proficient/advanced on the ELA PSSA in 2014-15, by 2018-19, they caught up with their counterparts, even surpassing them by one percentage point.

Figure 8. 2014-15 to 2018-19 trends in the percentage proficient/advanced on ELA PSSA (Grades 3-8)



Source: Data from Qlik PSSA & Keystone [v2.0.0], pulled February 23, 2021.
How to read this figure: The figure displays the percentage of students who scored in the Proficient/Advanced categories on the ELA PSSA in 2014-15 through 2018-19 on the solid lines for PBIS schools in blue and the dashed lines for non-PBIS schools in green. The dotted linear lines represent the rate of change from 2014-15 to 2018-19.

When examining each PBIS school separately, 22 out of the 24 PBIS schools experienced increases in the percentage of students in the proficient/advanced category on the ELA PSSA between 2014-15 and 2018-19 (Table 12). Overall, PBIS schools demonstrated a statistically significant increase in the percentage of students in the proficient/advanced category on the ELA PSSA from 2014-15 to 2018-19, $t(23) = 4.84$, $p < 0.001$, Cohen's $d = 0.06$. However, non-PBIS schools in the sample did not demonstrate a statistically significant increase in the percentage of students in the proficient/advanced category on the ELA PSSA from 2014-15 to 2018-19, $t(23) = 0.51$, $p = 0.61$, Cohen's $d = 0.08$.

Table 12. 2014-15 to 2018-19 changes in the percentage proficient/advanced on ELA PSSA (Grades 3-8)

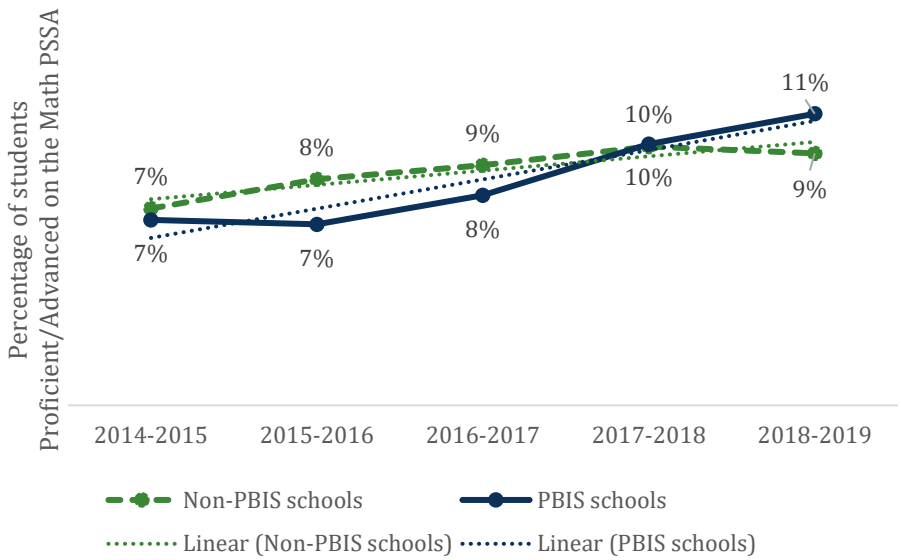
PBIS Schools	Percentage of Students Scoring Proficient/ Advanced in 2014-15	Percentage of Students Scoring Proficient/ Advanced in 2018-19	Percentage point change from 2014-15 to 2018-19
Hartranft, John F. School	14.1%	33.9%	19.8
Arthur, Chester A. School	26.2%	44.4%	18.2
Wright, Richard R. School	14.6%	27.4%	12.8
Taylor, Bayard School	9.5%	20.6%	11.1
Tilden Middle School	8.7%	19.5%	10.8
Roosevelt Elementary	5.3%	14.8%	9.5
Sheridan, Philip H. School	14.3%	23.7%	9.4
Kelley, William D. School	12.6%	20.6%	8
Duckrey, Tanner School	11.6%	18.0%	6.4
Morrison, Andrew J.	17.2%	22.6%	5.4
Richmond School	37.5%	42.8%	5.3
De Burgos, J. Elementary	15.4%	19.8%	4.4
Blaine, James G. School	17.8%	22.0%	4.2
Welsh, John School	18.3%	22.3%	4
Clemente, Roberto Middle	7.7%	10.7%	3
Dick, William School	10.3%	13.2%	2.9
McKinley, William School	24.6%	27.5%	2.9
Marshall, Thurgood	20.5%	23.2%	2.7
Comegys, Benjamin B.	13.0%	15.6%	2.6
Lea, Henry C.	29.0%	29.8%	0.8
Penrose School	26.4%	27.2%	0.8
Meade, Gen. George G.	12.6%	13.2%	0.6
Stearne, Allen M. School	10.5%	8.4%	-2.1
Blankenburg, Rudolph	16.7%	13.4%	-3.3

Source: Data from Qlik PSSA & Keystone [v2.0.0], pulled February 23, 2021.

PBIS schools had greater increases in the percentage of students scoring Proficient or Advanced on the Math PSSA than non-PBIS schools in our sample.

PBIS schools experienced a four-percentage-point increase in the percentage of students scoring in the proficient/advanced categories on the Math PSSA between 2014-15 and 2018-19, whereas non-PBIS schools in our sample experienced a two-percentage-point increase in the percentage of students in the proficient/advanced category (Figure 9).[6]

Figure 9. Trends in the percentage of students scoring proficient/advanced on the Math PSSA (Grades 3-8), 2014-15 to 2018-19



Source: Data from Qlik PSSA & Keystone [v2.0.0], pulled February 23, 2021.
How to read these figures: The figure displays the percentage of students scoring in the Proficient/Advanced categories on the Math PSSA in 2014-15 through 2018-19 on the solid lines for PBIS schools in blue and the dashed lines for non-PBIS schools in green. The dotted linear lines represent the rate of change from 2014-15 to 2018-19.

When examining each PBIS school separately, 19 out of the 24 PBIS schools experienced increases in the percentage of students in the proficient/advanced category on the Math PSSA between 2014-15 and 2018-19 (Table 13). Overall, PBIS schools demonstrated a statistically significant increase in the percentage of students in the proficient/advanced category on the Math PSSA from 2014-15 to 2018-19, $t(23) = 3.72$, $p = 0.001$, Cohen's $d = 0.65$. However, non-PBIS schools had a non-statistically significant, moderate increase in the percentage of students in the proficient/advanced category on the Math PSSA from 2014-15 to 2018-19, $t(23) = 2.02$, $p = 0.055$, Cohen's $d = 0.39$.

[6] To see patterns for individual grades, see Appendix B, Figures B7-B12.

Table 13. 2014-15 to 2018-19 changes in the percentage proficient/advanced on Math PSSA (Grades 3-8)

PBIS Schools	Percentage of Students Scoring Proficient/ Advanced in 2014-15	Percentage of Students Scoring Proficient/ Advanced in 2018-19	Percentage point change from 2014-15 to 2018-19
Arthur, Chester A. School	10.6%	32.4%	21.8
Hartranft, John F. School	4.9%	17.5%	12.6
Wright, Richard R. School	6.4%	16.8%	10.4
Blaine, James G. School	8.2%	14.9%	6.7
Richmond School	20.1%	26.7%	6.6
Sheridan, Philip H. School	11.8%	17.8%	6
Meade, Gen. George G. School	2.9%	8.5%	5.6
Kelley, William D. School	6.1%	11.5%	5.4
Duckrey, Tanner School	4.5%	9.3%	4.8
Taylor, Bayard School	6.6%	11.3%	4.7
Lea, Henry C.	8.7%	12.5%	3.8
Welsh, John School	3.5%	6.9%	3.4
Clemente, Roberto Middle Schl	0.0%	2.5%	2.5
Roosevelt Elementary School	0.3%	2.5%	2.2
Dick, William School	2.1%	3.6%	1.5
Comegys, Benjamin B. School	3.6%	4.7%	1.1
Stearne, Allen M. School	3.4%	4.5%	1.1
De Burgos, J. Elementary	8.3%	8.3%	0
Blankenburg, Rudolph School	3.7%	3.6%	-0.1
Morrison, Andrew J. School	8.5%	7.7%	-0.8
Penrose School	9.8%	8.9%	-0.9
McKinley, William School	13.3%	12.2%	-1.1
Marshall, Thurgood School	10.6%	9.1%	-1.5
Tilden Middle School	9.0%	5.5%	-3.5

Source: Data from Qlik PSSA & Keystone [v2.0.0], pulled February 23, 2021.

Conclusion

This report examined changes in school-wide outcomes from 2014-15 to 2018-19 for schools that first implemented PBIS in 2014-15 and similar non-PBIS schools. These school-wide outcomes included data on attendance, suspensions, violent and serious incidents, sense of belonging and school safety, and ELA and Math PSSA performance. Overall patterns reveal that, in general, PBIS schools did not differ from non-PBIS schools in our sample on 2018-19 school-wide outcomes.

Non-PBIS schools in our sample had slightly higher average percentages of students with 95% or higher attendance, out-of-school suspensions, student Sense of Belonging, School Safety, and the percentage of students performing in the Proficient or Advanced categories on the ELA PSSA than PBIS schools. The difference in ELA PSSA performance was the only statistically significant difference between the PBIS and non-PBIS schools in our sample in 2014-15. In 2018-19, the

school-wide outcomes barely differed between the PBIS and non-PBIS schools in our sample, and when they did differ, PBIS schools often had better outcomes. The PBIS schools in 2018-19 had slightly higher attendance rates, number of serious incidents, School Safety, ELA PSSA performance, and Math PSSA performance than the non-PBIS schools, though none of the differences in our sample were statistically significant.

These non-statistically significant differences may, on one hand, indicate a minimal impact of PBIS on these schools: Perhaps these schools would have had similar school-wide outcome averages in 2018-19 without the PBIS program due to other District initiatives. On the other hand, the lack of statistically significant differences may indicate that the PBIS program helped increase school-wide outcomes in PBIS schools enough for them to be equal to or better than non-PBIS school outcomes. A program like PBIS may require many years of implementation before an effect can be observed – or in this case – a lack of differences between PBIS and non-PBIS schools. Therefore, it is critical to look at longitudinal patterns across many years to recognize the potential impact of school-wide programs like PBIS.

We found that certain school-wide outcomes of PBIS schools had statistically significant changes from 2014-15 to 2018-19, demonstrating the importance of considering long-term data. For example, the percentage of students with 95% or higher attendance, with zero suspensions, scoring Proficient or Advanced on the ELA PSSA, and scoring Proficient or Advanced on the Math PSSA in PBIS schools statistically significantly increased from 2014-15 to 2018-19. While the non-PBIS schools in this sample also had statistically significant increases in the percentage of students with 95% or high attendance and zero suspensions from 2014-15 to 2018-19, the percentage of students performing in Proficient or Advanced on the ELA and Math PSSA did not significantly change from 2014-15 to 2018-19 for non-PBIS schools. This demonstrates that PBIS schools had increases in PSSA performance from 2014-15 to 2018-19 that were not observed in the non-PBIS schools in the sample, and may be indicating the importance of both the PBIS program and of examining longitudinal data to make comparisons between PBIS and non-PBIS schools.

Appendix A: PBIS Schools

Table A1: PBIS schools by Implementation Year

School	Implementation Year	Included in the analysis
Blaine	2013-14	Yes
Blankenburg Elementary	2013-14	Yes
Chester Arthur Elementary	2013-14	Yes
Comegys	2014-15	Yes
DeBurgos	2013-14	Yes
Duckrey Elementary	2013-14	Yes
Hartranft Elementary	2013-14	Yes
Henry C. Lea Elementary	2013-14	Yes
McKinley Elementary	2013-14	Yes
Meade	2014-15	Yes
Morrison	2013-14	Yes
Penrose Elementary	2013-14	Yes
Richmond	2014-15	Yes
Roberto Clemente Promise Academy	2013-14	Yes
Roosevelt Middle	2013-14	Yes
Sheridan	2013-14	Yes
Stearne	2014-15	Yes
T. Marshall	2013-14	Yes
Taylor	2013-14	Yes
Tilden Elementary	2013-14	Yes
Welsh	2013-14	Yes
William D. Kelley	2013-14	Yes
William Dick	2013-14	Yes
Wright	2013-14	Yes
Cayuga	2015-16	No
Mitchell	2015-16	No
Pennell	2015-16	No
Lingelbach	2015-16	No
Key	2015-16	No
McDaniel	2015-16	No
Bryant	2016-17	No
Barry	2016-17	No
Cooke	2016-17	No
Elkin	2016-17	No
Gideon	2016-17	No
Morris	2016-17	No
Locke	2016-17	No
Cassidy	2016-17	No

School	Implementation Year	Included in the analysis
Edmonds	2016-17	No
Franklin Elementary	2016-17	No
Bache Martin	2017-18	No
Crossroads Academy	2017-18	No
Edwin Forreset	2017-18	No
Ethel Allen	2017-18	No
Harding Middle School	2017-18	No
Juniata Park	2017-18	No
Kearny	2017-18	No
Kenderton	2017-18	No
Peirce	2017-18	No
Spruance	2017-18	No
Ziegler	2017-18	No
Bethune	2018-19	No
Decatur	2018-19	No
Hamilton	2018-19	No
Houston	2018-19	No
J.B. Kelly	2018-19	No
Lowell	2018-19	No
Taggart	2018-19	No
Wagner	2018-19	No
Grover Washington	2018-19	No
Webster	2018-19	No

Note: PBIS schools that first implemented in 2014-15 are included in the current analyses, PBIS schools that first implemented after 2014-15 are not included.

Determining matched schools

Although comparing the 5-year outcomes of the 24 PBIS schools against all 99 non-PBIS K-8 SDP schools can be a useful way to understand the effects of PBIS interventions, this can be problematic. Those two sets of schools are not directly comparable because the PBIS schools were explicitly selected in response to the significant climate challenges in those schools. The non-PBIS schools by definition did not have the same climate challenges or school demographic characteristics as the PBIS schools. Therefore, we conducted analyses in which the PBIS schools were matched against schools with as similar as possible characteristics in 2014-15 (matched pairs).

We used propensity score matching to identify 24 comparison schools from the original 99 non-PBIS schools included in the descriptive analyses. This is a mathematical procedure that identifies

an appropriate comparison group, in this case a set of comparison schools that had similar baseline characteristics to the 24 PBIS schools.[7] The 24 comparison schools are in Table 2A.

Covariates

- Percentage of Black/African American and Hispanic/Latinx students
- Percentage of White students
- Percentage of students with Economic Disadvantage status
- Percentage of students with IEPs
- Percentage of English Learners (ELs)
- Number of students enrolled
- Percentage of students performing Below Basic in Math PSSA
- Percentage of students performing Below Basic in ELA PSSA
- Percentage of students with Average Daily Attendance (ADA) of 95% or more
- Percentage of students with zero suspensions
- Violent Incident Rate per 100 students

Table A2. PBIS and comparison schools included in the analyses

PBIS School	Matched Non-PBIS School
Arthur, Chester A. School	Washington, Grover Jr. Middle
Blaine, James G. School	Hunter, William H. School
Blankenburg, Rudolph School	Rhoads, James School
Clemente, Roberto Middle Schl	McMichael, Morton School
Comegys, Benjamin B. School	Feltonville Arts & Sciences
De Burgos, J. Elementary	Cramp, William School
Dick, William School	Sullivan, James J. School
Duckrey, Tanner School	Webster, John H. School
Hartranft, John F. School	Dunbar, Paul L. School
Kelley, William D. School	Wagner, Gen. Louis Middle Sch.
Lea, Henry C.	Disston, Hamilton School
Marshall, Thurgood School	Bethune, Mary McLeod School
McKinley, William School	Steel, Edward School
Meade, Gen. George G. School	Pennypacker, Samuel School

[7] Several matching methods were tried, but 1-to-1 optimal matching produced the most balanced matched sample, increasing the area of common support and also reducing the standardized mean differences between the two groups in the selected covariates. However, the two covariates, % of students Below Basic on ELA PSSA and the violent incident rates, still had the standardized mean difference greater than 2, which is above the recommended threshold for a matched sample. Therefore, in our regression analyses, we control for this imbalance by adding them as covariates in a separate model.

PBIS School	Matched Non-PBIS School
Morrison, Andrew J. School	Morton, Thomas G. School
Penrose School	Meehan, Austin Middle School
Richmond School	Gompers, Samuel School
Roosevelt Elementary School	Potter-Thomas School
Sheridan, Philip H. School	Washington, Martha School
Stearne, Allen M. School	Heston, Edward School
Taylor, Bayard School	Sheppard, Isaac A. School
Tilden Middle School	Munoz-Marin, Hon Luis School
Welsh, John School	Ludlow, James R. School
Wright, Richard R. School	Rhodes Elementary School

Statistical Outputs

Table A3. Demographic Characteristics of PBIS schools and non-PBIS schools in our sample in 2014-15

Demographic characteristics	PBIS schools	Non-PBIS Schools	Significance test
Gender			
Male	52%	53%	$t(46) = 1.04$, $p = 0.31$, Cohen's $d = 0.38$
Female	48%	47%	$t(46) = 1.04$, $p = 0.31$, Cohen's $d = 0.38$
Race/Ethnicity			
Black/African American	59%	65%	$t(46) = 0.67$, $p = 0.51$, Cohen's $d = 0.19$
Hispanic/Latinx	28%	24%	$t(46) = 0.42$, $p = 0.68$, Cohen's $d = 0.13$
Multi-Racial/Other	7%	6%	$t(46) = 1.15$, $p = 0.26$, Cohen's $d = 0.32$
White	5%	3%	$t(46) = 0.59$, $p = 0.56$, Cohen's $d = 0.17$
Asian/Pacific Islander	2%	2%	$t(46) = 0.18$, $p = 0.86$, Cohen's $d = 0.02$
IEP Status			
Students with IEPs	17%	16%	$t(46) = 0.26$, $p = 0.80$, Cohen's $d = 0.18$
Students without IEPs	83%	84%	$t(46) = 0.26$, $p = 0.80$, Cohen's $d = 0.18$
English Learner Status			
English Leaners	7%	6%	$t(46) = 0.34$, $p = 0.74$, Cohen's $d = 0.11$
Non-English Leaners	93%	94%	$t(46) = 0.34$, $p = 0.74$, Cohen's $d = 0.11$

Table A4. School-wide Indicators of PBIS schools and non-PBIS schools in our sample in 2014-15

Indicator	PBIS schools (n = 24)	Non-PBIS Schools (n = 24)	Significance test
Percentage of students with Average Daily Attendance (ADA) of 95% or above	31%	32%	$t(46) = 0.63$, $p = 0.53$, Cohen's $d = 0.15$
Percentage of students with zero suspensions	85%	86%	$t(46) = 0.11$, $p = 0.91$, Cohen's $d = 0.13$
Number of Out-of-School Suspensions (OSS)	837	885	$t(46) = 0.26$, $p = 0.80$, Cohen's $d = 0.07$

Indicator	PBIS schools (n = 24)	Non-PBIS Schools (n = 24)	Significance test
Number of In-School Suspensions (ISS)	24	2	$t(46) = 2.12$, $p = 0.04$, Cohen's $d = 0.60$
Violent Incident Rate	8.2	6.3	$t(46) = 1.34$, $p = 0.19$, Cohen's $d = 0.39$
Number of Serious Incidents	41	34	$t(46) = 1.05$, $p = 0.30$, Cohen's $d = 0.30$
Sense of Belonging Sub-construct on the District-wide Survey	7.18	7.40	$t(46) = 1.31$, $p = 0.19$, Cohen's $d = 0.45$
School Safety Sub-construct on the District-wide Survey	7.58	7.89	$t(46) = 1.39$, $p = 0.18$, Cohen's $d = 0.45$
Percentage of students scoring proficient or advanced on the ELA PSSA (Grades 3-8)	17	21	$t(46) = 2.05$, $p = 0.04$, Cohen's $d = 0.55$
Percentage of students scoring proficient or advanced on the Math PSSA (Grades 3-8)	7	7	$t(46) = 0.35$, $p = 0.73$, Cohen's $d = 0.10$

Table A5. School-wide Indicators of PBIS schools and non-PBIS schools in our sample in 2018-19

Indicator	PBIS schools (n = 24)	Non-PBIS Schools (n = 24)	Significance test
Percentage of students with Average Daily Attendance (ADA) of 95% or above	38%	37%	$t(46) = 0.29$, $p = 0.77$, Cohen's $d = 0.08$
Percentage of students with zero suspensions	93%	93%	$t(46) = 0.38$, $p = 0.70$, Cohen's $d = 0.11$
Number of Out-of-School Suspensions (OSS)	370	380	$t(46) = 0.12$, $p = 0.90$, Cohen's $d = 0.03$
Number of In-School Suspensions (ISS)	94	11	$t(46) = 1.85$, $p = 0.07$, Cohen's $d = 0.53$
Violent Incident Rate	6.5	6.7	$t(46) = 0.12$, $p = 0.90$, Cohen's $d = 0.04$
Number of Serious Incidents	30	33	$t(46) = 0.12$, $p = 0.90$, Cohen's $d = 0.13$
Sense of Belonging Sub-construct on the District-wide Survey	6.23	6.24	$t(46) = 0.12$, $p = 0.91$, Cohen's $d = 0.04$
School Safety Sub-construct on the District-wide Survey	7.08	7.13	$t(46) = 0.32$, $p = 0.75$, Cohen's $d = 0.08$
Percentage of students scoring proficient or advanced on the ELA PSSA (Grades 3-8)	22	21	$t(46) = 0.36$, $p = 0.72$, Cohen's $d = 0.10$
Percentage of students scoring proficient or advanced on the Math PSSA (Grades 3-8)	11	9	$t(46) = 0.75$, $p = 0.46$, Cohen's $d = 0.22$

Appendix B: PSSA results by grade

Figure B1. Four-year trends in the percentage of students scoring proficient/advanced on Grade 3 ELA PSSA

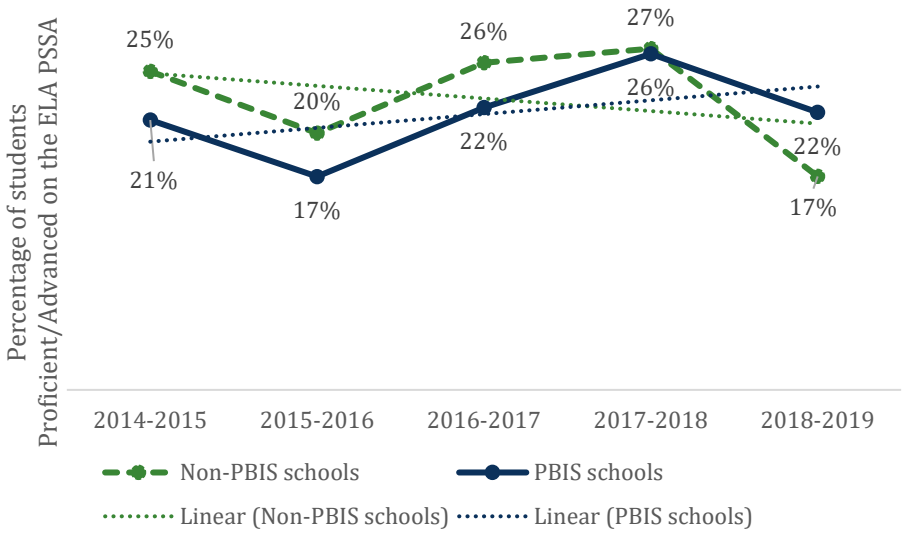


Figure B2. Four-year trends in the percentage of students scoring proficient/advanced on Grade 4 ELA PSSA

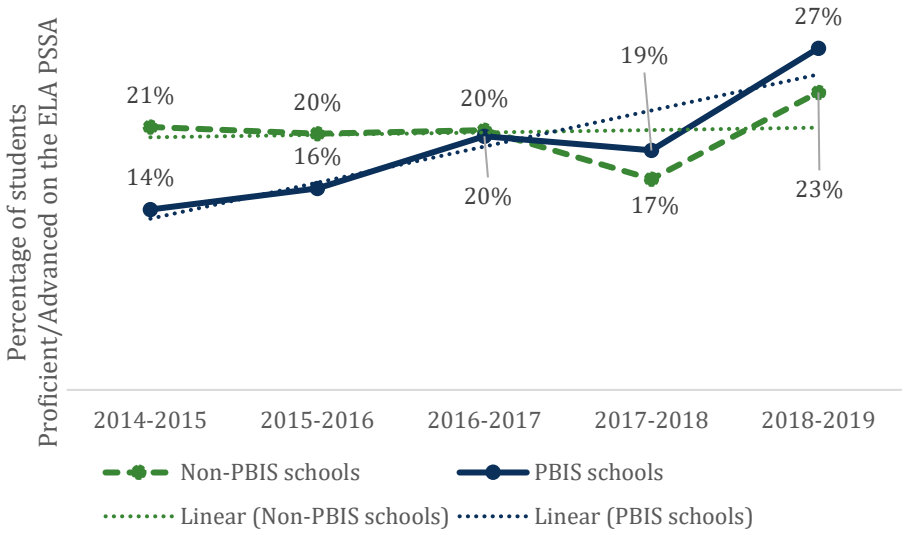


Figure B3. Four-year trends in the percentage of students scoring proficient/advanced on Grade 5 ELA PSSA

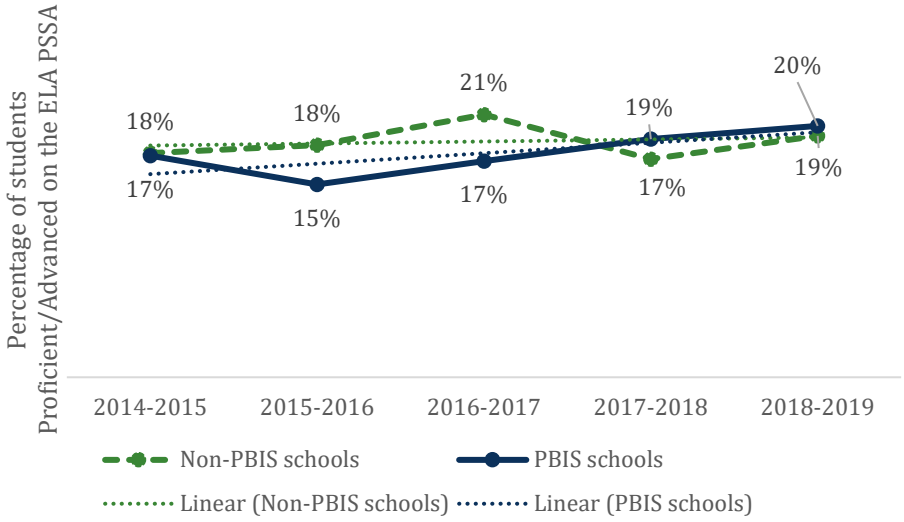


Figure B4. Four-year trends in the percentage of students scoring proficient/advanced on Grade 6 ELA PSSA

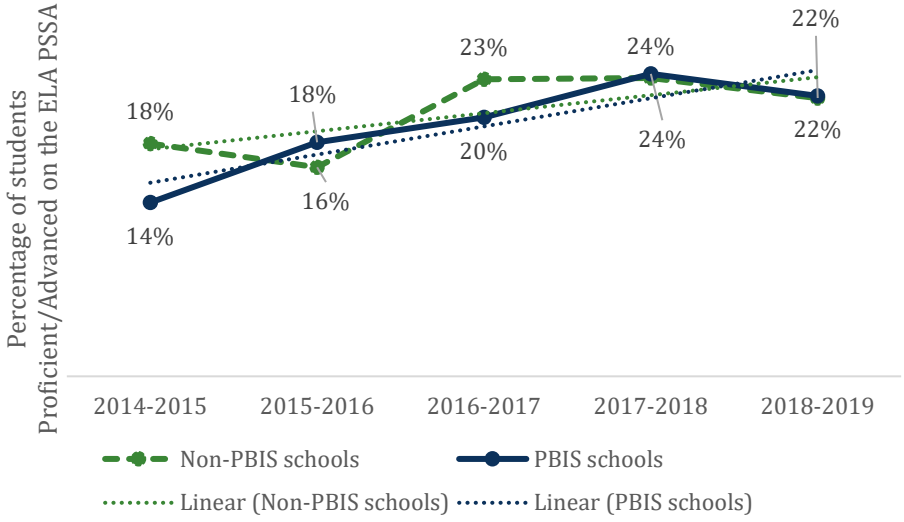


Figure B5. Four-year trends in the percentage of students scoring proficient/advanced on Grade 7 ELA PSSA

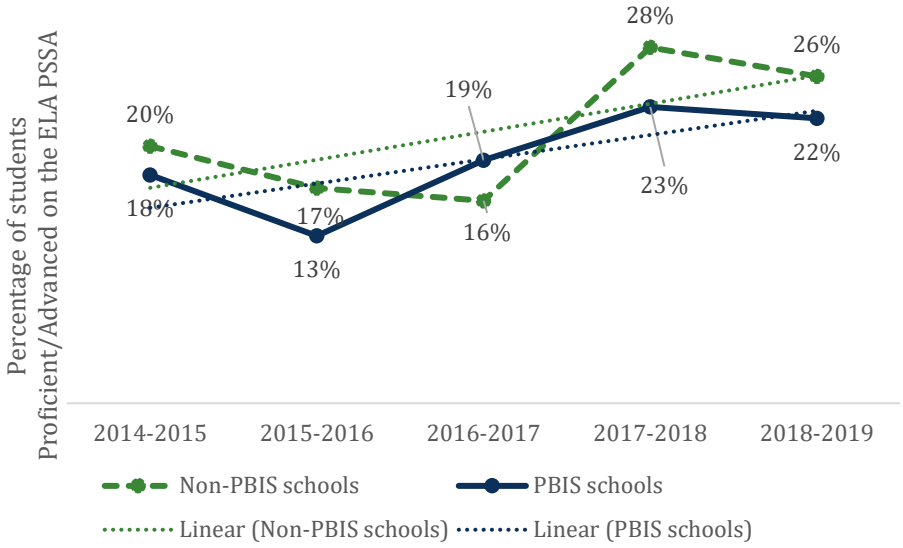


Figure B6. Four-year trends in the percentage of students scoring proficient/advanced on Grade 8 ELA PSSA

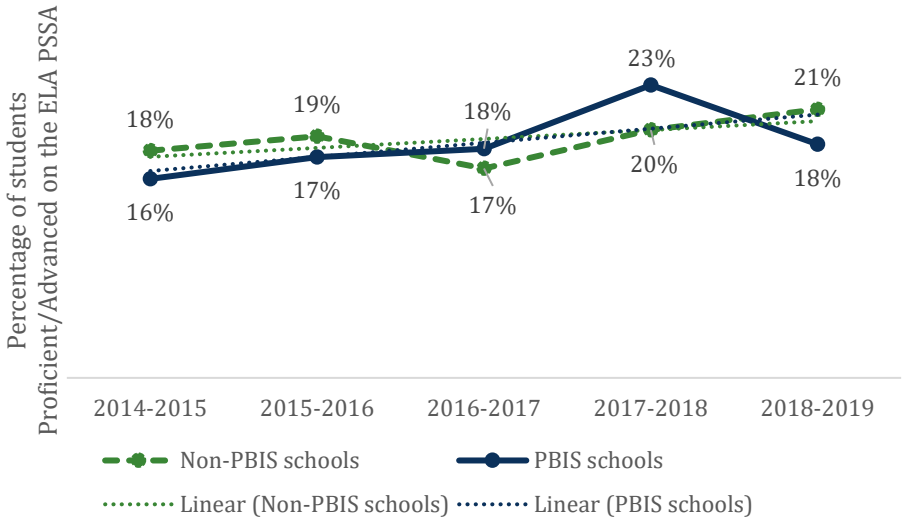


Figure B7. Four-year trends in the percentage of students scoring proficient/advanced on Grade 3 Math PSSA

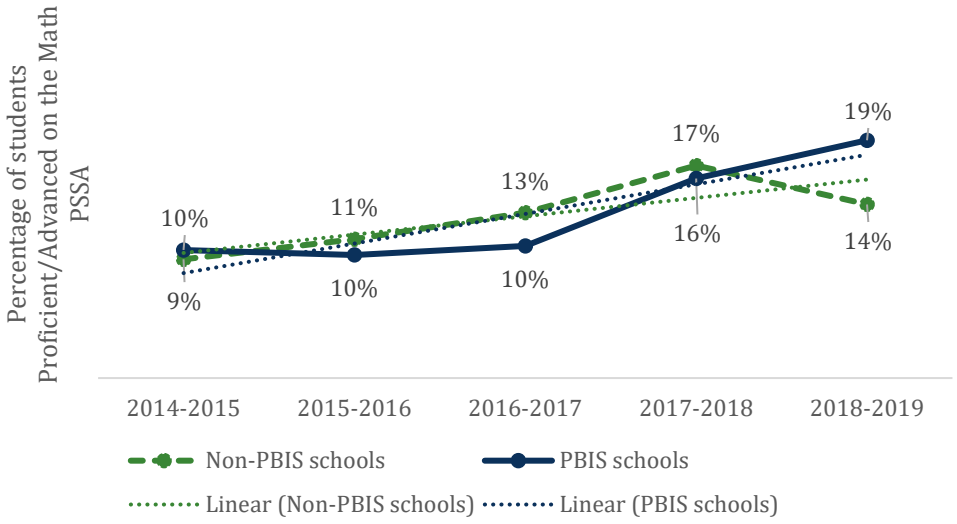


Figure B8. Four-year trends in the percentage of students scoring proficient/advanced on percentage Grade 4 Math PSSA

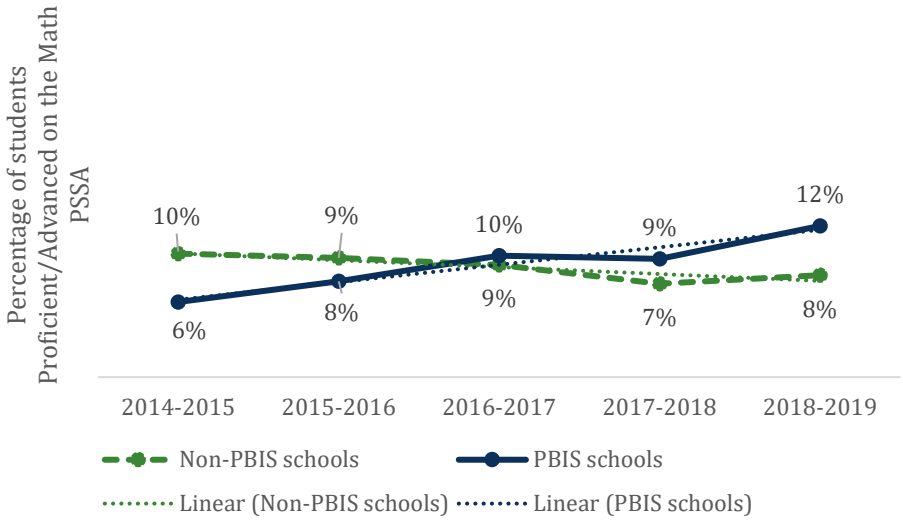


Figure B9. Four-year trends in the percentage of students scoring proficient/advanced on percentage Grade 5 Math PSSA

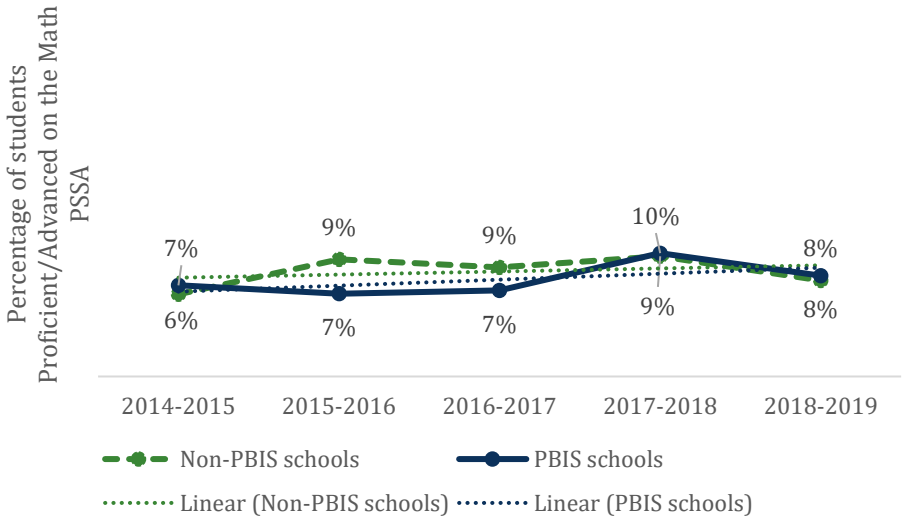


Figure B10. Four-year trends in the percentage of students scoring proficient/advanced on percentage Grade 6 Math PSSA

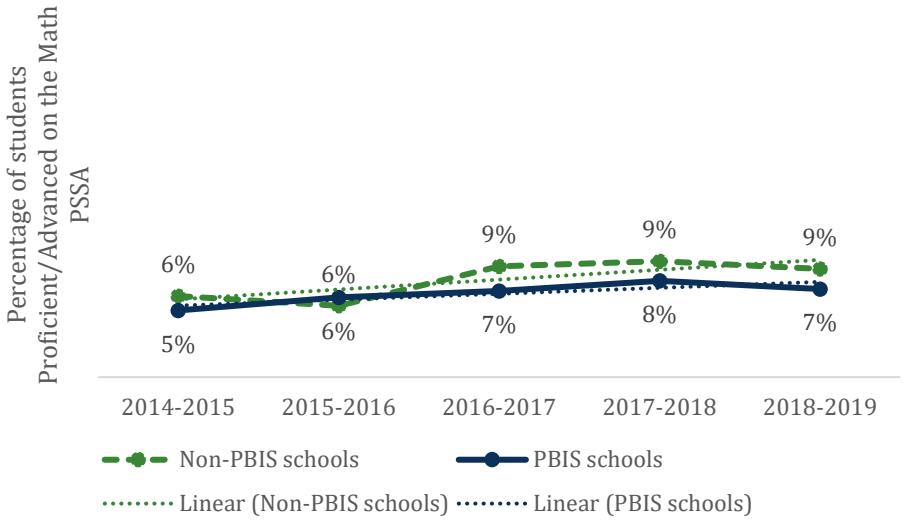


Figure B11. Four-year trends in the percentage of students scoring proficient/advanced on percentage Grade 7 Math PSSA

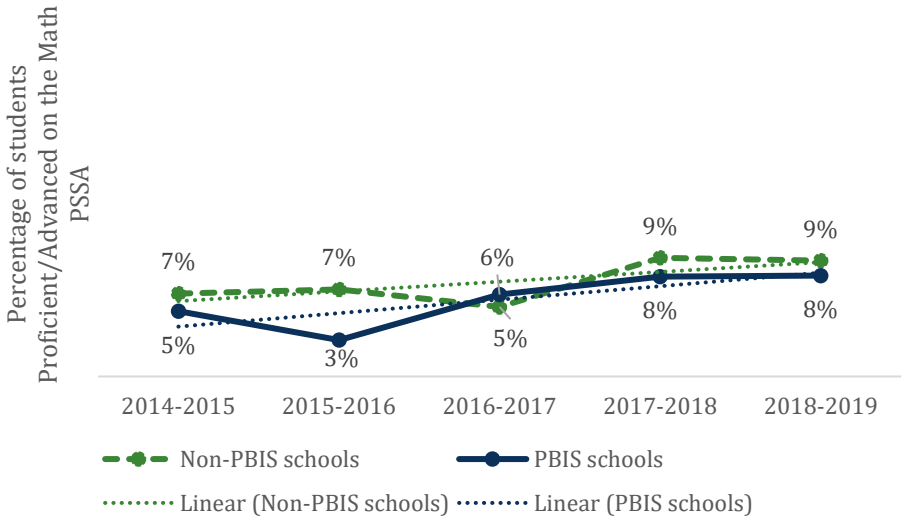
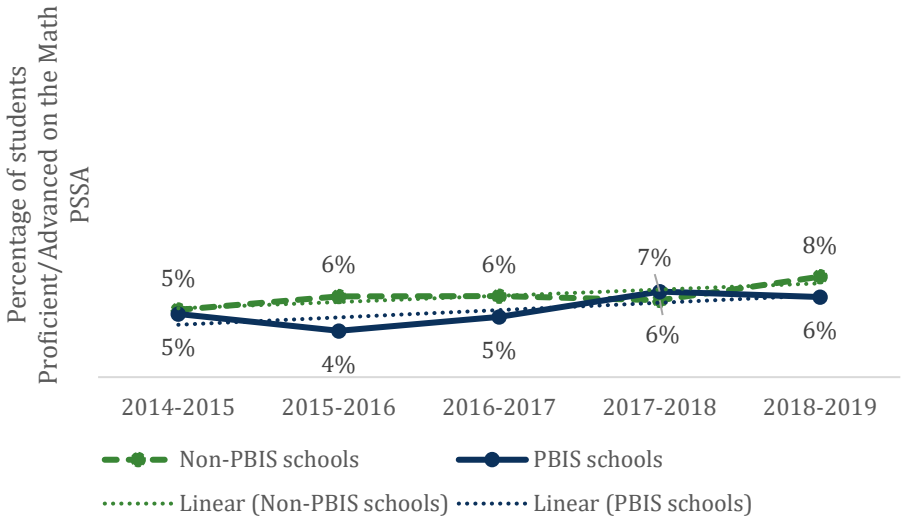


Figure B12. Four-year trends in the percentage of students scoring proficient/advanced on percentage Grade 8 Math PSSA



Appendix C: Statistical Analysis

Statistical analyses were conducted in order to examine if there are statistically significant differences between the PBIS schools and non-PBIS schools in our sample.

Independent Samples t-tests

An Independent Samples *t*-tests compares the average scores or values of two independent groups, when those scores or values are continuous or have an intuitive order to them. For example, the percentage of students whose average daily attendance (ADA) rate is 95% or higher are continuous on a 0-1 scale. An average percentage of 38% is meaningfully higher than an average percentage of 37%. The Independent Samples *t*-test examines whether the difference between the two average scores is significantly different.

A typical output for the Independent Samples *t*-test has this format: *t*(degrees of freedom) = *t*-value, *p* = *p*-value, Cohen's *d* = Cohen's *d*-value, or an example from this report: *t*(46) = 0.29, *p* = 0.77, Cohen's *d* = 0.084.

The first symbol in the output is *t;* this *t* denotes that this is the output of a *t*-test.

The first value in the parentheses immediately following the *t* symbol are the degrees of freedom. The degrees of freedom represent the sample size or number of participants' data included in the analysis, after subtracting the number of parameters needed to conduct the analysis, in this context, it is subtracting the two PBIS groups from the total sample size for Independent Samples *t*-tests. In the current example, the sample size is 48 schools, and therefore the degrees of freedom are 46.

The second value is the *t*-statistic value. The *t*-statistic value describes the size of the difference of the average scores of the two groups after accounting for the variation in the individual scores of all students included in the analysis. The *t*-statistic value in this output is 0.29, and is quite small.

The second symbol is a *p* or the symbol denoting a *p*-value. The *p*-value is the probability that the difference between the two average scores occurred by random chance. General conventions consider that if the *p*-value is greater than 0.05 than the differences between the two average scores occurred by random chance and are not significantly different from each other. Whereas, when *t*-tests produce a *p*-value below 0.05, it is generally considered that the two scores are not due to random chance, but represent statistically significant difference. In this example, the *p*-value is 0.77, and therefore, the two scores are not statistically significantly different from each other.

The third symbol is an effect size estimate. Effect sizes are quantitative measures of the size of the difference between the average scores being compared. The effect size used in the current example is Cohen's *d*. Cohen's *d* effect size indicates the standardized difference between two means and is most appropriate for presenting the effect size of *t*-tests. Cohen's *d*-values of about 0.8 are considered larger effect sizes, values of about 0.5 are considered medium effect sizes, and values of about 0.2 are considered small effect sizes. In the current example, the Cohen's *d*-value is 0.084, which is smaller than the value of the small effect size and indicates that the differences between the average value of the two scores are less than two standard deviations different from each other. Therefore, in the current example, the effect size is extremely small.