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**Final Summary Overview**  
**Interconnecting PBIS and School Mental Health to Improve School Safety: A Randomized Trial**

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**BACKGROUND:**

Although high-profile violent events transpiring in schools in recent years have brought concerns regarding children's safety to the forefront, they do not reflect the nature or extent of interpersonal violence commonly experienced by children at school. Bullying, fighting, and other forms of interpersonal violence occur frequently, even in elementary schools. Being victimized or otherwise exposed to violence is associated with increases in aggression, delinquency, and other behavior problems<sup>1</sup>. Further, the negative consequences of aggressive victimization in elementary school years last into adulthood<sup>2</sup>, highlighting the critical need for evidence-based prevention and early intervention of aggression and other problems that compromise student safety and increase risk of negative outcomes for involved students. There is growing momentum to improve school climate and safety by implementing comprehensive strategies that address the underlying causes of misbehavior, including exposure to violence and other mental health issues, and to replace punitive disciplinary practices with efforts to help students develop prosocial skills and behaviors. Two primary approaches include Positive Behavioral Interventions and Supports (PBIS) and School Mental Health (SMH).

PBIS is a holistic, multi-tiered, evidence-based approach for preventing and reducing aggression and other problem behavior in school through the implementation of universal prevention (Tier 1) for all children, targeted intervention (Tier 2) for children at risk or showing early signs of problems, and intensive interventions (Tier 3) for children and youth with more significant problems<sup>3</sup>. Increases in parent/guardian involvement<sup>4</sup>, decreases in student discipline referrals<sup>5</sup>, decreases in suspension rates<sup>6</sup>, and improvements in student academic performance and quality of life<sup>7</sup> have all been documented, along with benefits to schools and staff such as reduction in staff turnover, improved organizational efficiency and increased perception of teacher efficacy<sup>7</sup>. The critical strength of PBIS is the strong emphasis on implementation support<sup>8,9</sup>, including explicit support for (a) strong communication and collaboration, team functioning and data based decision making, (b) clear, documented roles and responsibilities for all personnel, and (c) selecting, implementing and refining evidence-based practices (EBPs) at each tier. However, despite widespread adoption, in general, intervention effects of PBIS have been modest<sup>10,11</sup>. Two key limitations are that the majority of PBIS schools struggle with intensive interventions at Tier 2 and Tier 3 (critically needed by students presenting

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aggressive/disruptive behaviors)<sup>12</sup> and the emphasis is on behavior with limited attention on issues that can exacerbate  
problem behavior such as depression, anxiety, emotional dysregulation and trauma<sup>11</sup>.

SMH services have been shown to significantly improve access to care and early identification and intervention<sup>13</sup>,  
<sup>14</sup>, and when done well, improve student outcomes<sup>15</sup>, and positively influence school safety<sup>16</sup>. However, SMH commonly  
involves “co-located” clinicians implementing treatment in a manner isolated from other programming in schools  
including PBIS<sup>15, 17</sup>. Under this model of stand-alone SMH, students effectively have to be at crisis level before they are  
referred for services, resulting in more intensive, costly services that are unlikely to achieve valued outcomes<sup>18</sup>. Students  
experiencing distress due to bullying or other types of victimization at school may be overlooked for mental health  
services unless they present acting out behavior problems. Further, staff from mental health centers often operate in  
isolation<sup>19, 20</sup>, and from PBIS teams<sup>21</sup>. Finally, across the board, mental health and school staff are poorly trained and  
supported to implement EBPs<sup>22-25</sup>. Taken together, these challenges lead to ineffective SMH programs that struggle to  
affect valued outcomes<sup>15</sup>.

The Interconnected Systems Framework (ISF) addresses limitations of PBIS and SMH in addressing school safety,  
by providing specific guidance on their systematic interconnection, with a widely distributed monograph<sup>17</sup>. Key  
components of ISF address limitations above and emphasize effective interdisciplinary collaboration, the functioning of  
teams, improving data-based decision making, and improving the selection and implementation of EBPs. The ISF  
capitalizes on PBIS’ strong implementation infrastructure and enhanced in depth services in Tiers 2 and 3 through SMH  
to provide a comprehensive continuum of EBPs. The purpose of the current study was to evaluate the contribution of  
the ISF in improving school safety, school climate, behavioral and discipline problems, and school outcomes in students.  
The study was the first experimental evaluation of the ISF’s contributions to school and student safety and functioning  
above the effects of PBIS alone or PBIS and SMH clinicians operating in normative co-located fashion.

## **METHODS:**

Two large school districts in the Southeastern, United States (U.S.) were recruited for this study, with 12  
elementary schools from each participating. Participating schools were selected by meeting the following criteria: served  
students Kindergarten through fifth grade, implemented PBIS with fidelity the previous school year, and did not have  
SMH presence prior to the study. In each district, four schools were randomly assigned to one of three conditions: PBIS

Final Summary Overview: Interconnecting PBIS and School Mental Health to Improve School Safety only, PBIS+SMH, or ISF. The intervention phase was implemented for two consecutive years, involving two cohorts of students. School-wide assessment of teacher/staff reports of school climate and safety and student records were collected for all students in grades K-5. Student-level analyses focused on students who entered the study at the end of 4th grade, and had post- assessment at the end of 5<sup>th</sup> grade, and follow-up (FU) assessments at the end of 6th grade. Due to the systemic level intervention, which is considered a routine educational practice, all students attending schools receiving an intervention condition received the intervention assigned. The subset of students completing questionnaires were recruited by an opt-out procedure, wherein parents were informed with multiple information letters and automated calls home, providing information on the study and the procedure for opting out of participation (returning post-card to school or contacting district liaison). The opt out rate ranged between 4% and 10% depending on cohort (see below) and school district.

**Participants.** For the 2016-2017 school year, there were 15,649 students (46.5% white) in schools across all three conditions and one combined condition. There were 3,773 students in PBIS only schools (49.3% White), 5,802 students in PBIS+SMH schools (36.2% White), 5,627 students in ISF schools (57.6% White), and one school that changed from PBIS only in year 1 to PBIS+SMH in year 2 (related to the initiative of the principal and against investigator recommendations), with 447 students (15.4% White; in analyses this school is treated as PBIS). There were 4,789 4<sup>th</sup> and 5<sup>th</sup> grade students (49.34% White, 49.84% male). Of teachers/school staff who completed the universal teacher survey for the 2016-2017 school year, 91.32% were female (N=682), and of the 678 who indicated race, 79.02% were White.

For the 2017-2018 school year, there were 14,978 students (48.1% White) across all three conditions and one combined condition. There were 3,613 students in PBIS only schools (49.3% White), 5,842 students in PBIS+SMH schools (40.7% White), 5,072 students in ISF schools (58.6% White), and the one school that added SMH to PBIS in Year 2, with 451 students (17.8% White). There were 4,572 4<sup>th</sup> and 5<sup>th</sup> grade students (48.18% White, 50.26% male). Of teachers/school staff who completed the universal teacher survey for the 2017-2018 school year, 88.45% were female (N=708), and of the 698 who indicated race, 78.26% were White.

In terms of attrition, for Cohort 1, students completing baseline assessment in the Spring, 2016, 17% of the sample did not complete measures in the Spring, 2017 (post assessment), and 22% did not complete measure in the

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Spring, 2018 (follow-up assessment). For Cohort 2, completing baseline assessment in the Spring, 2017, 26% of students did not complete measures in the Spring, 2018, and 22% did not complete measures in the Spring, 2019.

**Measures. Faculty/staff measures.** Teacher perceptions of school climate were assessed using scales from the Authoritative School Climate Survey (ASCS)<sup>26</sup>, including teacher perceptions of fairness, student willingness to seek help, teacher respect for students, student affective engagement, student cognitive engagement, and extent of teasing and bullying<sup>27</sup>. Teacher perceptions of school safety were measured using the Safety scale from the teacher version of the Effective School Battery (ESB)<sup>28</sup>.

*Teacher ratings of selected students.* Teachers completed the Strengths and Difficulties Questionnaire (SDQ)<sup>29</sup> for youth aged 3–17 years, which assessed a range of emotional and behavioral problems (EB) and prosocial behavior. Teachers also completed the Physical Aggression subscale of the New York Teacher Rating Scale (NYTRS<sup>30</sup>), developed for students in 1st - 10th grades for deeper assessment of disruptive behavior disorders. There were two cohorts of students selected, one cohort of students selected prior to ISF implementation (2015-2016) and one cohort selected after ISF implementation (2016-2017).

*Student ratings.* Like the teacher version, the student SDQ assesses EB problems and prosocial behavior<sup>29</sup>. In addition, students evaluated their satisfaction with the most recent mental health services received using the Youth Satisfaction Questionnaire (YSQ)<sup>31</sup>. Student perceptions of school climate were measured using scales from the ASCS<sup>26</sup>, assessing perceptions of fairness and strictness of discipline, supportiveness of teachers, affective engagement, and the extent of bullying and teasing<sup>32, 33</sup>. Students also completed items from the Exposure to Violence Screening Measure (EVSM<sup>34</sup>), reflecting recent exposure to violence (e.g., robbery, assault, shooting).

*School record data.* School records were retrieved on all students in grades K-5 for three years prior to implementation, as well as each year of the study. Variables collected included demographic data, attendance, behavior, educational placement/disability status, and course performance/grades.

*PBIS Team variables.* All PBIS teams (average size of 8 members) for the three conditions were asked to record the following during each team meeting: names/disciplines of participants, meeting duration, and which students received Tier 2 or Tier 3 services and the types of services they received. At the beginning and end of the study

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intervention years, teams completed the Benchmark for Advanced Tiers (BAT)<sup>35</sup> and the Tiered Fidelity Inventory (TFI)<sup>36</sup>  
to measure the quality of team processes and delivery and refinement of EBPs in each tier.

*Fidelity.* In ISF schools, implementation fidelity was evaluated through data collected for each team meeting (as above) and use of the ISF Implementation Inventory (ISF-II)<sup>37</sup> in the fall and spring of intervention years.

## **FINDINGS:**

In this section we report on the two main research aims for the study. As ISF schools serve as the treatment condition, two schools that did not meet treatment fidelity requirements (successful implementation of 80% or more of ISF-II items by year 2) were removed from all analyses, leaving 6 ISF schools, and 8 each in PBIS, and PBIS+SMH conditions. Summarizing findings – following intervention, schools in the ISF condition had: a) broader involvement with school administration, b) more administrators and clinical staff in team meetings, c) more discussion of school-wide issues at team meetings, d) more students proactively referred for Tier 2 (early intervention) or Tier 3 (treatment) services, e) more interventions provided to students, f) a trend of increasing interventions for students of color, g) a reduction in the number and likelihood of in-school suspension (ISS) and office discipline referral (ODR), and h) reductions in out-of-school suspensions and ODR for Black students. We found significant differences between ISF and the comparison conditions on some of the student surveys, including more respect for other students, more student engagement, less externalizing behaviors, fewer students rated as at-risk for behavioral disorders, and higher perceptions of school safety.

Conditions were similar (i.e., no statistical differences) in areas of: a) post-test ratings of behavioral competency by student- or teacher ratings, b) student satisfaction with treatment services, c) student ratings of exposure to school violence/bullying, and teacher reports of student aggression. Findings related to cost-effectiveness ratios (CERs) for the three respective conditions are inconclusive at this point in time.

Results are provided by Aim and Objective, focusing on comparisons of the treatment condition (ISF) to the two other conditions. **Aim 1** (see Appendix A) investigates the relationship between the three treatment conditions on areas of school functioning, such as school discipline ratings, teacher and student perceptions of school safety and climate and reported behavioral functioning of students. Four aims (A1.1 – A1.4) focus on elementary level students and two aims (A1.5 – A1.6) examine follow-up effects at middle school.

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**Objective A1.1** details comparisons of discipline infractions across conditions. Generalized linear mixed effects models provided the likelihood a student received a disciplinary exclusion of in-school suspension (ISS), out-of-school suspension (OSS), and office discipline referral (ODR). The interaction effect for treatment and ISF was statistically significant for ISS ( $OR = 0.40$ ) and ODR ( $OR = 0.80$ ), suggesting a decrease in the likelihood of ISS and ODR in ISF schools. Further, we found that Black students in ISF schools were significantly less likely to receive an OSS ( $OR = 0.57$ ) or an ODR ( $OR = 0.65$ ).

**Objective A1.2** focuses on pre-post comparisons for student reports of school safety, discipline, school climate, and violence exposure. We took three different modeling approaches based on the cohort of students completing the surveys and the years the surveys were completed. First, we estimated a series of difference-in-difference models with the cohort of 4<sup>th</sup> grade students that completed the surveys prior to the intervention beginning. Overall, we found that students in ISF schools rated greater respect for other students after controlling for pre-intervention perceptions and all available covariates. We estimated a series of mixed-effects models that included all students and all years of data, and modeled both differences between ISF and the combined comparison conditions and then comparisons among the three treatment conditions. Overall, we also found that students in ISF schools reported more school engagement and felt safer at school than students in the PBIS only condition.

We also examined teacher reports of school safety, discipline, and school climate. Unlike the student-responses, teachers completed the surveys anonymously, therefore pre-post change could not be evaluated at the teacher-level. Instead, we estimated a series of mixed-effects cross sectional models by year. Across all measures, we found only one difference between teachers in ISF schools and teachers in the two PBIS conditions during the pre-intervention period (2015-2016) school year (i.e., ASCS Respect for Students). After one year of implementation, we found that teachers rated higher on the ASCS Student Engagement in School Subscale ( $d = 1.04$ ) and ASCS Appropriate Discipline Subscale ( $d = 0.71$ ) in ISF schools than teachers in the PBIS and PBIS+SMH conditions.

**Objective A1.3** compares student- and teacher-rated SDQs of behavior functioning of targeted students pre- and post-intervention. We did not find any student-level differences for the first cohort of students after one year of implementation on the SDQ. However, we examined the second cohort of students and estimated treatment effects for two years of implementation. We found fewer students were considered at-risk for behavior disorders in ISF schools



Final Summary Overview: Interconnecting PBIS and School Mental Health to Improve School Safety than students in the comparison conditions based on the SDQ. We then estimated a series of models that leveraged all students and all years of SDQ data and found that students in ISF schools reported fewer externalizing concerns after the first year of implementation.

Teachers completed ratings of randomly selected students using the SDQ for EB problems and ratings of student aggression on the NYTRS. Students were selected in two cohorts, one prior to ISF implementation (Cohort 1) and one after implementation (Cohort 2). Next, we examined overall treatment effects for both cohorts and found that students in Cohort 2 in ISF schools were significantly less likely (OR = 0.32) to be rated as Abnormal on the SDQ. We also found that students in Cohort 2 in ISF schools reported significantly less emotional problems ( $d = -0.59$ ), all students in ISF schools had less prosocial problems during the 2016-2017 school year, and students in Cohort 2 had less Total Emotional and Behavioral Problems ( $d = -0.33$ ).

**Objective A1.4** focuses on effects of treatments on student perceptions of climate/safety (using the ASCS), and personal behavior (using the SDQ) across gender, race/ethnicity, and grade level, with no consistent differences for these groups.

**Objective A1.5** examines differences among treatment conditions on student discipline encounters and suspensions when in middle school, and **Objective A1.6** examines student perceptions of bullying and violence, and behavioral functioning in middle school. We reduce the sample to only those students with middle school data available and re-estimated the mixed-effects models with the student level covariates. Overall, we found no significant differences between students by treatment condition. However, the number of students with middle school follow-up data was limited.

**Aim 2** focuses on the impact of interventions on team functioning, access to interventions for students identified as those who benefiting from intervention (Appendix B), and analysis of CERs (Appendix C).

**Objective A2.1** Examines the functioning of teams for each of the three conditions through in each intervention year, and as above, two ISF schools not meeting fidelity criteria were removed from the analyses. PBIS+SMH schools met more frequently than ISF or PBIS schools. While ISF schools held longer meetings, the amount of time was not significantly different from schools in the other two conditions. The median number of participants also was higher, on average, in ISF schools, suggesting broader involvement of school personnel. The odds of a principal attending these

Final Summary Overview: Interconnecting PBIS and School Mental Health to Improve School Safety meetings was higher in ISF schools (1.4 times higher than PBIS, 1.8 times higher than PBIS+SMH), an important finding given that fidelity is often linked to leadership participation. Psychologist and/or counselor participation was significantly more likely for ISF schools than for the other two conditions. Meetings in ISF schools were more likely to focus on Tier 1 (school wide) topics than in either PBIS or PBIS+SMH schools.

**Objective A2.2** examined students rated by teachers as at-risk for behavioral problems, as well as access to and quality of treatment among experimental conditions. Considering the median number of interventions and median number of students served per school, ISF schools were more consistent in providing more interventions and serving more students for both years of the study. The median number of interventions provided per school was substantially greater (370) in the ISF condition than in either PBIS+SMH (209) or PBIS (200) condition in year 1; the pattern persisted with even more pronounced differences in year 2: 382 for ISF, 169 for PBIS+SMH, and 122 for the PBIS-only condition. The median number of students served by these interventions were 32, 34, 69, for PBIS, PBIS+SMH, and ISF schools respectively, in year 1 and 24, 32, and 59 in year 2. Considering students of color, PBIS+SMH schools served more students in year 1. However, the median number of these students receiving intervention dropped off for both PBIS and PBIS+SMH schools in year 2, while remaining consistent for ISF schools.

**Objective A2.3** is focused on estimating the cost of each intervention condition and comparing intervention costs to desired changes in outcomes (e.g., reduced suspensions) to calculate incremental cost-effectiveness ratios (CERs, see Appendix C). Please note this analysis is preliminary and final CERs may be adjusted. The economic analysis compared the costs PBIS, PBIS+SMH and ISF as compared to costs for PBIS documented by Blonigen et al. (2008)<sup>38</sup>. Cost data were assembled from study financial records and interviews with study investigators. The analysis perspective is that of the school administrators (and, more broadly, state department of education). A total of 22 schools that were already implementing PBIS participated in the study (6 in the ISF arm, 8 in the PBIS + SMH arm, and 8 in the PBIS arm). The primary cost categories included training activities, personnel costs, transportation/travel, and supplies. Personnel costs were the largest category for both the PBIS + SMH and ISF conditions. The cost analysis represents a 12-month period from July 2017 – June 2018. Total costs of ISF were \$325,164 for this period and total costs of adding SMH to PBIS were \$77,677. Blonigen et al. (2008) present two estimates of the annual costs of PBIS (listed here in 2019 dollars) – one representing a new implementation in schools requiring additional personnel costs (average total cost per year based on

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a 10-school district was \$80,144), and the second representing an implementation using existing school staff and resources (average total cost per year based on a 10-school district was \$25,053). Based on the number of students exposed to the intervention in the participating schools, the average annual cost per 100 students was \$1,502 in the PBIS + SMH condition, \$8,643 in the ISF condition, and ranged from \$6,157 - \$19,696 for PBIS-only using estimates from Blonigen et al. (2008).

Three child school discipline outcomes were compared across study conditions and assessed in relation to the costs of implementing the interventions: In-school suspensions (ISS), Out-of-school suspensions (OSS), and Office discipline referrals (ODR). The two main comparisons of costs/outcomes are ISF vs. PBIS-only and ISF vs. PBIS + SMH. The incremental cost per 100 students was \$3,224 in ISF vs. PBIS-only and \$7,879 in ISF vs. PBIS + SMH. Reductions in OSS, ISS, and ODR were highly variable across conditions and follow-up time points.

These cost-outcome comparisons are meant to inform if the additional cost of the most expensive condition, ISF, is a good value based on achieved reductions in child school discipline outcomes. Traditionally, cost effectiveness or cost-benefit analyses compare costs and effects at an individual level. In this comparison, however, both costs and outcomes reflect averages “per 100 students.” At the second follow-up (Post 2) ISF had fewer OSS relative to PBIS-only and fewer ISS than PBIS + SMH. In terms of ODRs, ISF had relatively greater reductions in these events at both Post 1 and Post 2 compared to PBIS and PBIS + SMH. The cost/outcome ratios represent the average cost to achieve reductions in ISS, OSS, and ODR per 100 students, thus lower ratios are considered reflective of a better value. The lowest cost per reductions are seen in ODR at Post 2: \$586 in ISF vs. PBIS-only and \$1,832 in ISF vs. PBIS + SMH. Stated differently, the incremental cost per reduction in ODR events (based on the rate per 100 students) was \$586 in ISF relative to PBIS-only and the incremental cost per reduction in ODR event (rate per 100 students) was \$1,832 for ISF relative to PBIS + SMH.

#### **SUMMARY AND IMPLICATIONS:**

Findings from this first randomized controlled trial on the ISF provide support for positive impacts across multiple realms. Related to our very large and complex database on school records (>30,000 students) these analyses are incomplete, but do include very promising findings. Compared to elementary schools implementing PBIS alone, or co-located PBIS+SMH, ISF schools showed enhanced team functioning, greater involvement with school leaders and mental health professionals, more discussion and action planning on school-wide (tier 1) programs, more students

Final Summary Overview: Interconnecting PBIS and School Mental Health to Improve School Safety proactively referred for Tier 2 and Tier 3 interventions, more interventions provided, and decreased in-school suspensions and office discipline referrals (ODRs). Notably, the reduction in ODRs and for out-of-school suspensions (OSS) was more pronounced for Black students, indicating benefits of the ISF in improving equity in school discipline<sup>39,40</sup>. In addition, student and teacher surveys documented higher respect, engagement, and perceptions of safety among students in ISF schools, and they were also rated as less likely to display acting out behavior or be to at-risk for behavioral disorder. Findings failed to document differences between the three conditions in student satisfaction with Tier 2 and 3 supports, self-reported exposure to violence/bullying, or teacher-reported student aggression. In addition, and likely related to a smaller sample size, we did not document sustained impacts of the ISF on student functioning for a subset of students followed into middle school, and data on cost-effectiveness are inconclusive at this time.

Thus, these findings provide support for impacts of the ISF in providing needed assistance to students at-risk for or presenting EB problems and contending with stressors including unsafe school environments. Deeper analyses (e.g., of the very large school record data base) will help to discern ISF impacts on issues such as preventing/mitigating discipline problems and avoiding juvenile justice involvement<sup>41</sup>.

At the time of this writing, the research team continues to explore this uncommonly large database of student records (>30,000) and corresponding teacher-and student report data, examining research questions beyond those described here. The original ISF monograph<sup>17</sup>, supported by the National Center on PBIS ([www.pbis.org](http://www.pbis.org)) has had a broad influence on education and collaborating mental health systems, with this document downloaded more than 50,000 times. This interest prompted the PBIS Center to commission a second ISF monograph, published in 2019, and focusing on a range of strategies, tools and resources for effective implementation<sup>42</sup>. Further analyses of the database collected for the current study will help to elucidate aspects of the ISF working well (e.g., improving identification and provision of Tier 2/3 intervention for students in need, reducing student discipline, improving perceptions of school safety), and areas in need of increased focus (e.g., on exposure to violence/bullying, involvement in aggressive behavior). These analyses will strengthen the ISF, its policy and practice impacts, and extend connections to more fully include juvenile justice as a collaborator in the enhancement of school systems toward improved school and student functioning.

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**Objective A1.1**

**Sample**

School administrative record data was collected from all 24 participating schools across five consecutive school years, from 2013-14 to 2017-18. The intervention began during the 2016-2017 school year and was supported for two consecutive school years. On average, there were 12,593 students across all schools each year. Demographic distributions by race and gender were consistent across all years for the full sample. The percentage of students identified as receiving special education services increased from almost 7% in 2013-14 to 15% in 2017-18 (see Table 1). Demographics by treatment condition are presented in Table 2. Schools implementing PBIS only were smaller by enrollment, but similar by gender compared to schools in other conditions. Schools in the PBIS+SMH study condition had more Black students compared to schools in other study conditions and fewer Hispanic students than PBIS only schools. ISF schools had the fewest Black students and Hispanic students. ISF schools served more students with disabilities compared to either alternate condition. Overall, the schools were not equivalent by race and special education status.

Table 1.

Full Sample Demographics by Year

Year	Enrollment	White	Black	Hispanic	Boy	SPED
2013-2014	12,264	53.2%	32.2%	8.0%	51.6%	6.7%
2014-2015	12,675	52.9%	32.0%	8.4%	51.5%	12.9%
2015-2016	12,675	52.4%	32.1%	8.4%	51.1%	16.6%
2016-2017	13,278	51.8%	32.5%	8.7%	50.2%	17.2%
2017-2018	12,073	52.0%	32.0%	9.1%	51.5%	15.1%

Table 2.

Demographics by Year and Treatment Condition

Year	Condition	Enrollment	White	Black	Hispanic	Boy	SPED
2013-2014							
	PBIS	3,733	51.8%	30.2%	11.6%	52.0%	5.7%
	PBIS+SMH	4,546	43.2%	41.8%	8.1%	51.0%	6.6%
	ISF	3,718	69.6%	18.9%	4.8%	51.8%	7.2%
	PBIS and PBIS+SMH	267	13.5%	82.8%	0.0%	52.4%	16.5%
2014-2015							
	PBIS	3,711	52.9%	28.8%	12.1%	51.3%	12.6%



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	PBIS+SMH	4,900	42.3%	42.2%	8.4%	51.6%	11.1%
	ISF	3,799	69.4%	18.5%	5.3%	51.4%	15.4%
	PBIS and PBIS+SMH	265	11.3%	83.8%	0.0%	55.5%	14.0%
2015-2016							
	PBIS	3,553	52.0%	28.8%	12.4%	51.1%	16.9%
	PBIS+SMH	5,067	42.6%	41.8%	7.9%	50.4%	14.3%
	ISF	3,802	68.3%	19.1%	5.8%	51.6%	20.0%
	PBIS and PBIS+SMH	253	17.4%	78.7%	0.0%	56.1%	7.9%
2016-2017							
	PBIS	3,645	50.6%	29.1%	13.8%	51.4%	16.8%
	PBIS+SMH	5,417	41.5%	42.8%	7.9%	48.9%	15.3%
	ISF	3,930	69.5%	18.2%	5.7%	50.8%	20.5%
	PBIS and PBIS+SMH	286	18.5%	78.3%	0.0%	49.3%	10.5%
2017-2018							
	PBIS	3,495	50.4%	29.5%	14.0%	52.6%	15.3%
	PBIS+SMH	4,784	41.5%	41.6%	8.8%	50.5%	14.2%
	ISF	3,509	70.6%	17.5%	5.3%	51.7%	16.5%
	PBIS and PBIS+SMH	285	18.6%	79.3%	0.0%	52.6%	9.8%

## Data Analysis

**Treatment effects models.** We developed a series of generalized linear mixed models (GLMM) that leveraged all five years of data and examined the likelihood a student received an in-school suspension (ISS), out of school suspension (OSS), and office disciplinary referral (ODR) from baseline to intervention and then differences by treatment condition. The modeling approach was similar to that used by Gage et al. (2017) to evaluate the average effect of PBIS on academic achievement. We created three-level generalized linear mixed effects models with students nested in schools and school years. All three dependent variables were dichotomous. Each model included a series of student- and school-level covariates. Student-level covariates included grade-level in school (K-6<sup>th</sup>), gender, race, and special education status. School-level covariates included percentage of male students, percentage of White students, percentage of Black students, percentage of Hispanic students, percentage of students receiving special education, the total school enrollment, number of unexcused absences, and total ODR for the suspension models and total OSS for the ODR model. We also included a dummy indicator for state (South Carolina and Florida). We created a dichotomous treatment indicator, with 0 for baseline and 1 for intervention. We then estimated an interaction term with treatment and treatment condition to evaluate differences in treatment effects by treatment condition. We extended the models

Final Summary Overview: Interconnecting PBIS and School Mental Health to Improve School Safety to explore whether or not there was a differential effect for Black students by disciplinary outcome and treatment condition. These models were based on evidence that Black students are disproportionately suspended in and out-of-school (Gage et al. 2019). Last, we replicated the same models, but instead of comparing all three treatment conditions, we compared ISF to the two PBIS conditions.

Next, we used data from the 2015-16 and 2016-17 school years to estimate a difference-in-difference (DiD) estimator. DiD is an econometric approach to estimating treatment effects controlling for initial heterogeneity between the groups. In this study, the three groups were not equivalent on the dependent variables prior to implementation of the interventions, nor were they equivalent when we compare ISF to a combined PBIS and PBIS+SMH condition. The DiD estimator is calculated using a regression model, for disciplinary exclusions we used a logistic regression model with time (i.e., pre- and post-intervention), treatment group, and a time by treatment group interaction, as well as all covariates included in the GLMM models. In addition, we included random effects for students and schools.

### Average Treatment Effect Models for Disciplinary Exclusions

Next, we estimated a series of generalized linear mixed effects models (GLMM) to estimate treatment effects on the likelihood a student received a disciplinary exclusion. The first model examined the treatment effects on ISS (Tables 3). Parameters of interest are the treatment variable and the interaction effects for treatment and treatment conditions. The odds ratio for treatment was statistically significant and indicates that the odds of an ISS significantly decreased after treatment began in all schools. The interaction effect for treatment and ISF was also statistically significant. The odds ratio for the ISF effect on ISS was 0.47, which is approximately a -0.42 standard deviation (*d*) decrease using the conversion suggested by Sánchez-Meca, Marín-Martínez, and Chacón-Moscoso (2003). Next, we examined OSS and again found a significant and negative effect for treatment, suggesting a decrease in likelihood a student received an OSS following implementation, however, there was no difference between treatment conditions. Last, we examined office discipline referrals (ODR). We found a significant treatment effect for ODR, but no significant differences between the three treatment conditions.

Next, we replicated the same models, but compared ISF to a combined PBIS group. The results were clearer when we combined the comparison groups. We again found a significant effect for the treatment and ISF interaction, which suggests that students are significantly less likely to receive an ISS in ISF schools (Table 4). When converted to standardized mean difference, we found an effect size of *d* = -0.505 standard deviation units. For OSS, we found a significant and positive interaction, but the effect size was small (*d* = 0.14) (Table 5). The results for the ODR model were different than the three treatment group models. We found a significant and negative interaction effect, suggesting that students in ISF schools were less likely to receive an ODR than the combined PBIS condition (Table 6). When converted to standardized mean differences, the *d* was -0.123 standard deviation units.

Table 3.

### Mixed Effects Logistic Regression Model for In-School-Suspensions

Predictors	Log(Odds Ratio)	Odds Ratio	Std. Error	z value	p-value
(Intercept)	-2.54	0.08	2.99	-0.85	0.395
treatment	-1.65	0.19	0.96	-1.72	0.085
PBIS+SMH	0.71	2.03	0.63	1.13	0.260
ISF	0.03	1.03	0.76	0.04	0.966
1 <sup>st</sup> Grade	0.26	1.30	0.14	1.82	0.068

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2 <sup>nd</sup> Grade	0.58***	1.79	0.13	4.36	0.000
3 <sup>rd</sup> Grade	1.12***	3.06	0.13	8.92	0.000
4 <sup>th</sup> Grade	1.27***	3.57	0.13	10.11	0.000
5 <sup>th</sup> Grade	1.35***	3.85	0.13	10.77	0.000
6 <sup>th</sup> Grade	2.37***	10.65	0.40	5.85	0.000
Female	-1.15***	0.32	0.07	-16.83	0.000
Asian	-0.72	0.49	0.75	-0.96	0.337
Black	0.94*	2.57	0.47	2.01	0.044
Hispanic	-0.28	0.76	0.48	-0.58	0.563
White	-0.07	0.93	0.47	-0.15	0.879
Other	0.43	1.54	0.48	0.90	0.371
SPED	0.04	1.05	0.08	0.56	0.575
State	-2.46	0.09	1.96	-1.25	0.210
School Enrollment	0.00	1.00	0.00	-1.85	0.064
% Male	37.38*	5.00	15.29	2.45	0.014
% SPED	21.69*	5.00	9.66	2.25	0.025
% Black	19.77	5.00	15.07	1.31	0.190
% Hispanic	36.04*	5.00	16.91	2.13	0.033
% White	23.98	5.00	14.61	1.64	0.101
Unexcused Absences	0.00	1.00	0.00	0.51	0.612
ODR	0.00**	1.00	0.00	2.68	0.007
SWPBIS Fidelity	1.04	2.84	0.76	1.36	0.172
treatment:PBIS+SMH	0.26	1.30	0.16	1.66	0.097
treatment:ISF	-0.75**	0.47	0.26	-2.89	0.004

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 4.

Mixed Effects Logistic Regression Model for In-School Suspensions with Reduced Treatment Indicator

Predictors	Log(Odds Ratio)	Odds Ratio	Std. Error	z value	p-value
(Intercept)	-2.31	0.10	3.03	-0.76	0.447

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Treatment	-1.48	0.23	0.96	-1.55	0.121
ISF	-0.36	0.70	0.69	-0.52	0.601
1 <sup>st</sup> Grade	0.26	1.30	0.14	1.82	0.069
2 <sup>nd</sup> Grade	0.58***	1.79	0.13	4.36	0.000
3 <sup>rd</sup> Grade	1.12***	3.06	0.13	8.92	0.000
4 <sup>th</sup> Grade	1.27***	3.57	0.13	10.11	0.000
5 <sup>th</sup> Grade	1.35***	3.86	0.13	10.79	0.000
6 <sup>th</sup> Grade	2.37***	10.70	0.40	5.88	0.000
Female	-1.15***	0.32	0.07	-16.82	0.000
Asian	-0.73	0.48	0.75	-0.98	0.329
Black	0.94*	2.56	0.47	2.00	0.045
Hispanic	-0.28	0.75	0.48	-0.59	0.556
White	-0.08	0.93	0.47	-0.16	0.870
Other	0.43	1.54	0.48	0.89	0.372
SPED	0.04	1.05	0.08	0.56	0.577
State	-2.23	0.11	1.97	-1.14	0.256
School Enrollment	0.00	1.00	0.00	-1.61	0.107
% Male	33.53*	5.00	14.94	2.24	0.025
% SPED	20.87*	5.00	9.98	2.09	0.037
% Black	14.14	5.00	14.83	0.95	0.340
% Hispanic	28.54	5.00	16.35	1.75	0.081
% White	18.28	5.00	14.34	1.27	0.202
Unexcused Absences	0.00	1.00	0.00	0.16	0.876
ODR	0.00**	1.00	0.00	2.77	0.006
SWPBIS Fidelity	0.80	2.22	0.75	1.06	0.288
Treatment:ISF	-0.92***	0.40	0.24	-3.88	0.000

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 5.

Mixed Effects Logistic Regression Model for Out-of-School Suspensions with Reduced Treatment Indicator

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Predictors	Log(Odds Ratio)	Odds Ratio	Std. Error	z value	p-value
(Intercept)	-6.19***	0.00	1.23	-5.01	0.000
Treatment	-1.21*	0.30	0.55	-2.22	0.027
ISF	0.43	1.54	0.30	1.42	0.155
1 <sup>st</sup> Grade	0.04	1.04	0.07	0.59	0.558
2 <sup>nd</sup> Grade	0.17*	1.18	0.07	2.40	0.016
3 <sup>rd</sup> Grade	0.49***	1.64	0.07	7.42	0.000
4 <sup>th</sup> Grade	0.58***	1.79	0.07	8.68	0.000
5 <sup>th</sup> Grade	0.78***	2.18	0.07	11.78	0.000
6 <sup>th</sup> Grade	1.03***	2.80	0.29	3.55	0.000
Female	-1.27***	0.28	0.04	-30.07	0.000
Asian	-1.10*	0.33	0.45	-2.43	0.015
Black	0.86	2.37	0.27	3.15	0.002
Hispanic	-0.34	0.71	0.28	-1.22	0.224
White	-0.21	0.81	0.27	-0.75	0.452
Other	0.22	1.24	0.28	0.77	0.441
SPED	0.53***	1.70	0.05	11.71	0.000
State	1.70*	5.45	0.74	2.28	0.023
School Enrollment	0.00	1.00	0.00	-0.06	0.956
% Male	-8.13	0.00	5.29	-1.54	0.124
% SPED	-3.41	0.03	4.37	-0.78	0.435
% Black	15.89**	5.00	6.06	2.62	0.009
% Hispanic	16.17*	5.00	6.98	2.32	0.021
% White	15.17*	5.00	5.96	2.55	0.011
Unexcused Absences	0.00	1.00	0.00	1.06	0.288
ODR	0.00*	1.00	0.00	2.41	0.016
SWPBIS Fidelity	0.43	1.54	0.31	1.40	0.160
Treatment:ISF	0.25**	1.29	0.09	2.74	0.006

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

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Table 6.

Mixed Effects Logistic Regression Model for Office Discipline Referrals with Reduced Treatment Indicator

Predictors	Log(Odds Ratio)	Odds Ratio	Std. Error	z value	p-value
(Intercept)	-1.71*	0.18	0.71	-2.40	0.016
Treatment	-0.16**	0.85	0.06	-2.66	0.008
ISF	0.05	1.05	0.19	0.28	0.780
1 <sup>st</sup> Grade	0.18***	1.19	0.04	4.43	0.000
2 <sup>nd</sup> Grade	0.28***	1.32	0.04	7.07	0.000
3 <sup>rd</sup> Grade	0.57***	1.77	0.04	14.96	0.000
4 <sup>th</sup> Grade	0.64***	1.89	0.04	16.58	0.000
5 <sup>th</sup> Grade	0.78***	2.19	0.04	20.37	0.000
6 <sup>th</sup> Grade	1.04***	2.83	0.13	7.79	0.000
Female	-0.87***	0.42	0.02	-39.76	0.000
Asian	-1.01***	0.37	0.22	-4.66	0.000
Black	0.73***	2.07	0.15	4.88	0.000
Hispanic	-0.31*	0.73	0.15	-2.05	0.041
White	-0.16	0.85	0.15	-1.07	0.283
Other	0.13	1.14	0.15	0.86	0.389
SPED	0.31***	1.36	0.03	10.72	0.000
State	-0.04	0.96	0.45	-0.09	0.931
School Enrollment	0.00	1.00	0.00	-1.35	0.178
% Male	0.35	1.42	3.21	0.11	0.914
% SPED	-3.25	0.04	2.70	-1.21	0.228
% Black	2.07	7.91	3.57	0.58	0.563
% Hispanic	3.79	5.00	4.23	0.90	0.371
% White	3.22	5.00	3.54	0.91	0.362
Unexcused Absences	0.00	1.00	0.00	-0.29	0.771
ODR	0.00***	1.00	0.00	4.13	0.000

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SWPBIS Fidelity	0.18	1.20	0.19	0.97	0.330
Treatment:ISF	-0.23***	0.80	0.05	-4.60	0.000

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Difference-in-Difference Models for Disciplinary Exclusions**

We estimated a series of difference-in-difference models to account for the lack of baseline equivalence by treatment condition for ISS, OSS, and ODR and estimate pre-post treatment effects. As noted, we included all student and school covariates, state ID, and random effects for student and school IDs. The results for the three models are presented in Table 7 (we do not report all covariates for clarity of presentation). We found statistically significant negative effects for the DiD estimator for ISS and ODR. The results suggest that, controlling for pre-intervention and all covariates, students were less likely to receive an ISS and an ODR in ISF schools. The effects sizes, when converted to standardized mean difference, were -0.611 and -0.189 standard deviation units respectively.

Table 7.

Difference-in-Difference Models for the Disciplinary Exclusions

Outcome	Predictor	log(OR)	OR	Std. Error	p-value
ISS					
	(Intercept)	-10.31**	0.00	3.84	0.007
	ISF	-0.26	0.77	0.74	0.728
	time	-0.21*	0.81	0.09	0.017
	did	-1.11***	0.33	0.31	0.000
OSS					
	(Intercept)	-7.55***	0.00	1.21	0.000
	ISF	0.08	1.09	0.26	0.749
	time	-0.35***	0.71	0.07	0.000
	did	0.55***	1.73	0.13	0.000
ODR					
	(Intercept)	-2.78**	0.06	0.85	0.001
	ISF	0.01	1.01	0.21	0.948
	time	-0.17***	0.84	0.04	0.000
	did	-0.34***	0.71	0.08	0.000

Note. Pre is data from the 2015-2016 school year and post is data for the 2016-2017 school year.

**Exploratory Models for Differential Impacts on Black Students**

We explored whether or not there was a differential effect for Black students. Given the evidence of disproportionate discipline presented above, evidence of reductions specifically for Black students provide evidence that the models are potentially addressing disproportionate disciplinary exclusions. For ease of comparison, we report only

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the ISF and combined comparison group results. The model results for ISS, OSS, and ODR are presented in Tables 8-10. Results for ISS indicate that Black students were significantly more likely to receive an ISS, that Black students were more likely overall to receive ISS after implementation than White students, but no difference was found after implementation began between treatment conditions when comparing Black and White students. The results for OSS were different. Overall, we found that Black students are significantly less likely to receive an OSS in an ISF school. When converted to standardized mean difference, we found an effect size of -0.310 standard deviation units. We also found a significant, negative effect for the three-way interaction for ODR, which suggests that Black students were less likely than White students to receive an ODR in ISF schools after implementation began. When converted, we found an effect size of -0.238 standard deviation units.

Table 8.

Mixed Effects Logistic Regression Model for In-School Suspensions for Black Students in Treatment Schools

Predictors	Log(Odds Ratio)	Odds Ratio	Std. Error	z value	p-value
(Intercept)	-2.40	0.09	3.00	-0.80	0.424
Treatment	-1.65	0.19	0.96	-1.72	0.086
ISF	-0.47	0.63	0.69	-0.67	0.502
Black	0.90***	2.46	0.09	10.43	0.000
1 <sup>st</sup> Grade	0.26	1.30	0.14	1.85	0.064
2 <sup>nd</sup> Grade	0.58***	1.79	0.13	4.34	0.000
3 <sup>rd</sup> Grade	1.11***	3.03	0.13	8.84	0.000
4 <sup>th</sup> Grade	1.27***	3.56	0.13	10.08	0.000
5 <sup>th</sup> Grade	1.34***	3.83	0.13	10.74	0.000
6 <sup>th</sup> Grade	2.42***	11.26	0.40	5.98	0.000
Female	-1.15***	0.32	0.07	-16.80	0.000
SPED	0.04	1.04	0.08	0.50	0.615
State	-2.18	0.11	1.97	-1.11	0.269
School Enrollment	0.00	1.00	0.00	-1.59	0.112
% Male	33.56*	5.00	14.94	2.25	0.025
% SPED	20.67*	5.00	9.97	2.07	0.038
% Black	14.38	5.00	14.81	0.97	0.332
% Hispanic	28.50	5.00	16.32	1.75	0.081
% White	18.45	5.00	14.33	1.29	0.198
Unexcused Absences	0.00	1.00	0.00	0.15	0.878
ODR	0.00**	1.00	0.00	2.76	0.006



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SWPBIS Fidelity	0.79	2.20	0.75	1.05	0.292
Treatment:ISF	-0.53	0.59	0.30	-1.73	0.084
Treatment:Black	0.31*	1.36	0.15	2.08	0.038
ISF:Black	0.25	1.28	0.20	1.27	0.205
Treatment:ISF:Black	-0.88	0.42	0.49	-1.78	0.075

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 9.

Mixed Effects Logistic Regression Model for Out-of-School Suspensions for Black Students in Treatment Schools

Predictors	Log(Odds Ratio)	Odds Ratio	Std. Error	z value	p-value
(Intercept)	-6.42***	0.00	1.20	-5.36	0.000
treatment	-1.20*	0.30	0.55	-2.19	0.029
ISF	0.36	1.43	0.30	1.19	0.234
Black	1.04***	2.83	0.06	18.76	0.000
1 <sup>st</sup> Grade	0.04	1.04	0.07	0.59	0.557
2 <sup>nd</sup> Grade	0.16*	1.18	0.07	2.34	0.019
3 <sup>rd</sup> Grade	0.49***	1.63	0.07	7.33	0.000
4 <sup>th</sup> Grade	0.58***	1.78	0.07	8.61	0.000
5 <sup>th</sup> Grade	0.77***	2.16	0.07	11.70	0.000
6 <sup>th</sup> Grade	1.02***	2.76	0.29	3.51	0.000
Female	-1.27***	0.28	0.04	-30.07	0.000
SPED	0.52***	1.68	0.05	11.55	0.000
State	1.73*	5.63	0.74	2.34	0.019
School Enrollment	0.00	1.00	0.00	-0.05	0.960
% Male	-8.30	0.00	5.24	-1.58	0.114
% SPED	-3.55	0.03	4.33	-0.82	0.412
% Black	15.81**	5.00	6.01	2.63	0.009
% Hispanic	15.93*	5.00	6.91	2.30	0.021
% White	15.06*	5.00	5.90	2.55	0.011

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Unexcused Absences	0.00	1.00	0.00	1.08	0.281
ODR	0.00*	1.00	0.00	2.44	0.015
SWPBIS Fidelity	0.43	1.54	0.31	1.42	0.155
Treatment:ISF	0.39**	1.48	0.12	3.41	0.001
Treatment:Black	-0.02	0.98	0.10	-0.21	0.831
ISF:Black	0.23*	1.26	0.12	2.01	0.044
Treatment:ISF:Black	-0.57**	0.57	0.21	-2.72	0.007

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 10.

Mixed Effects Logistic Regression Model for Office Discipline Referrals for Black Students in Treatment Schools

Predictors	Log(Odds Ratio)	Odds Ratio	Std. Error	z value	p-value
(Intercept)	-1.92	0.15	1.41	-1.36	0.173
treatment	-0.21**	0.81	0.07	-3.24	0.001
ISF	-0.03	0.98	0.28	-0.09	0.928
Black	0.82***	2.26	0.03	23.80	0.000
1 <sup>st</sup> Grade	0.18***	1.19	0.04	4.41	0.000
2 <sup>nd</sup> Grade	0.28***	1.32	0.04	7.00	0.000
3 <sup>rd</sup> Grade	0.56***	1.76	0.04	14.83	0.000
4 <sup>th</sup> Grade	0.63***	1.88	0.04	16.44	0.000
5 <sup>th</sup> Grade	0.78***	2.17	0.04	20.25	0.000
6 <sup>th</sup> Grade	1.05***	2.86	0.13	7.85	0.000
Female	-0.87***	0.42	0.02	-39.74	0.000
SPED	0.31***	1.36	0.03	10.56	0.000
State	0.02	1.02	0.93	0.02	0.985
School Enrollment	0.00	1.00	0.00	-1.23	0.220
% Male	0.19	1.21	2.06	0.09	0.926
% SPED	-3.50	0.03	7.80	-0.45	0.654
% Black	2.30	9.97	1.79	1.28	0.200

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% Hispanic	3.75	5.00	3.97	0.95	0.344
% White	3.40	5.00	2.19	1.55	0.121
Unexcused Absences	0.00	1.00	0.00	-0.30	0.763
ODR	0.00**	1.00	0.00	2.88	0.004
SWPBIS Fidelity	0.18	1.20	0.23	0.78	0.433
Treatment:ISF	-0.10	0.91	0.06	-1.64	0.100
Treatment:Black	0.10*	1.11	0.05	2.05	0.041
ISF:Black	0.28***	1.33	0.07	3.98	0.000
Treatment:ISF:Black	-0.44***	0.65	0.11	-3.86	0.000

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

### Objective A1.2 to A1.4

#### Sample

Student survey data was collected from two cohorts of students starting in 4<sup>th</sup> grade. The first cohort of students completed the surveys starting in the 2015-2016 school year, prior to the beginning of the data collection. The second cohort completed the surveys starting in 2016-2017, after intervention began. Student survey responses were collected from students in all 24 schools. However, two of the ISF schools did not implement with fidelity and were removed for all analyses. One school began as a PBIS only school, but then added a mental health professional during the second year of implementation. This school was treated as a PBIS only school for all analyses. Cohort 1 began with 1,571 students in 2015-2016. Cohort 2 began with 1,620 students in 2016-2017. Table 11 provides sample sizes by year, cohort and treatment condition. Students retained a grade were invited to participate again. A one-year follow up data collection was completed for students who left a participating elementary school to go to a middle school in the participating district, but these data are not included in these analyses.

Table 11.

#### Sample Sizes by Year, Cohort, and Treatment Condition

		Cohort 1			Cohort 2		
Year	PBIS	PBIS+SMH	ISF	PBIS	PBIS+SMH	ISF	
1516	493	631	445	0	0	0	
1617	415	573	389	468	635	516	
1718	88	0	0	395	460	449	
1819	35	0	1	0	1	39	

### Data Analysis

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**Cohort Treatment Effect Models.** First, we used data from the 2015-16 and the 2016-17 school years to estimate a difference-in-difference (DiD) estimator for Cohort 1. Cohort 1 was the only cohort that had pre-treatment data. DiD is an econometric approach to estimating treatment effects controlling for initial heterogeneity between the groups. In this study, the three groups were equivalent on the dependent variables prior to implementation of the interventions, but were not equivalent by student demographics by condition. The DiD estimator is calculated using a regression model, for disciplinary exclusions we used a logistic regression model and a linear model for attendance, with time (i.e., pre- and post-intervention), treatment group, and a time by treatment group interaction, as well as all covariates included in the school records models. In addition, we included random effects for students and schools. For Cohort 2, we estimated treatment effects between conditions for the 2016-2017 and 2017-2018 school years. We included all of the student- and school-level covariates and a random effect for school.

**Overall Treatment effect models.** We developed a series of linear mixed models that leveraged all four years of data and examined differences by treatment condition across time. We created three-level generalized linear mixed effects models with students nested in schools and school years. All three dependent variables were dichotomous. Each model included the same student- and school-level covariates as all other models. We estimated an interaction term with time and treatment condition to evaluate differences in treatment effects by treatment condition and year. We then replicated the same models, but instead of comparing all three treatment conditions, we compared ISF to the two PBIS conditions.

## Results

### Difference-in-Difference Models for Cohort 1

We estimated 15 difference-in-difference models with mixed-effects for Cohort 1. Overall, we found that students in schools implementing ISF had significantly greater Respect for Students as measured by the ASCS (Table 12). All other DiD estimators were not statistically significant. It is worth noting that all DiD values were in the therapeutic direction.

### Mixed-Effects Models Exploring Effects for Cohort 2

We estimated 15 mixed-effects models to identify treatment effects for Cohort 2 overall and differences by school year. We identified a statistically significant effect for the likelihood a student was rated as Borderline or Abnormal on the SDQ. The model was a GLMM, therefore, the coefficient was converted to odds ratio (see Table 13). The odds ratio for students in ISF schools rated as Borderline or Abnormal was  $OR = 0.57$  ( $p < .05$ ). We also found a significant difference between treatment conditions on Perceptions of School Safety (See Table 14). Students in ISF schools reported feeling safer in school than students in the other treatment conditions ( $d = 0.18$ ).

### Overall Treatment Effects

We estimated 15 mixed effects models comparing all three conditions and 15 mixed-effects models comparing ISF to a combined comparison group. First, we found a significant treatment effect for ISF on the SDQ Externalizing measure during the 2016-2017 school year (see Table 15). The significant interaction effect suggests that students in ISF schools reported significantly fewer externalizing concerns during the first year of ISF implementation ( $d = -0.17$ ). The significant effect remained when we estimated the combined comparison group. Next, we found a significant overall treatment effect for ISF compared to PBIS on the School Engagement subscale (Table 16). Students in ISF schools were 0.44 standard deviations more engaged in school than students in PBIS schools when accounting for all years of data and cohorts. There was no effect when the comparison conditions were combined, suggesting that the difference was only between the ISF and PBIS conditions. We again found a significant effect of Perceptions of School Safety, this time when comparing the three treatment conditions (see Table 17). The effect was overall across all years and cohorts. The result suggests that students in ISF schools reported 0.32 standard deviations more perception of safety than students in PBIS schools. The effect was no longer significant when we combined the treatment conditions.

Table 12.

Cohort 1 Difference-in-Difference Models: ASCS

	Respect For Students		
	Estimate	Std. Error	p-value
(Intercept)	14.93	0.85	0.000
ISF	-1.02	0.55	0.073
Time	-0.79	0.11	0.000
<b>Did</b>	<b>0.52*</b>	<b>0.20</b>	<b>0.012</b>
Female	0.16	0.09	0.080
Asian	0.51	0.64	0.429
Black	-0.15	0.51	0.766
Hispanic	0.31	0.53	0.564
White	-0.02	0.50	0.973
Other	-0.17	0.54	0.747
SPED	-0.14	0.13	0.288
State	-1.09	1.22	0.392
School Enrollment	0.00	0.00	0.728
% Male	3.68	2.21	0.121
% SPED	3.64	5.83	0.544
% Black	-0.22	5.65	0.970
% Hispanic	2.59	8.07	0.755
% White	2.07	5.82	0.730
Unexcused Absences	0.00	0.00	0.504
ODRs	0.00	0.00	0.595
Fidelity	0.09	0.41	0.841

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

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Table 13.

Cohort 2 Mixed-Effects Models: SDQ

	SDQ Borderline and Abnormal		
	Estimate	Std. Error	p-value
(Intercept)	-0.43	1.06	0.683
ISF	<b>-0.57*</b>	<b>0.27</b>	<b>0.037</b>
2017-2018	-12.36	533.15	0.982
5th Grade	12.19	533.15	0.982
Female	-0.26	0.12	0.028
Asian	-1.39	1.31	0.287
Black	0.25	1.01	0.808
Hispanic	-0.05	1.03	0.959
White	-0.10	1.01	0.920
Other	0.26	1.05	0.806
SPED	0.35	0.15	0.017
State	-0.59	0.62	0.342
School Enrollment	0.00	0.00	0.239
% Male	-0.45	1.34	0.734
% SPED	5.52	3.00	0.066
% Black	-0.10	2.70	0.972
% Hispanic	-0.08	3.90	0.984
% White	0.00	2.73	1.000
Unexcused Absences	0.00	0.00	0.394
ODRs	0.00	0.00	0.040
Fidelity	-0.17	0.20	0.378
ISF:2017-2018	0.35	0.21	0.090

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 14.

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 Cohort 2 Mixed-Effects Models: SS

	SS Safety Perception		
	Estimate	Std. Error	p-value
(Intercept)	2.14	0.29	0.000
ISF	<b>0.13*</b>	<b>0.07</b>	<b>0.049</b>
2017-2018	0.15	0.69	0.824
5th Grade	-0.09	0.69	0.898
Female	-0.14	0.03	0.000
Asian	0.00	0.31	0.996
Black	-0.02	0.28	0.929
Hispanic	-0.10	0.28	0.735
White	-0.02	0.28	0.933
Other	-0.07	0.29	0.796
SPED	-0.09	0.04	0.022
State	0.35	0.16	0.026
School Enrollment	0.00	0.00	0.057
% Male	-0.37	0.34	0.278
% SPED	-1.81	0.75	0.016
% Black	1.13	0.70	0.110
% Hispanic	0.46	1.01	0.648
% White	1.08	0.71	0.127
Unexcused Absences	0.00	0.00	0.181
ODRs	0.00	0.00	0.116
Fidelity	0.07	0.05	0.198
ISF:2017-2018	-0.01	0.04	0.857

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 15.

Overall Treatment Mixed-Effects Models By Treatment Condition: SDQ

	SDQ Externalizing
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	Estimate	Std. Error	p-value
(Intercept)	7.23	1.02	0.998
2016-2017	-1.51	2.66	0.990
2017-2018	-3.02	5.31	0.914
2018-2019	-4.08	5.36	0.898
PBIS+SMH	-0.48	0.43	0.268
ISF	-0.21	0.56	0.705
Cohort	1.60	2.65	0.547
5th Grade	1.64	2.65	0.536
6th Grade	3.60	5.32	0.499
Female	-1.15	0.10	0.000
Asian	-1.65	0.77	0.031
Black	0.52	0.63	0.408
Hispanic	-0.26	0.65	0.693
White	-0.19	0.63	0.759
Other	0.38	0.67	0.568
SPED	0.27	0.13	0.041
State	-0.74	1.26	0.568
School Enrollment	0.00	0.00	0.435
% Male	-1.51	1.78	0.408
% SPED	7.13	5.79	0.238
% Black	0.44	4.11	0.917
% Hispanic	1.47	6.52	0.826
% White	0.83	4.31	0.852
Unexcused Absences	0.00	0.00	0.569
ODRs	0.00	0.00	0.214
Fidelity	0.05	0.35	0.882
2016-2017: PBIS+SMH	-0.06	0.28	0.841
2017-2018: PBIS+SMH	-0.09	0.34	0.804



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2018-2019: PBIS+SMH	3.69	4.63	0.425
2016-2017: ISF	<b>-0.65*</b>	<b>0.30</b>	<b>0.032</b>
2017-2018: ISF	-0.56	0.35	0.117
2018-2019: ISF	-0.34	2.78	0.903

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 16.

Overall Treatment Mixed-Effects Models by Treatment Condition: ASCS

	Student Engagement		
	Estimate	Std. Error	p-value
(Intercept)	17.38	1.09	0.991
2016-2017	-3.56	2.21	0.979
2017-2018	-7.53	4.41	0.804
2018-2019	-8.66	4.45	0.789
PBIS+SMH	1.03	0.47	0.036
<b>ISF</b>	<b>1.43*</b>	<b>0.62</b>	<b>0.027</b>
Cohort	3.57	2.20	0.104
5th Grade	3.29	2.20	0.135
6th Grade	6.47	4.42	0.143
Female	0.45	0.08	0.000
Asian	1.60	0.64	0.013
Black	0.36	0.53	0.500
Hispanic	1.00	0.55	0.069
White	0.72	0.53	0.175
Other	0.34	0.56	0.540
SPED	-0.15	0.11	0.174
State	2.42	1.51	0.128
School Enrollment	0.01	0.00	0.035
% Male	5.61	2.10	0.018
% SPED	-12.80	6.90	0.080

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% Black	6.26	5.29	0.263
% Hispanic	-3.13	8.28	0.712
% White	3.03	5.57	0.598
Unexcused Absences	0.00	0.00	0.160
ODRs	0.00	0.00	0.056
Fidelity	-0.04	0.43	0.921
2016-2017: PBIS+SMH	-0.37	0.23	0.110
2017-2018: PBIS+SMH	-0.34	0.29	0.241
2018-2019: PBIS+SMH	1.00	3.85	0.795
2016-2017: ISF	0.07	0.25	0.768
2017-2018: ISF	0.25	0.30	0.397
2018-2019: ISF	-4.89	2.34	0.037

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 17.

Overall Treatment Mixed-Effects Models by Treatment Condition: SS

	SS Safety Perception		
	Estimate	Std. Error	p-value
(Intercept)	1.97	0.19	0.000
2016-2017	-0.07	0.49	0.885
2017-2018	-0.21	0.98	0.829
2018-2019	-0.57	0.99	0.564
PBIS+SMH	0.08	0.08	0.318
ISF	<b>0.22*</b>	<b>0.10</b>	<b>0.040</b>
Cohort	0.08	0.49	0.874
5th Grade	0.21	0.49	0.662
6th Grade	0.49	0.98	0.618
Female	-0.12	0.02	0.000

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Asian	0.06	0.14	0.672
Black	0.09	0.12	0.448
Hispanic	0.02	0.12	0.839
White	0.08	0.12	0.492
Other	0.02	0.12	0.843
SPED	-0.11	0.02	0.000
State	0.39	0.23	0.109
School Enrollment	0.00	0.00	0.106
% Male	0.24	0.32	0.461
% SPED	-2.15	1.04	0.060
% Black	0.66	0.74	0.394
% Hispanic	-0.34	1.17	0.775
% White	0.45	0.77	0.577
Unexcused Absences	0.00	0.00	0.359
ODRs	0.00	0.00	0.096
Fidelity	0.03	0.06	0.646
2016-2017: PBIS+SMH	0.02	0.05	0.724
2017-2018: PBIS+SMH	0.02	0.06	0.729
2018-2019: PBIS+SMH	0.56	0.85	0.509
2016-2017: ISF	0.00	0.06	0.959
2017-2018: ISF	-0.03	0.07	0.702
2018-2019: ISF	-0.27	0.51	0.595

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

### Teacher Survey Results

#### Sample

School staff survey data was collected during the 2015-2016 (pre-intervention), 2016-2017 (post-intervention 1), and 2017-2018 (post-intervention 2) school years. All school staff were invited to participate in the schoolwide surveys; however, these data cannot be connected longitudinally at the individual level. Tables provide the sample sizes by year, by condition, and by respondent position. Teachers accounted for 75% of responses during the 2015-2016 school year, 76% of the responses during the 2016-2017 school year, and 90% of the responses during the 2017-2018 school year. For this report, we focused on teachers' perceptions of school climate and behavior; therefore, we removed all other

Final Summary Overview: Interconnecting PBIS and School Mental Health to Improve School Safety respondents. Table 2 provides the demographic characteristics of responding teachers by year and treatment condition. Teachers in ISF schools had more years of experience than teachers in the PBIS+SMH condition. Almost all of the teachers across all years and conditions were women and White. There were more Black teachers in PBIS+SMH schools than the other two conditions. Just over 50% of the teachers had a Bachelor’s degree, while ~43% had a Master’s degree.

## Data Analysis

As noted, the teachers completed the surveys anonymously; therefore, we could not evaluate teacher-level change from pre-intervention to post-intervention. Instead, we conducted three cross-sectional mixed-effects models, one for each year. All models compared only the ISF condition to the combined PBIS conditions. All models included teachers’ years of experience at the school, gender, race, and degree. We also included a series of school-level covariates, including PBIS fidelity, the percentage of White, Black, and Hispanic students, percentage of male students, percentage of students receiving special education services, number of unexcused absences, and number of out-of-school suspensions (OSS). All models included a random-effect for school (i.e., multilevel model with teachers nested in schools). We then calculated standardized mean difference effect sizes with the unstandardized beta coefficients, standard deviations, and sample sizes.

## Results

### Mixed-Effects Models

Next, we estimated 17 models for each year and examined differences by treatment condition. First, we examined results for the 2015-2016 school year. The only significant difference between the treatment groups was on the ASCS Teacher Respect for Students Scale, with teachers in ISF schools reporting slightly higher scores than teachers in the PBIS and PBIS+SMH schools (see Table 18). Next, we estimated models for data collected after the first year of implementation. We found two significant and positive effects (see Table 19). First, we found that teachers rated higher on the ASCS Student Engagement in School Subscale in ISF schools than teachers in the PBIS and PBIS+SMH conditions. Second, we found that teachers rated higher on the ASCS Discipline Structure Subscale in ISF schools than teachers in the PBIS and PBIS+SMH conditions. Covariate adjusted effect sizes were large for both, with  $d = 1.04$  for Student Engagement and  $d = 0.71$  for Discipline Structure. No other differences were found. Last, we estimated models for survey data collected at the end of the 2017-2018 school year. We found a significant, positive effect for teachers in ISF schools reporting more Respect for Students than teachers in the PBIS and PBIS+SMH condition. The effect size was  $d = 0.68$ , which is large (see Table 20).

Table 18.

2015-2016 Mixed-Effects Models: AUTHORITATIVE SCHOOL CLIMATE SURVEY

	RSPSTD		
	Estimate	Std. Error	p-value
(Intercept)	20.03	1.88	0.000
<b>ISF</b>	<b>1.68*</b>	<b>0.68</b>	<b>0.028</b>
Years Exp.	0.03	0.02	0.058
Some College	-0.19	1.99	0.924
Associate's Degree	-0.63	1.56	0.684
Bachelor's Degree	-0.19	1.29	0.884

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Master's Degree	-0.14	1.30	0.911
Doctoral Degree	-0.84	2.22	0.707
Female	-0.30	0.48	0.534
Asian	1.07	2.13	0.615
Black	0.93	1.21	0.443
Hispanic	2.15	1.39	0.122
White	1.26	1.15	0.275
Other	2.18	1.42	0.124
Enrollment	-0.01	0.00	0.211
PBIS Fidelity	0.50	0.52	0.359
% White	5.60	7.32	0.463
% Black	5.57	7.50	0.475
% Hispanic	7.78	8.32	0.373
% SPED	-10.83	4.22	0.029
% Male	5.70	4.91	0.262
Unexcused Absences	0.00	0.00	0.272
OSS	0.02	0.01	0.119

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 19.

2016-2017 Mixed-Effects Models: AUTHORITATIVE SCHOOL CLIMATE SURVEY

	Student Engagement			Discipline		
	Estimate	Std. Error	p-value	Estimate	Std. Error	p-value
(Intercept)	22.85	2.68	0.000	26.98	4.62	0.000
ISF	3.42**	0.93	<b>0.003</b>	4.14**	1.37	<b>0.009</b>
Years Exp.	0.07	0.02	0.003	0.05	0.04	0.206
Some College	-2.65	2.06	0.199	-0.09	3.58	0.979
Associate's Degree	-3.91	2.14	0.069	-1.95	3.73	0.602
Bachelor's Degree	-2.48	1.68	0.139	0.50	2.91	0.864

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Master's Degree	-2.34	1.67	0.162	1.48	2.90	0.610
Doctoral Degree	-2.15	2.33	0.356	1.17	4.06	0.774
Female	-0.40	0.61	0.511	-1.23	1.06	0.248
Asian	2.87	2.47	0.246	2.18	4.32	0.614
Black	4.25	1.95	0.030	2.53	3.41	0.458
Hispanic	2.32	2.02	0.253	0.49	3.54	0.891
White	2.08	1.88	0.270	1.37	3.28	0.677
Other	2.40	2.17	0.270	0.48	3.79	0.899
Multiracial	2.56	2.20	0.244	0.22	3.84	0.954
Enrollment	0.00	0.01	0.562	0.00	0.01	0.778
PBIS Fidelity	1.91	0.83	0.038	1.78	1.21	0.163
% White	-23.04	11.65	0.073	-22.65	16.78	0.203
% Black	-21.49	11.86	0.097	-15.16	17.10	0.394
% Hispanic	-20.30	13.65	0.163	-16.30	19.81	0.426
% SPED	-16.63	6.28	0.024	-20.51	8.96	0.044
% Male	-0.20	5.11	0.969	-14.82	7.80	0.069
Unexcused Absences	0.00	0.00	0.330	0.00	0.00	0.018
OSS	-0.02	0.02	0.277	0.03	0.02	0.256

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 20.

2017-2018 Mixed-Effects Models: AUTHORITATIVE SCHOOL CLIMATE SURVEY

	RSPSTD		
	Estimate	Std. Error	p-value
(Intercept)	20.03	1.88	0.000
ISF	<b>1.68*</b>	<b>0.68</b>	<b>0.028</b>
Years Exp.	0.03	0.02	0.058
Some College	-0.19	1.99	0.924
Associate's Degree	-0.63	1.56	0.684
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Hispanic	2.15	1.39	0.122
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Enrollment	-0.01	0.00	0.211
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% White	5.60	7.32	0.463
% Black	5.57	7.50	0.475
% Hispanic	7.78	8.32	0.373
% SPED	-10.83	4.22	0.029
% Male	5.70	4.91	0.262
Unexcused Absences	0.00	0.00	0.272
OSS	0.02	0.01	0.119

Note. \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

### References

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## Objective A2.1

### Sample

Team meeting data were collected from all 24 schools, but two schools did not meet the ISF fidelity criteria so were not included in the analysis. Thus, the sample consisted of 8 (PBIS-only), 8 (PBIS plus school mental health), and 6 (ISF) schools.

### Data Analysis

We addressed the following questions in the data analysis:

- Did school personnel in the ISF condition meet more frequently than those in other conditions?
- Was more time spent in meetings in the ISF condition than was spent in other conditions?
- How did schools in the different conditions differ in terms of tier discussions?
- Were meetings in ISF schools more likely to include the principal than in other conditions?
- Were meetings in ISF schools more likely to include a school psychologist or counselor?
- Were meetings in ISF schools more inclusive with more participants?

Differences in the numbers of meetings per school across years were small ( $p = 0.685$ ) and there was little interaction of condition and year ( $p = 0.990$ ), so we dropped these within-subject factors and looked at the numbers of meetings across the entire two-year intervention period. Table 1 provides meeting frequency categories.

Table 1.

Meeting Frequencies for Schools in the Three Conditions

Number of Meetings Categories	PBIS Number in Category	PBIS Percentage in Category	PBIS+SMH Number in Category	PBIS+SMH Percentage in Category	ISF Number in Category	ISF Percentage in Category
< 25	5	62.5	1	12.5	0	0
25 – 50	2	25.0	6	75.0	3	50.0
> 50	1	12.5	1	12.5	3	50.0

We used a Kruskal-Wallis rank sum test to infer that meeting frequency depends on condition ( $p = 0.035$ ) with PBIS+SMH promoting more meetings than PBIS and ISF promoting more meetings than either of the other two conditions.

We used the median time of meetings for each school as a representation of meeting time for that school. Although the means of these times was smallest for PBIS (48.8 minutes), greater for PBIS plus school mental health (55.0 minutes) and greatest for ISF (59.2 minutes) we were unable to infer that this is due to experimental condition ( $p = 0.43$ ). ISF and PBIS plus school mental health schools were more consistent with their meeting times than PBIS schools, though this was not statistically significant ( $p = 0.45$ ).

We also collected data regarding school-meeting content, categorizing discussions as focusing on school-wide issues (Tier 1), targeted interventions (Tier 2) or intensive intervention (Tier 3). Table 2 contains the means of the proportions of meetings including discussions of a specific tier.

Table 2.

Mean Proportion of Meetings including Discussion at each Tier

Condition	Tier 1	Tier 2	Tier 3
PBIS	0.49	0.57	0.48



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PBIS+SMH	0.49	0.55	0.46
ISF	0.64	0.49	0.43

Using the generalized linear model to regress proportions on conditions yields the coefficients and odds ratios in Table 3. The odds that a school in the ISF condition will have a Tier 1 (school-wide issues) discussion are 1.7 times higher than those of either PBIS ( $p < 0.01$ ) or PBIS+SMH schools ( $p < 0.01$ ).

Table 3.

Estimates of Coefficients and Odds Ratios with both PBIS and PBIS+SMH as Reference Condition

PBIS as Reference Condition				
	Coefficients	Odds Ratio	Std Error	P
PBIS	-0.035		0.132	0.791
PBIS+SMH	-0.024	0.98	0.172	0.887
ISF	0.528	1.70	0.178	0.00307
PBIS+SMH as Reference Condition				
	Coefficients	Odds Ratio	Std Error	P
PBIS	0.024	1.02	0.172	0.887
PBIS+SMH	-0.059		0.109	0.585
ISF	0.553	1.74	0.162	0.0000637

Given the importance of “administrative buy-in” to program success, we recorded the presence or absence of the principal at each meeting. Using the generalized linear model to regress proportions on conditions yields the coefficients and odds ratios in Table 4. The odds that the principal of a school in the ISF condition would attend the meeting are 1.4 times higher than the odds for a PBIS school (not statistically significant,  $p = 0.07$ ) and 1.8 times higher than the odds for a PBIS plus school mental health school ( $p < 0.01$ ).

Table 4.

Estimates of Coefficients and Odds Ratios with both PBIS and PBIS+SMH as Reference Condition

PBIS as Reference Condition				
	Coefficients	Odds Ratio	Std Error	p
PBIS	-0.105		0.33	0.427
PBIS+SMH	-0.280	0.76	0.173	0.105
ISF	0.321	1.38	0.177	0.069
PBIS+SMH as Reference Condition				
	Coefficients	Odds Ratio	Std Error	P
PBIS	0.280	1.32	0.173	0.105
PBIS+SMH	-0.386		0.111	0.0005
ISF	0.601	1.82	0.161	0.000189

Given the focus on behavioral interventions, we also recorded the presence or absence of a counselor or psychologist at each meeting. Using the generalized linear model to regress proportions on conditions yields the coefficients and odds in Table 5. The odds of a psychologist/counselor being at a school meeting were 3.1 times greater in ISF schools than PBIS schools and 3.3 times greater in ISF schools than in PBIS plus school mental health schools.

Table 5.

Estimates of Coefficients and Odds Ratios with both PBIS and PBIS+SMH as Reference Condition

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PBIS as Reference Condition				
	Coefficients	Odds Ratio	Std Error	P
PBIS	1.742		0.186	< 0.001
PBIS+SMH	-0.066	0.94	0.239	0.781
ISF	1.128	3.09	0.317	<0.001
PBIS+SMH as Reference Condition				
	Coefficients	Odds Ratio	Std Error	P
PBIS	0.066	1.07	0.239	0.781
PBIS+SMH	1.675		0.150	< 0.001
ISF	1.194	3.30	0.297	< 0.001

There was little difference in the number who attended meetings across the conditions, with the average attendance being near 6 persons per meeting in the PBIS and PIBS plus school mental health conditions, and near 7 persons for the ISF condition.

**Objective A2.2**

**Sample**

Intervention data were collected from all 24 schools. Two ISF were dropped from these analyses due to poor implementation of the treatment. Thus, the sample consisted of students receiving interventions in 8 (PBIS-only), 8 (PBIS plus school mental health), and 6 (ISF) schools.

**Data Analysis**

Table 6 provides the total number of interventions provided in the 2016-17 school year, by condition. Additionally, it contains the median number of interventions per school, the number of students served in each condition, and the median number of students served per school. The school-level metrics show higher intervention activity for PBIS plus school mental health than for PBIS-only schools, but the highest activity was in ISF schools.

Table 6.

Numbers of Interventions Provided and Student Served in 2016-17.

Condition	Interventions	Median Per School	Students Served	Median Per School
PBIS	1816	200	247	32
PBIS+SMH	4021	209	617	34
ISF	2385	370	398	69

Table 7 provides this information for the 2017-18 school year. In comparing Table 6 and Table 7, schools in ISF conditions were more consistent in the number of interventions offered and students served across both years, while other conditions did not sustain the same level of activity in the second year of the study.

Table 7.

Numbers of Interventions Provided and Student Served in 2017-18.

Condition	Interventions	Median Per School	Students Served	Median Per School
PBIS	1181	122	223	24
PBIS+SMH	2116	169	358	32
ISF	2258	382	334	59

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Table 8 provides data about the number of students of color receiving interventions. While PBIS+SMH schools provided more interventions for students of color in the first year of the study, the number of students of color served with interventions dropped off in the second year for both PBIS and PBIS+SMH schools. ISF schools were consistent in the median number of students of color served across both years of the study.

Table 8.

Numbers of Students of Color Receiving Interventions

Condition	Students Served	Median Per School
2016-17		
PBIS	159	20
PBIS+SMH	448	27
ISF	219	22
Condition	Students Served	Median Per School
2017-18		
PBIS	160	16
PBIS+SMH	254	22
ISF	215	24

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Appendix C

The economic analysis compared the costs of Positive Behavior Intervention and Support plus School-based Mental Health Clinician (PBIS + SMH) and Interconnected Systems Framework (ISF) as implemented in the PASS trial to published costs of PBIS from Blonigen et al. (2008). Core comparisons focused on PBIS + SMH vs. ISF. Cost data were assembled from study financial records and interviews with study investigators. The analysis perspective is that of the school administrators (and, more broadly, state department of education). A total of 22 schools that were already implementing PBIS participated in the study (6 in the ISF arm, 8 in the PBIS + SMH arm, and 8 in the PBIS arm). The primary cost categories included training activities, personnel costs, transportation/travel, and supplies. Personnel costs were the largest category for both the PBIS + SMH and ISF conditions. The cost analysis represents a 12-month period from July 2017 – June 2018. Results are presented in Table 1 below. Total costs of ISF were \$325,164 for this period and total costs of adding SMH to PBIS were \$77,677. Blonigen et al. (2008) present two estimates of the annual costs of PBIS (listed here in 2019 dollars)– one representing a new implementation in schools requiring additional personnel costs (average total cost per year based on a 10-school district was \$80,144), and the second representing an implementation using existing school staff and resources (average total cost per year based on a 10-school district was \$25,053). Based on the number of students exposed to the intervention in the participating schools, the average annual cost per 100 students was \$1,502 in the PBIS + SMH condition, \$8,643 in the ISF condition, and ranged from \$6,157 - \$19,696 for PBIS-only using estimates from Blonigen et al., (2008).

**Table 1**

<b>Annual Costs of PBIS, PBIS + SMH, and ISF (2019 dollars)</b>				
<b>Cost Category</b>	<b>PBIS - new implementation (Blonigen et al. 2008)</b>	<b>PBIS - substituting existing school resources (Blonigen et al., 2008)</b>	<b>PBIS+SMH</b>	<b>ISF</b>
<i>Start-up Costs</i>				
Training		\$ -	\$ -	\$ 4,558.23
<i>Implementation Costs</i>				
Personnel Costs			\$ 77,465	\$ 315,791
Transportation/travel			\$ 212	\$ 1,311
Supplies				\$ 3,504
<b>Total costs per year</b>	<b>\$ 801,443.50</b>	<b>\$ 250,530.50</b>	<b>\$ 77,677</b>	<b>\$ 325,164</b>
<b>Average Cost Per School</b>	<b>\$ 80,144.35</b>	<b>\$ 25,053.05</b>	<b>\$ 9,710</b>	<b>\$ 54,194</b>
<b>Average Cost Per 100 students</b>	<b>\$ 19,696.33</b>	<b>\$ 6,157.05</b>	<b>\$ 1,502</b>	<b>\$ 8,643</b>
Notes: Number of schools per condition: PBIS (n=8); PBIS + SMH (n=8); ISF (n=6)				

Three child school discipline outcomes were compared across study conditions and assessed in relation to the costs of implementing the interventions: In-school suspensions (ISS), Out-of-school suspensions (OSS), and Office discipline referrals (ODR). Table 2 shows the results of cost and cost-outcome comparisons. The two main comparisons of costs/outcomes are ISF vs. PBIS-only and ISF vs. PBIS + SMH. The incremental cost per 100 students was \$3,224 in ISF vs. PBIS-only and \$7,879 in ISF vs. PBIS + SMH. Reductions in OSS, ISS, and ODR were highly variable across conditions and follow-up time points. The red font in Table 2 indicates when ISF had fewer reductions in these events relative to the comparison conditions, which represents a situation where ISF would be dominated (i.e., not a good value).

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These cost-outcome comparisons are meant to inform if the additional cost of the most expensive condition, ISF, is a good value based on achieved reductions in child school discipline outcomes. Traditionally, cost effectiveness or cost-benefit analyses compare costs and effects at an individual level. In this comparison, however, both costs and outcomes reflect averages “per 100 students.” At the second follow-up (Post 2) ISF had fewer OSS relative to PBIS-only and fewer ISS than PBIS + SMH. In terms of ODRs, ISF had relatively greater reductions in these events at both Post 1 and Post 2 compared to PBIS and PBIS + SMH. The cost/outcome ratios represent the average cost to achieve reductions in ISS, OSS, and ODR per 100 students, thus lower ratios are considered reflective of a better value. The lowest cost per reductions are seen in ODR at Post 2: \$586 in ISF vs. PBIS-only and \$1,832 in ISF vs. PBIS + SMH. Stated differently, the incremental cost per reduction in ODR events (based on the rate per 100 students) was \$586 in ISF relative to PBIS-only and the incremental cost per reduction in ODR event (rate per 100 students) was \$1,832 for ISF relative to PBIS + SMH.

These costs appear to be modest, but from the department of education or school administrators’ perspectives the willingness-to-pay for these results will depend on the ability to increase budgets to support new programs or be able to reallocate existing budgets for this purpose. School discipline events drain school resources. Reductions in these events translate into cost-offsets for schools that could be used to justify additional funds or reallocation of funds to support ISF and/or PBIS + SMH.

**TABLE 2: Incremental Cost and Cost/Outcome Comparisons**

	Incremental Costs Per 100 Students	Pre - Post Outcome Comparisons of In School Suspensions (ISS), Out of School Suspensions (OSS), and Office Discipline Referrals (ODR) Baseline to Follow-up 1 (Post 1) and Follow-up 2 (Post 2)								Incremental Cost-Outcome Comparisons (Per 100 Students)					
		OSS Post 1	OSS Post 2	ISS Post 1	ISS Post 2	ODR Post 1	ODR Post 2	Cost/outcome OSS Post 1	Cost/outcome OSS Post 2	Cost/outcome ISS Post 2	Cost/outcome ISS Post 2	Cost/outcome ODR Post 1	Cost/outcome ODR Post 2		
ISF vs. PBIS-only	\$ 3,224	2.8	-0.4	0.6	2	-4.6	-5.5	\$ (1,151)	\$ 8,059	\$ (5,373)	\$ (1,612)	\$ 701	\$ 586		
ISF vs. PBIS + SMH	\$ 7,879	2.8	2.1	-0.2	3.8	-3.6	-4.3	\$ (2,814)	\$ (3,752)	\$ 39,394	\$ (2,073)	\$ 2,189	\$ 1,832		
Notes:	Red font indicates less effectiveness and higher cost relative to the comparison condition Estimates are based on average annual cost per 100 students and average outcomes per 100 students														