Scaling-Up Positive Behavioral Interventions and Supports:

The Distribution of Costs Across Educational Stakeholders

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Lindstrom Johnson, S., Alfonso, Y. N., Pas, E. T., Debnam, K. J., & Bradshaw, C. P. (2020). Scaling Up Positive Behavioral Interventions and Supports: Costs and Their Distribution Across State, Districts, and Schools. *School Psychology Review*, *49*(4), 399–414. https://doi.org/10.1080/2372966X.2020.1777831

Published in *School Psychology Review*

Funding: Support for this article comes grants from the Institute of Educational Sciences (R305H150027) and the National Institutes of Justice (2014-CK-BX-0005) awarded to Catherine Bradshaw. This content is solely the responsibility of the authors and does not necessarily represent the official views of the funders.

Abstract

Positive Behavioral Interventions and Supports (PBIS) is a widely-used multi-tiered prevention framework that embeds a systems approach for establishing behavioral supports for all students, across all levels of need, to achieve social, behavioral, and academic success. A growing body of research has documented the effectiveness of PBIS in schools with regard to a range of student outcomes; however, few studies have rigorously examined the costs to implement PBIS. Further, as many states have scaled-up PBIS, consideration of the costs borne by different organizational structures are critical for understanding PBIS implementation fidelity and sustainability. This study utilized an ingredients-based costing approach capitalizing on both qualitative and quantitative data from multiple stakeholders to examine the total societal costs to implement multiple tiers of PBIS. Also examined were the distribution of costs across the school, district, and state levels using the same ingredients-based costing approach. Findings suggest an annual cost of $48.16 per student, the bulk of which occurs at the school level (average cost $27,363 per year).

Key words: cost analysis; sustainability; implementation fidelity; behavioral health

Scaling-Up Positive Behavioral Interventions and Supports: Costs and Their Distribution across State, Districts, and Schools

Positive Behavioral Interventions and Supports (PBIS) is a non-curricular, multi-tiered prevention framework that is widely disseminated as a strategy for improving school climate and preventing disruptive behavior problems (Sugai & Horner, 2006). The universal, school-wide or Tier 1 PBIS (SW-PBIS) model has been widely implemented in over 26,000 schools in nearly states throughout the U.S. as well as internationally (Sugai, Horner, & McIntosh, 2016). Despite its widespread implementation, there is limited understanding of the cost of implementing PBIS, and more specifically the distribution of costs across stakeholder groups. As is discussed in the introduction to this special issue, there is a need to understand the cost to adopt, use, and scale programs and practices in school psychology. School psychologists are often asked to advise on the appropriate intervention for students' social, emotional, or behavioral health (Barrett, Gadke, & VanDerHeyden, 2020). Leveraging data from a large randomized controlled trial (RCT) of PBIS in one mid-Atlantic state, this study examined the total cost to implement PBIS as well as the specific public education sector costs (i.e., school, district, and state levels). We present a cost analysis utilizing a societal perspective, which accounts more broadly for costs of multiple organizational structures as well as opportunity costs (Levin, McEwan, Belfield, Bowden, & Shand, 2018). We included a delineation of fixed costs and variable costs, which can have important implications for sustainability of interventions (Drummond, Sculpher, Claxton, Stoddart, & Torrance, 2015). Additionally, the actual resources utilized versus ideal resources needed (both from the stakeholder and literature perspective) are discussed. Finally, this information is presented from multiple organizational structures, allowing for the understanding of the total costs to scale up PBIS in one state.

Due to the challenges of scaling and sustaining effective evidence-based practices such as PBIS (Fagan et al., 2019), researchers and practitioners have focused on enhancing existing system supports (Ervin, Schaughency, Matthews, Goodman, & McGlinchey, 2007). In education these include organizational structures at the levels of state departments of education, technical assistance agencies, school districts, and individual schools. Standards for economic evaluations highlight the importance of understanding the distribution of costs across different organizational structures, as each level may have separate and independent budgets from which costs are drawn as well as their own personnel dedicating time and thus incurring opportunity costs (i.e., costs that would not appear on the budget; Crowley et al., 2018). Understanding the distribution of costs across multiple organizational structures has important implications. For example, if the organizational structures that pay for the costs are different from the organizational structures that reap the benefits, it may lead to difficulty in reaching high fidelity or sustainability (Johnson, 2004).

Key Components of PBIS

The first step in any cost analysis is to understand the components of the intervention (Haddix, Teutsch, & Corso, 2003). Below we present key supports for the implementation of PBIS by organizational structure.

School Support of PBIS. As is true for more traditional intervention packages, PBIS has clearly-articulated critical elements, which are reflected in its implementation fidelity tools (e.g., Tiered Fidelity Inventory; Algozzine et al., 2019) and also represent cost components. Several key features are the defining and teaching of positive behavioral expectations, the existence of systems to reward positive behavior and respond to behavioral violations, and the monitoring and evaluation of data regarding implementation and student outcomes. Also documented by these

fidelity measures are important structures including the PBIS team, continued professional development, and broader stakeholder involvement. Regarding selective and indicated interventions (i.e., Tiers 2 and 3), the key components also include screening and referral considerations, how programs are matched to student need, the staffing to support the most intensive interventions, and monitoring to determine the extent to which students receive additional supports and are responsive (Algozzine et al., 2019). As such, previous work has found the main cost components of PBIS at the school level are the regular PBIS team meetings, training, coaching, management, and implementation support of the intervention, along with incentives (Bradshaw, Debnam, Player, Bowden, & Lindstrom Johnson, 2020).

District and State Level Support of PBIS. Monetary support and district level coaching have been the primary advocated school district supports for PBIS (Horner et al., 2012). Additionally, the role of technical assistance is seen as critical to implementation fidelity (Elliott & Mihalic, 2004). Oversight for PBIS implementation and scale-up is often led by the school district, for which there is often a staff person(s) responsible for interventions related to student social, emotional, and behavioral health. Despite this identified core feature of PBIS, analyses have identified associations between all major dimensions of implementation support at the school level and student office discipline referrals (ODRs), but fewer results for district-level support. However, district-level support, to date, has been defined narrowly as a budget and a liaison (Molloy, Moore, Trail, Van Epps, & Hopfer, 2013). Less is known about important state-level supports, with implementation guides and practice briefs highlighting the relevance of state-wide management and leadership teams to coordinate training, coaching, and evaluation efforts (e.g., Barrett, Bradshaw, & Lewis-Palmer, 2008). Another important role of these state-level teams is to provide technical assistance to districts and serve as a resource for district

efforts for program sustainability. However, the associated cost for each organizational structure is not well understood.

Benefits and Costs of PBIS

A recent meta-analysis of the effects of PBIS, including both RCT and quasi-experimental designs, suggested a significant impact of PBIS across elementary, middle, and high schools (Lee & Gage, 2020). Specifically, their review of 29 studies found an effect size of 0.26 for reduction in problem behavior (i.e., teacher report, disciplinary exclusions, suspensions) and an effect size of 0.11 for improved academic outcomes (i.e., math and and reading ability). Additionally, PBIS is also believed to lead to a cost savings in terms of administrator and student time due to the reduction in staff and administrator time spent processing office discipline referrals (Scott & Barrett, 2004). This cost savings perspective has been extended by connecting the reduction in suspensions to a reduction in dropouts, which has large economic costs for society (Swain-Bradway, Lindstrom Johnson, Bradshaw, & McIntosh, 2017).

Extant cost analyses of PBIS suggest that the primary cost drivers are training, coaching, and evaluation. Specifically, a brief report on the costs of PBIS, led by its developers, provides an estimate of costs at the district level (Horner et al., 2012). They concluded that district implementation of school-wide PBIS cost, on average, from $5,000 to $10,000 per school over a two-year period. These costs included training of school teams, coaches, and a district leadership team. Additional costs included recurring costs associated with the use of a data system (e.g., the School-Wide Information System or SWIS) to track behavioral incidents, which is estimated at approximately $400 per year. Although opportunity costs were mentioned in terms of the time district and school personnel spent in trainings and regular meetings, these costs are not accounted for in the estimate. The brief also estimated the cost-savings for a district scale-up and

mentioned additional costs that would incur with any additional school programming (i.e., selected or indicated interventions).

A more comprehensive cost analysis of the initial implementation (first year) of school-wide PBIS that included personnel time as well as equipment and material needs, estimated the cost per school of PBIS to be approximately $60,000, depending on the number of schools in a district (Blonigen et al., 2004). This case study included both district and school costs; school costs primarily included the opportunity cost of staff time for meetings, data entry, and training, which accounted for two-thirds of the total PBIS costs. As the authors note, and as will be discussed below, this total cost assumed that the time investment would not exist in the absence of PBIS. Using a program substitution framework (i.e., assuming that some of these costs would exist in the absence of PBIS), the costs of PBIS were estimated to decrease to $20,000 per school (Blonigen et al., 2004). Our own work assessing just the school-level costs of PBIS using a common fidelity measure, the Schoolwide Evaluation Tool (Sugai, Lewis-Palmer, Todd, & Horner, 2001), estimated a median cost of approximately $37,000 for a school to implement PBIS at multiple tiers, depending on the implementation fidelity (Bradshaw et al., 2020). Schools with higher quality implementation incurred greater costs than schools with low quality implementation.

Contributions of this Paper to Understanding the Cost of PBIS

The current study was designed to extend prior cost analyses of PBIS to account for the the recurrent costs (i.e., not just 1st year of implementation) and to examine the cost distribution across the state, district, and school levels. Specifically, this paper aimed to 1) present a comprehensive understanding of the fixed and variable costs of this widely-used behavioral prevention framework, 2) identify the distribution of the costs between educational

organizational structures, and 3) present data that suggests areas whereby the current resources allocated to support PBIS are perceived as lacking. In this way, we intended to elucidate critical aspects across organizational structures that can support both intervention fidelity and sustainability (Erwin et al., 2007), as well identify possible areas in need of additional support.

Method

This project was conducted in partnership between the research team, the Maryland State Department of Education, and Sheppard Pratt Health System. In total 1,177 Maryland schools have been trained to implement SW-PBIS and 887 schools are actively implementing, as determined by their annual provision of data to the statewide PBIS collaborative. As part of an initiative to evaluate the impact of PBIS across the state, a cost analysis was conducted involving each of the partner agencies.

School-level data were captured in the context of a RCT of PBIS conducted in 40 middle schools in 4 districts all trained to implement SW-PBIS. The intervention utilized systems-based coaching to support the 20 intervention schools to implement evidence-based programs across all three tiers of PBIS (Pas, Lindstrom Johnson, Alfonso, & Bradshaw, 2020). All 40 had been trained in SW-PBIS between 7 to 13 years prior to the study and thus began the study demonstrating high fidelity to the school-wide features at baseline (i.e., only 2 out of 40 schools implemented less than 80% of all core features), as measured by the School-wide Evaluation Tool (SET; Sugai, Lewis-Palmer, Todd, & Horner, 2001). Districts participating in the interviews served an average of 60,000 students (*M* range 4,785 to 162,680), of which 58% were racial/ethnic minorities (range 34% - >95%) and 38% (range 33.2% - >95%) were eligible for free and reduced-priced meals. Districts had a high attendance rate (*M* = 93.7%) and graduation rate (*M* = 89.4%).

Cost Data

Research costs were excluded from the analyses to better reflect implementation in authentic settings. Only implementation costs are considered.

Key Informant Interviews. One-to-one key-informant interviews with key PBIS stakeholders from the Maryland PBIS collaborative were conducted. This included the State Department of Education (n = 2), the Maryland PBIS technical assistance institution (n = 3), and district coordinators (n = 8) who provided detailed accounts of activities and resources needed to run PBIS. Out of the 24 school districts in the state, each with one district coordinator, eight district coordinators were purposely selected for interviews, to be representative of the geographic regions of the state, the range in district size/school caseload, experience with PBIS implementation, and funding level provided by the district. The interview development was guided by members of the research team with input from the PBIS State Management Team. The structure of the interview and its content development were guided by best practices in economic evaluation (Drummond et al., 2015) and thus focused on gathering information both about PBIS activities as well as the cost parameters associated with each. Interview questions were standardized across agency and inquired about roll out of the PBIS framework, activities, types and counts of resources used (e.g., program design, trainings, labor, capital and supplies, transport), and perspective regarding workload levels and program needs, and included both open- and closed-ended questions. Documentation and records regarding counts and expenditure of specific inputs were collected from the interviewees when available. Interviews included 25 questions and took about an hour to complete; the majority of the interviews were completed in person with the others completed by phone. Additional information on the content of these interviews is provided in Table 1. Interviews were conducted by a master's educated economist

as well as a master's educated program staff with expertise in PBIS implementation and qualitative data collection techniques.

Coach Time Logs. Coaches in the 20 intervention schools were asked to keep logs of their time spent on specific activities (see Pas et al., 2020). Activities included relationship building, participation in school-level meetings, individual meetings with key stakeholders, coaching of individual teachers, supporting evidence-based program (EBP) adoption and implementation, support for data collection and completion, and preparation of materials and planning. Each week, coaches logged into an online system to enter data. Researchers tracked entries monthly during the intervention study to ensure consistency in data entry as well as provide feedback about activities and time allocation to each school. This log was created based on the experience with a prior systems-based coaching study (Bradshaw et al., 2014) and was designed to both capture the active inputs of the coaching as well as to assess for coach and school time in a non-duplicated manner (Findorff, Wyman, Croghan, & Nyman, 2005). Estimates of school staff time devoted to PBIS were derived from the coach time logs, as such school labor estimates are representative of an optimal level of support of PBIS.

Overhead Cost. The overhead cost (e.g., PBIS program's share of the cost for office space, utilities, administration, human resources) of each agency was estimated as a standard 11.4% of the total agency's non-out-of-pocket (OOP) program cost. This value represents the 2019 fiscal year average overhead expenditure of 22 counties (overhead expenditure range: 8.8%-16.2%) (Maryland State Department of Education 2019).

Cost Analysis Strategy

Using a ten-year time horizon, the cost analysis considered both the public education sector and the societal cost perspectives. The ingredients-based costing approach (IBCA) was

used to estimate the total annual cost of the PBIS program in the state. The analysis also estimated total annual cost by agency (e.g., state department of education, technical assistance institution, district, school) and per student. The IBCA is a standard bottom-up costing strategy (Drummond et al., 2015). Common program inputs include units of labor, trainings, equipment, supplies, mileage, travel, provider incentives, and overhead. All PBIS-specific inputs needed to run the program were identified during each interview, and for each cost input, detailed program data were collected on the quantity of the input and frequency of use. Data collected from the interviews provided ranges of how quantities varied across agency (e.g., time allocated to PBIS activities by district coordinators and coaches) and were used to estimate the mean and distribution of these inputs.

Inputs were separated into fixed costs and variable costs. Fixed costs were start-up investments that occur only at the beginning of the program or are used infrequently, such as start-up trainings and physical capital, whereas variable costs were staff time or refresher training that occur repeatedly. The societal perspective inputs included provider out-of-pocket (OOP) expenditures such as non-reimbursed transport costs and overtime. Inputs were valued using average local market prices and expenditure data from program administrative records. Specifically, publicly available local average wage data was used for teachers, administrators, district coordinators and state level staff (Bureau of Labor Statistics, 2019a), while program records were used to quantify inputs such as supplies, transportation reimbursement, travel records, and provider incentives. Labor costs estimates included both the wage and fringe benefits. Fringe benefits were estimated at 33.54% of wages (Bureau of Labor Statistics, 2018). A simple version of the costing equations is shown below:

$$Total\ Cost = Fixed\ Cost\ Annualized + Variable\ Cost$$

$$Fixed\ Costs\ Annualized = \sum_{j=1}^{J} \frac{P_j Q_j}{\sum_{t=1}^{T}(1+r)^{t-1}}$$

$$Variable\ Costs = \sum_{k=1}^{K} P_k Q_k$$

The total cost is the sum of fixed and variable costs. The variable costs estimate is the summation of the costs of inputs that can be listed from *k*=1 to *k*=K. For each input *k*, the cost is the product of the input price, *P*, and the quantity, *Q*. Similarly, fixed costs are the summation of the costs of inputs that can be listed from *j*=1 to *j*=J. For each input *j*, the cost is the product of *P* and *Q* annualized using the input's lifetime, *T*, and a standard three percent discount rate, *r* (Drummond et al., 2015). Some fixed and variable inputs' prices were reported in years 2016 or 2017 and were inflation adjusted to 2018 US dollars using the Bureau of Labor Statistics' consumer price index (CPI) inflation adjustment calculator (Bureau of Labor Statistics, 2019b). Inflation adjustment of input prices to a common year is conducted prior to estimation of variable and fixed annualized costs and shown by the equations described above. Each fixed input was estimated for its lifetime value. An input's lifetime represents the number of years before the investment should be repeated and were obtained from key-informant interviews. Lifetime values were 15 years for start-up costs, 10 years for trainings, and 3 years for equipment. For example, in the case of a training price from the year 2017, the price was first inflation adjusted to 2018. As this input is needed only once every 10 years, to obtain the annual cost of this input, the training cost, valued in 2018 US dollars, was annualized over 10 years. This process produces the annual cost for the training per year over the next 10 years. The state's total cost estimate was modeled based on the total of number of districts in the state (i.e., *N* = 24), the average number of schools per district (i.e., *M* = 50) and the average number of students

per school observed (i.e., in the 8 districts and 20 schools evaluated for this study, $M = 636$). A final per pupil cost was generated, which most easily allows for comparison to other interventions, because they most frequently have been examined regarding per student costs (Levin et al., 2018).

Lastly, univariate sensitivity analysis tests evaluated the extent to which changes to input quantities and prices changed total cost estimates (Drummond et al., 2015). This analysis was conducted by varying each input parameter by 5% increments up and down to 20%, and for each increment, re-estimating the total cost. Data from this analysis were plotted on a graph to illustrate and compare how these changes impacted results in order to generate the high- and low-cost thresholds based on the number of schools per district, overhead costs, training costs, and staff costs for the technical assistance agency, state, or district. Sensitivity analyses were conducted in the @Risk Decision Tool software version 8.0.0 (Palisade, 2019). See Appendix A for a checklist illustrating how this paper meets the Consolidated Health Economic Reporting Standards (Husereau et al., 2013). Of the 21 categories, we met all applicable standards.

Results

Table 1 summarizes the list of PBIS program inputs. For details about the count and frequency of each input, see Appendix B.

Fixed and Variable Inputs to Support State-wide Implementation of PBIS

Program inputs included investments to initiate a statewide PBIS structure, such as the adaptation of the national PBIS curriculum (i.e., an effort involving both the state department of education and the technical assistance agency) and training school teams (e.g., coach, teachers, administrators) in school-wide PBIS, as well as supported selective and indicated interventions (i.e., Tiers 2 and 3). These start-up trainings were conducted by district coordinators who trained

multiple school teams at a time, when possible, in order to save costs. Each school could send up to 10 attendees per training. Schools paid for attendees' hourly stipend as well as teacher substitutes, when needed (i.e., most trainings occurred in the summer). SW-PBIS (i.e., Tier 1) training was two full days, whereas trainings for Tiers 2 and 3 were one full day each. Fixed costs comprised 36.4% of a district's cost and less than 2% of the cost for the other agencies, largely reflecting the districts role in providing training. For a breakdown of fixed and variable costs by agency, see Appendix B. Most costs (96.4%) were variable and included labor, refresher trainings, program monitoring, supplies, and overhead at the state, district and school level.

Costs for PBIS Implementation

Table 2 lists program inputs in more detail as well as the total and proportional distribution of costs by cost category and agency.

Technical assistance agency. Their primary role was providing technical assistance, capacity building, and supporting statewide sustainability of PBIS. The team included senior management staff who devoted a fraction of their time to oversee the PBIS activities, full-time senior behavioral health and mental health specialists, school coaching experts, and consultants. Key PBIS activities included housing, developing, and biannually updating the PBIS curriculum modules for school-wide and advanced trainings; training district coordinators and school PBIS teams when a district coordinator was not available; developing the state PBIS annual action plan (e.g., program objectives and activities, program monitoring and evaluation); providing technical assistance to state and district PBIS staff (e.g., classroom systems, advanced tier systems, restorative practices, coaching, district leadership, adaptation of curricula); coordinating state coaches' meetings (at least three per year and one in-person, each a full-day meeting); attending State Management and Leadership Team Meetings; grant writing to generate additional fiscal

support for these activities; disseminating research articles and technical briefs; marketing; budget and fiscal matters; and management of the state PBIS website. Out of the total annual operational cost for the technical assistance agency, $740,657, the majority, 84.5%, were labor costs.

State department of education. The team included a director, co-director, and PBIS and senior behavioral support specialists, all of whom devoted a portion of their time to PBIS activities. Their primary role was overseeing the statewide school climate programs and measures (e.g., mental health, school safety). Main activities included supervising the development of the PBIS curriculum and annual implementation plans; supporting evaluation efforts and workshops; coordinating monthly PBIS State Leadership Team meetings with all district coordinators (providing updates and refresher trainings on best practices); supporting regional PBIS activities including hosting trainings (e.g., venues, guest speakers); and other specific specialized work (e.g., consultations, meetings with research institutions). The total annual department of education operational cost was $152,247 and the majority, 87.1%, were labor costs.

District. The district staff is one district coordinator. Among the 8 district coordinators interviewed, the average time allocated to PBIS activities was 56% (*SD* = 34%; range = 15% - 100%). The total number of schools supported by these eight coordinators was 395 and the average number of PBIS schools under their direction was 50 (*SD* = 43; range = 5 - 109). The district coordinators' main role was training and providing day-to-day support to PBIS school teams. Key activities included conducting start-up trainings for schools; attending state-level PBIS meetings/refresher-trainings (e.g., State Leadership Team meetings, state coaches' meetings, non-PBIS state leadership meetings on topics such as school climate and related

restorative practices). Additionally, district coordinators' activities included coordinating quarterly coach meetings for their schools (i.e., meetings' length varied between one hour to a full day and were either one-on-one with each coach or an internal, district coaches' meeting; some were held monthly); and the annual PBIS refresher trainings/returning-team-trainings which were always co-organized with other districts to share the cost of meetings. District coordinators' OOP expenditures were non-reimbursed transportation costs (e.g., to regional and state-wide meetings). The total annual district cost was $143,541. Out of this total, 6.2% (not listed in the tables) were OOP expenditures. Most district costs were labor and start-up trainings (i.e., 38.2% and 36.3%, respectively). Districts did not provide direct funding to schools, but district coordinators generally suggested that if more PBIS funding were available, those resources should be allocated to support school teams' professional development (i.e., refresher trainings reinforcing school-wide expectations and program development) and to reduce the workload of district and school staff. This was based on the observation that the best PBIS school performers were often those recently trained with start-up trainings.

School. A school's PBIS team included a coach, either an internal school counselor or other mental health specialist (e.g., school psychologist), teachers, and administrators who had voluntarily committed time to conduct PBIS activities. The opportunity cost of teachers' and administrators' time is an OOP expenditure, excluding time spent in PBIS start-up trainings during the summer, which were remunerated by the district. Other school-level costs reported by the state and district stakeholders included teacher substitutes, the opportunity cost of volunteers' time conducting biannual implementation fidelity assessments (e.g., SET), and overhead. Other OOP expenditures included non-remunerated transportation for attending PBIS refresher trainings (e.g., state coaches' meetings, regional training meetings). The total annual school cost

was $27,363. Out of this total, 12.2% (not listed in the table) were OOP expenditures. Most of the school cost, 76.1%, was labor costs.

Total Costs

The total annual cost of running all PBIS operations in the state was $37.2 million dollars, assuming an average of 50 schools per district, see Table 3. Further, assuming a total of 636 students per PBIS school, the total annual PBIS cost per student was $48.16. Table 3 also lists the cost per student by agency. The majority of the "per student" cost is borne by the school, with the other agencies providing a smaller per student amount but serving larger numbers of students. Total and per student cost estimates are subject to change based on changes to program inputs. Sensitivity analyses showed that the program inputs that changed total and average costs the most were the number of schools per district and the number of coach hours spent on PBIS activities (see Figure 1). Overhead costs, training costs, and staff costs for the technical assistance agency, state, or district did not substantially impact the cost of PBIS. Figure 1 shows the impact of 5% changes to input on the total cost estimate. For instance, a 5% increase in the number of schools per district (i.e., across all districts) would increase the total cost from $37.2M to $38.9M (a 4.71% increase). To view the data in a table format, see Appendix B. This analysis assumes there is a linear relationship between the change in inputs and output (i.e. total cost), which is reasonable for small changes in inputs, as small changes in one input (e.g., number of schools per district) may not require change in other input amounts (e.g., number of district coordinators).

Discussion

This paper summarized the results of a cost-analysis of a state-wide scale-up of PBIS. We found that annual PBIS implementation costs were approximately $37M in total, or $48.16 per

student. The bulk of these costs were borne by schools, specifically for coach time to support implementation of SW-PBIS and other selective and indicated interventions. The primary drivers of cost across the district, technical assistance agency, and the state department of education were staff salaries for support of training and evaluation (see Belfield et al., 2015 for similar findings), with an additional cost percentage, particularly at the district level, to support trainings. While other previous work has focused on the cost to initiate PBIS, this paper attempted to understand the cost of a state-wide scale-up of PBIS. Cost analyses that focus only on the initial implementation of PBIS may miss labor costs that are essential for supporting sustained high-fidelity implementation (Domitrovich et al., 2008). It is also important to emphasize that while most of the cost may be at the school level, in order to support the scale-up of PBIS, substantial investment must occur within state-level organizational structures, possibly both from the department of education and a technical assistance provider (Bradshaw et al., 2014), as is the suggested infrastructure for PBIS nationwide.

Despite differences in how this cost analysis was conducted as compared to cost estimates of prior work, the results regarding school-and district-level costs were similar. Specifically, examining school-level costs using PBIS fidelity data, we estimated the school-level cost of PBIS to be $37,000 (Bradshaw et al., 2020) versus our current estimate of $27,000. This is slightly lower than the estimate generated by Blonigen and colleagues (2008), who estimated a cost of between $40,000 and $60,000. While less work has focused on the district level, our estimated district per school cost of $2,860 ($143,541/50 schools) per year is within the previous suggested costs of $5,000-$10,000 per school for a two-year period (Horner et al., 2012). What our study adds to extant literature is both a more granular understanding of the cost components as well as the drivers of cost. Previous studies have relied on generic estimates of

cost; this study used both a prospective tool (e.g., coach time logs) as well as key-informant interviews, which represent best practices in economic evaluation (Crowley et al., 2018). Additionally, our paper captures the role of the technical assistance agency as well as the state department of education in creating and sustaining the training and implementation infrastructure at a cost of about $900,000 a year. The technical assistance agency had a large responsibility for the training of PBIS, as funded through a subcontract from the state department of education. This type of cost was previously accounted for as a district cost in prior research (i.e., Blonigan et al., 2008; Horner et al., 2012). While this may be specific to Maryland, other work has supported the importance of technical assistance agencies in the scale-up of programs (Barrett, Pas, & Lindstrom Johnson, 2020) suggesting that this as an important cost to consider in furthering the dissemination of PBIS.

Although state-level support represented the largest expenditure of resources on PBIS, a per-pupil analysis indicated that schools contribute the majority of resources, primarily in the form of time spent by school personnel to support the implementation of PBIS. While wages may not represent an additional budgetary cost to schools, best practices in economic analysis suggest the importance of including these opportunity costs (Levin et al., 2018). Accounting for the time required to implement an intervention is critical to understanding the likelihood of implementation fidelity and sustainability (Pas et al., 2020). A recent evaluation of well-known socio-emotional programs (i.e., Belfield et al., 2015) also found that personnel time represented the bulk of costs of these school-based interventions. However, this amount of money represented less than a full-time position of a coach, such as a school psychologist. It can be easy to assume that a change of priorities at the school would result in a change in the time distribution of the coach. In fact, coach time was the largest determinant of the overall cost of

PBIS as seen in the sensitivity analyses. While decreased coach time would result in a decreased cost of PBIS, due to the critical role of coaches in supporting PBIS implementation (Sugai et al., 2016), this would also most likely decrease fidelity of implementation and student outcomes. Other work suggests that higher fidelity does result in more cost for PBIS at the school level, which may be driven by personnel time (e.g., staff and coach time; Pas et al., 2020). However, fidelity to PBIS also demonstrates better student academic and behavioral outcomes (Scott et al., 2019).

The other component of the cost analysis that had the most dramatic impact on cost variability was the number of schools in the district. This most likely relates to the district's role in providing training, which may operate as a variable versus fixed cost. This is an important consideration as other work has suggested a hypothetical cost savings with additional schools (Blonigan et al., 2008). While the technical assistance agency and the state department of education also provide support for training, given the low per-pupil expenditure, this had less of an impact on the total per-pupil cost. Additionally, the number of students in the school did not affect the cost of PBIS. This is likely because the cost of PBIS is largely driven by factors that exist regardless of the number of students served (i.e., fixed costs; Drummund et al., 2015).

Although the current cost analysis attempted to understand the existing resources used to implement and support PBIS, stakeholders mentioned additional resources that they felt were needed. Specifically, in interviews, key stakeholders indicated the need for additional resources (i.e., trainings) at the district level as well as the state level to support the continued implementation of PBIS as well as the integration of other advanced-tier interventions. District stakeholders mentioned a desire for more support for the continued implementation of PBIS, both in terms of training as well as support provided to school and district personnel. Thus, it

was noted during the interviews that there is a need for support at the school level beyond the initial implementation of PBIS. It should be acknowledged that this may already be reflected in our cost analysis at the school level, as the coach costs may be inflated (i.e., as compared to more typical practice) due to the presence of a grant-funded coach in certain schools and districts to support the implementation of targeted and intensive interventions (Bradshaw et al., 2014). It may also be the case that the cost of coaching in our estimates was shifted to the schools, whereby it may be traditionally supported by the district.

Implications for School Psychologists and Future Directions

As school psychologists commonly engage with PBIS across all local organizational levels, this study has important relevance. At the macro level, it suggests that the inclusion of cost considerations into data-based decision making, in addition to implementation fidelity monitoring, may be a critical domain of practice as noted in the Model for Comprehensive and Integrated School Psychological Services (National Association of School Psychologists [NASP], 2010). However, there are current gaps in measurement of cost at the school level for practical purposes (e.g., not for the purposes of economic evaluation but for resource allocation; Bradshaw et al., 2020), and is an area for future development and research. Practicing school psychologists are prime candidates to serve as PBIS coaches, given their training and competence in critical and relevant areas (e.g., consultation, systems change, assessment, data gathering and monitoring, data-based decision making, behavioral principles; NASP, 2010). The findings of the current study also emphasize the relative importance of support provided at the school level (i.e., as compared to district and state levels), as well as the need to dedicate adequate time to and account for time spent providing this systems-level coaching (Pas et al., 2020). This need for additional and on-going training and school-based support for sustainability

are common challenges associated with PBIS and other school-based program implementation (Barrett et al. 2008) and are likely an area for professional development that school psychologists should focus on. Possible approaches to addressing this challenge include focusing on coaching to develop the competency of school personnel to implement EBPs across the tiered prevention model. From the perspective of economic evaluation, more work is needed both to understand the components of cost, particularly from different implementation support models, as well as pair this information with benefits and effectiveness.

Limitations

This paper summarized findings that may be generalizable to other states seeking to further implement PBIS or that have already scaled PBIS. The use of the IBCA illustrates how a cost evaluation of PBIS may inform both ongoing program evaluation and the relevant supports needed for scale-up of PBIS. Maryland is a national exemplar in the dissemination of PBIS (see Barrett et al., 2008; Bradshaw et al., 2014; Bradshaw & Pas, 2011) and PBIS has been integrated into two state-level laws. This, as well as the fact that additional support was provided to some schools by the grant-funded PBIS coach, suggests that this analysis might capture the cost of an optimally scaled-up version of PBIS. Thus, the cost in states with less support may be lower; however, this likely will have an impact on the implementation fidelity and outcomes associated with PBIS. Additionally, a part of the data collected about coaching was specific to middle school implementation of PBIS; less is known about either the cost or effectiveness of PBIS in middle schools (Lee & Gage, 2020). Additionally, more information is needed about how different aspects of support for PBIS, including fidelity, impact cost. Support for teachers in this study was accounted for in teacher time (Pas et al., 2020); however, additional teacher time spent on implementing components of PBIS in their classroom was not accounted for. While this time

would represent an opportunity cost in terms of lost instructional time, due to the impact of PBIS on behavioral outcomes of students (Lee & Gage, 2020) it might also represent a cost-savings. Nonetheless, we believe that the current findings may provide useful information to inform the scale-up of PBIS, by providing insight regarding the types of supports and costs that schools, districts, and state-level entities should be considering in scaling-up PBIS.

Conclusion

Taken together, the findings from this study suggests that the PBIS scale-up costs less than $50 per student, which is less than well-known socio-emotional programs like 4Rs ($420 per student), Second Step ($390 per student), and Responsive Classrooms ($900 per student; Belfield et al., 2015). Identifying information about both the benefits and costs of interventions is critical to support informed data-based decision making, a core component of the Model of Comprehensive and Integrated School Psychological Services (NASP, 2010). This paper takes an important and less common step in advancing the literature regarding a widely-implemented prevention framework, PBIS, in that it identifies the costs of scale-up. The availability of cost data may be particularly important for interventions for which the bulk of the cost relates to staffing, given that staffing often comprises the majority of implementation costs. Our findings also suggest that there is an ongoing need for resources to support high-quality implementation as well as advanced training. Despite these needs and costs, relative to other interventions to support social-emotional well-being (Belfield et al., 2015), and given the high-costs of suspensions and dropouts (Swain-Bradway et al., 2017), PBIS has the potential to have a high return on investment.

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Table 1.

Summary of the PBIS Program Inputs

Category	Description	
	Fixed Costs*	
Start-up costs	Program design and curriculum development/adaptation (e.g., staff time)	
Training	Tier I- fee per school and school staff stipends; 2-days long	
	Tier II- fee per school and school staff stipends; 1-day long	
	Tier III- fee per school and school staff stipends; 1-day long	
Equipment	Rare (mostly office equipment)	
	Variable Costs	
Labor	State department of education	
	Technical assistance agency	
	District coordinators (DC)	
	School coach/psychologist	
	Teachers	
	School administrators	
Refresher trainings / professional development	State & District	**PBIS State Leadership meeting** (6 per year)
		Other state level professional development for DCs- 2 per year
		PBIS State Coaches meetings- 2-4 per year
	Schools	District Coaches meetings- 4 per year
		Returning Team Training meetings- fee per school and staff stipends
Monitoring and evaluation	SET fidelity assessment	
	Data Management System (e.g., SWIS)	
Supplies	Coach/team leader incentives, marketing (printing)	
Overhead	Technical assistance agency and district coordination	

Note. *Fixed costs were annualized over the ingredients' lifetime and a 3% discount rate. SET = School-wide Evaluation Tool. SWIS = School-wide Information System.

Table 2.

PBIS Activities, Description and Cost by Agency and Cost Category

Activities and Description	Annual Cost 2018USD		%
Technical Assistance Agency			
Program start-up*		$10,593	1.4%
Wage + fringe benefits±		$625,876	84.5%
Staff professional development±		$11,848	1.6%
Staff travel		$376	0.1%
State coaches' meetings		$9,188	1.2%
Data management systems		$4,440	0.6%
Office equipment*±		$2,588	0.3%
Office overhead±		$75,748	10.2%
Total		$740,657	100.0%
Department of Education			
Program start-up*		$1,783	1.2%
Wages + fringe benefits±		$132,656	87.1%
Staff travel		$1,200	0.8%
State leadership meetings		$384	0.3%
Office equipment*±		$654	0.4%
Office overhead±		$15,571	10.2%
Total		$152,247	100.0%
District	Excludes OOP Costs	Staff OOP Costs	
PBIS Schools' trainings (Tier I)*			
PBIS Schools' trainings (Tier II)*	$52,077	$0	36.3%
PBIS Schools' trainings (Tier III)*			
Wages + fringe benefits±	$54,839	$0	38.2%
Training (variable) for district coordinators	$0	$8,440	5.9%
Refresher trainings for school teams	$12,500	$400	9.0%
Supplies	$1,300	$0	0.9%
Office equipment*±	$209	$0	0.1%
Office overhead±	$13,776	$0	9.6%
Total	$134,701	$8,840 $143,541	100.0%
School	Excludes OOP Costs	Staff OOP Costs	
Wages + fringe benefits± Coach	$20,811	$0	76.1%
Wages + fringe benefits± Teachers	$0	$2,526	9.2%
Wages + fringe benefits± School Administrators	$0	$502	1.8%
Refresher trainings	$270	$320	2.2%
Supplies	$432	$0	1.6%

Office equipment*±	$45	$0	0.2%
Office overhead±	$2,456	$0	9.0%
Total	$24,015	$3,348 $27,363	100.0%

Note. OPP: Out-of-pocket costs. *Fixed cost. ± Indicates inputs for which the cost is shared between the agencies' PBIS and other prog

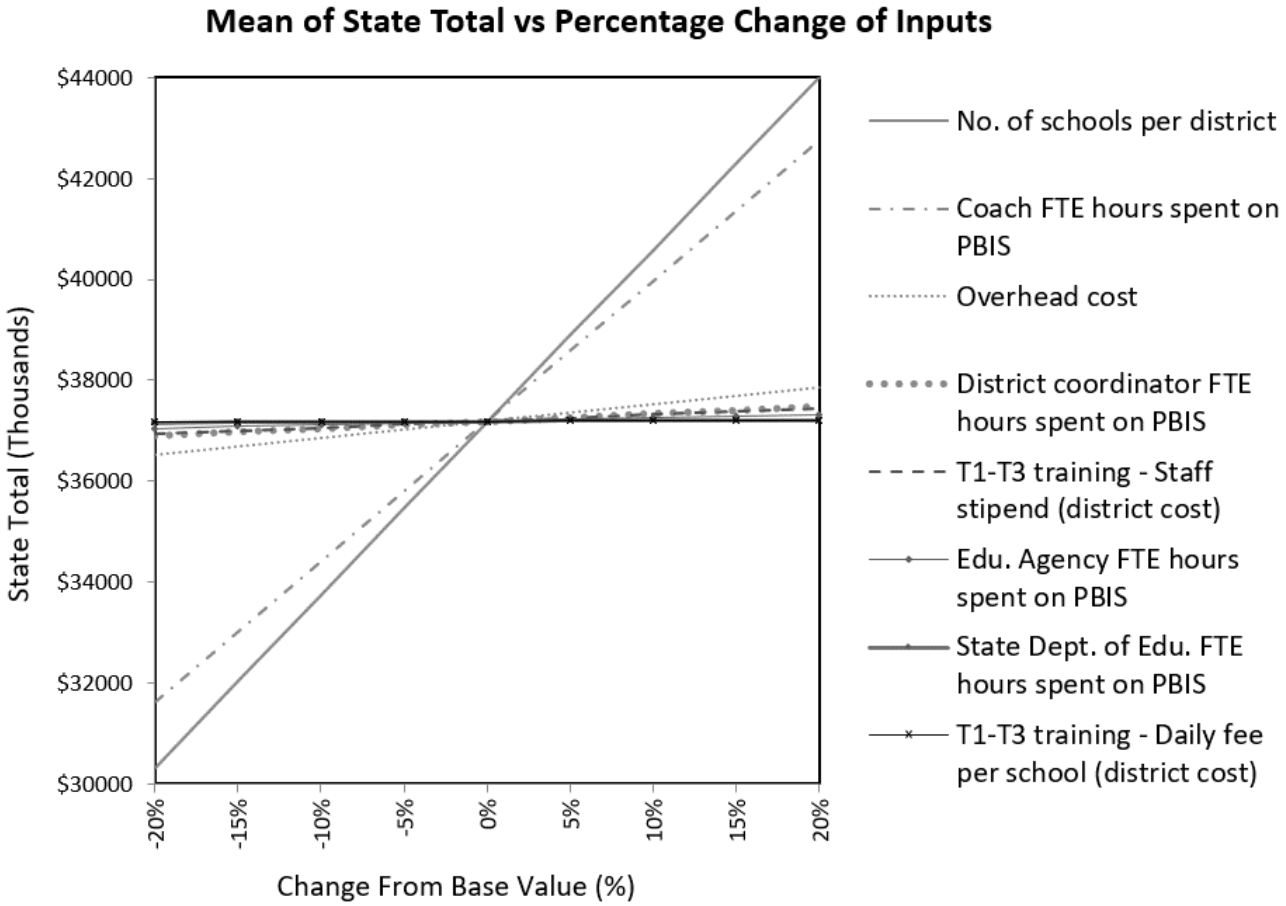
Table 3.

Total State Level PBIS Cost by Agency

Total Cost	Technical Assistance Agency	State Dept. of Education	District	School	State Total (x100%)		
Per State	$740,657	$152,247			$892,904	(0.02)	
Per District (24 per State)			$143,541		$3,444,977	(0.09)	$37,173,275
Per School (Avg. 50 per District)				$27,363	$32,835,394	(0.88)	
Per Student (Avg. 636 per School)	$0.97	$0.20	$4.51	$42.99		$48.67	

Figure 1.

Cost Sensitivity Analyses



Note. Inputs listed in order of effect on total cost. Changing the top three inputs by the same percent produce the greatest change in the PBIS program's total cost. Notes: FTE = full-time equivalent. T1-T3 = Tiers 1 through 3 programs. PBIS = Positive Behavioral Interventions and Supports.

Appendix A

Consolidated Health Economic Evaluation Reporting Standards (CHEERS) Checklist for Economic Evaluation of Health Interventions

All analyses and reporting of results were conducted in accordance with the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) for the economic evaluation of health interventions (Husereau et al., 2013). The CHEERS guidelines describe the various data and methodological elements required for conducting economic evaluations (e.g. cost studies, cost-effectiveness studies, cost-benefit studies). The table below summarizes the complete list of 24 elements and marks each as either "YES", indicating that the item was evaluated and reported in the manuscript, or "NA", indicating that the item was not applicable to this this type of economic evaluation.

Section/Topic	Checklist Item	Response
Title/Subtitle	Study identified as an economic evaluation and describes the interventions compared	Yes
Background and objectives	Provides an explicit statement of the broader context for the study explicitly presenting the study question and its relevance for health policy or practice decisions	Yes
Target Population and Sub-groups	Describes the characteristics of the base case population and sub-groups analyzed, including why they were chosen	Yes
Setting and Location	States relevant aspects of the system(s) in which the decision(s) need(s) to be made	Yes
Study Perspective	Describes the perspective of the study and relates this to the costs being evaluated	Yes
Comparators	Describes the interventions or strategies compared and states why they were chosen	N/A
Time Horizon	States the time horizon(s) over which costs and consequences are being evaluated	Yes
Discount Rate	Reports the choice of discount rate(s) used for costs and outcomes and says why appropriate.	Yes
Choice of Health Outcomes	Describes what outcomes were used as the measure(s) of benefit in the evaluation and their relevance for the type of analysis performed	N/A
Measure of Effectiveness	*Single study-based estimates:* Describes fully the design features of the single effectiveness study, and why the single study was a sufficient source of clinical effectiveness data	N/A
	Synthesis-based estimates: Describes fully the methods used for identification of included studies and synthesis of clinical effectiveness data	N/A
Measurement and valuation of preference based outcomes	Describes the population and methods used to elicit preferences for outcomes	N/A
Estimating resources and costs	*Single study-based economic evaluation:* Describes approaches used to estimate resource use associated with the alternative Interventions, primary or secondary research methods for valuing each resource item in terms of its unit cost, and any adjustments made to approximate to opportunity costs	Yes
	Model-based economic evaluation: Describes approaches and data sources used to estimate resource use associated with model health states. Describes primary or secondary research methods for valuing each resource item in terms of its unit cost and any adjustments made to approximate to opportunity costs	Yes
Currency, price date, and conversion	Reports the dates of the estimated resource quantities and unit costs, methods for adjusting estimated unit costs to the year of reported costs if necessary, and methods for converting costs into a common currency base and the exchange rate	Yes
Choice of model	Describes and gives reasons for the specific type of decision analytical model used	N/A
Assumptions	Describes all structural or other assumptions underpinning the decision-analytical model	N/A
Analytical methods	Describes all analytical methods supporting the evaluation. This could include methods for dealing with skewed, missing, or censored data; extrapolation methods; methods for pooling data; approaches to validate or make adjustments (such as half cycle corrections) to a model; and methods for handling population heterogeneity and uncertainty	Yes
Study parameters	Reports the values, ranges, references, and, if used, probability distributions for all parameters, reasons or sources for distributions used to represent uncertainty where appropriate.	Yes
Incremental costs and outcomes	For each intervention, reports mean values for the main categories of estimated costs and outcomes of interest, as well as mean differences between the comparator groups. If applicable, reports incremental cost-effectiveness ratios.	N/A
Characterizing uncertainty	*Single study-based economic evaluation:* Describes the effects of sampling uncertainty for the estimated incremental cost and incremental effectiveness parameters, together with the impact	Yes
	Model-based economic evaluation: Describes the effects on the results of uncertainty for all input parameters, and uncertainty related to the structure of the model and assumptions	N/A
Characterizing heterogeneity	If applicable, reports differences in costs, outcomes, or cost-effectiveness that can be explained by variations between subgroups of patients with different baseline characteristics or other observed variability in effects that are not reducible by more information	Yes
Discussion	Summarizes the key findings and describes how they support the conclusions reached	Yes
	Discusses the limitations and the generalizability of the findings and how they fit with current knowledge	Yes

Appendix B

Expanded data for cost estimates

The following tables provide details about the data used to produce annual cost estimates for various program inputs. The qualitative and quantitative methods used for capturing this data are described in the manuscript. The data includes values on the total count and or frequency of inputs (e.g., count of staff and their professional specialty, number, type and length of trainings). The data is listed by agency and cost category. Additionally provided are a breakdown of fixed and variable costs, including the total state cost broken down by these costs per agency. Finally, specific results of the sensitivity analyses are presented that indicate the percent change in cost based on changes in input parameters.

Table 1.

Detailed List of PBIS Activities and Descriptions

Technical Assistance Agency
Program start-up* (3-months of 6 FTE psychologists / behavioral sciences experts.)
Wage + fringe benefits± (Co-director, assistant director, technical specialists, curriculum development and video recording consultants.)
Staff professional development± (Conferences for PBIS specialists, 2-4 times per year.)
Staff travel (Local PBIS meetings.)
State coaches' meetings (Two to four full-day meetings per year with guest speakers, at least one in-person, attendees include school coaches, district coordinators, and state dept. of education specialists. Cost includes venue, speaker and materials. Meeting topics change depending on the annual plan's focus (e.g. disproportionality training, 10 essential features, radical adaptation, etc.)
Data management systems
Office equipment*± (Computers & software.)
Office overhead ±
State Department of Education
Program start-up* (Core staff for 3-6 months.)
Wages + fringe benefits ± (Director, co-director, senior PBIS and behavioral support specialists.)
Staff travel (Local PBIS meetings.)
State leadership meetings (Occurs every one-to-two months for half-day. Participants include district coordinators, state-level PBIS specialists and other researchers. About 20-30 people per meeting. Opportunity cost includes in-kind resources for the venue.)
Office equipment*± (Computers & software.)
Office overhead ±
District
PBIS Schools' trainings (Tier I)* (Mostly done by district coordinators, but also by the technical assistance agency if the school is willing to pay the fee. Fee includes a maximum of 10 people per training. Done the 1st & 2nd years, each is 2 days long, and repeated every 10 years. Cost includes the fee and school staff stipend.)
PBIS Schools' trainings (Tier II)* (Same as Tier I except each is 1 day long.)
PBIS Schools' trainings (Tier III)* (Under development, assumes same as Tier II.)
Wages + fringe benefits ± (District coordinator- one per district.)
Training (recurrent) for district coordinators (1) State leadership meetings; 2) State coaches' meetings; and 3) Staff professional development, 2 per year not mandatory. OOP cost is non-reimbursed transport.)
Refresher trainings for school teams (1) District quarterly coaches' meetings: district coordinator and coach one-on-one meetings; and (2) summer returning team training (RTT): co-organized with other districts to share costs. Cost is an average for 3 counties, $250 fee/school, includes 5-6 staff per school, 0.5-2 days. Labor is covered in wages. Cost includes in-kind resources when applicable: venue, speaker, materials, food. Teacher substitutes are paid by schools and OOP cost is non-reimbursed transport.)
Supplies (Incentives for coaches or school team leaders: goodies.)
Office equipment*± (Computers & software.)
Office overhead ±
School
Wages + fringe benefits ± (Coach time: 20% of a FTE; teachers and school administrators time: 46 and 7 hours per year, respectively. Estimates are based on 20 MDS3 schools--an optimal PBIS case scenario.)
Refresher trainings (1) State coaches' meetings: includes 1 coach per school, cost includes teacher substitutes if the participant is a teacher and is paid by schools, but may also be covered by district training substitute-funds; 2) district quarterly coaches meeting; and 3) RTT. Costs include staff's OOP expenditure for non-reimbursed transport costs. Staff overtime is covered in OOP wages.
Supplies (SET assessment consultant.)
Office equipment*± (Computers & software.)
Office overhead ±

OPP: Out-of-pocket costs. *Fixed Costs. ± Indicates inputs for which the cost is shared between the agency's PBIS and other programs.

Table 2.

Fixed versus Variable Total Cost by Agency

Agency	Annual Cost 2018 USD	%
Technical Assistance Agency		
Fixed (Program start-up & Equipment)	$13,181	1.8%
Variable	$727,476	98.2%
Total	$740,657	100.0%
Department of Education		
Fixed (Program start-up & Equipment)	$2,437	1.6%
Variable	$149,810	98.4%
Total	$152,247	100.0%
District		
Fixed (School trainings Tier 1-3 & Equipment)	$52,286	36.4%
Variable	$91,255	63.6%
Total	$143,541	100.0%
School		
Fixed (Office equipment)	$45	0.2%
Variable	$27,318	99.8%
Total	$27,363	100.0%

Table 3.

Total State Cost Stratified by Fixed versus Variable Cost and Agency

Cost Type by Agency		State Total	
Fixed Costs			
Per State	$15,618		
Per District (24 per State)	$1,254,863	$1,324,834	3.6%
Per School (Avg. 50 per District)	$54,353		
Variable Costs			
Per State	$877,286		
Per District (24 per State)	$2,190,114	$35,848,441	96.4%
Per School (Avg. 50 per District)	$32,781,041		
Both Fixed & Variable Costs			
Per State	$892,904		
Per District (24 per State)	$3,444,977	$37,173,275	100.0%
Per School (Avg. 50 per District)	$32,835,394		

Table 4.

Change in Mean Total State with Different Percentage Changes in Input Parameters

% Change in Input	No. of schools per district		Coach FTE hours spent on PBIS		Overhead cost		District coordinator FTE hours spent on PBIS		T1-T3 training - staff stipend (district cost)		Edu. agency FTE hours spent on PBIS		State Dept. of Edu. FTE hours spent on PBIS		T1-T3 training - Daily fee per school (district cost)	
	Mean	% Change	Mean	% Change	Mean	% Change	Mean	% Change	Mean	% Change	Mean	% Change	Mean	% Change	Mean	% Change
-20.0%	$30,328,679	-18.41%	$31,616,905	-14.95%	$36,513,608	-1.77%	$36,897,582	-0.74%	$36,931,489	-0.65%	$37,050,055	-0.33%	$37,159,061	-0.04%	$37,168,033	-0.01%
-15.0%	$32,040,214	-13.81%	$33,008,363	-11.20%	$36,682,302	-1.32%	$36,970,894	-0.54%	$36,995,860	-0.48%	$37,084,806	-0.24%	$37,166,550	-0.02%	$37,173,280	0.00%
-10.0%	$33,751,749	-9.20%	$34,399,820	-7.46%	$36,850,996	-0.87%	$37,044,207	-0.35%	$37,060,231	-0.30%	$37,119,557	-0.14%	$37,174,038	0.00%	$37,178,528	0.01%
-5.0%	$35,463,283	-4.60%	$35,791,278	-3.72%	$37,019,690	-0.41%	$37,117,519	-0.15%	$37,124,602	-0.13%	$37,154,308	-0.05%	$37,181,527	0.02%	$37,183,776	0.03%
0.0%	$37,174,818	0.00%	$37,182,735	0.03%	$37,188,385	0.04%	$37,190,831	0.05%	$37,188,973	0.04%	$37,189,060	0.04%	$37,189,015	0.04%	$37,189,023	0.04%
5.0%	$38,886,353	4.61%	$38,574,193	3.77%	$37,357,079	0.49%	$37,264,143	0.24%	$37,253,344	0.22%	$37,223,811	0.14%	$37,196,504	0.06%	$37,194,271	0.06%
10.0%	$40,597,888	9.21%	$39,965,650	7.51%	$37,525,773	0.95%	$37,337,455	0.44%	$37,317,715	0.39%	$37,258,562	0.23%	$37,203,992	0.08%	$37,199,519	0.07%
15.0%	$42,309,423	13.82%	$41,357,108	11.25%	$37,694,467	1.40%	$37,410,768	0.64%	$37,382,086	0.56%	$37,293,313	0.32%	$37,211,481	0.10%	$37,204,766	0.08%
20.0%	$44,020,958	18.42%	$42,748,565	15.00%	$37,863,162	1.86%	$37,484,080	0.84%	$37,446,457	0.73%	$37,328,064	0.42%	$37,218,969	0.12%	$37,210,014	0.10%

Notes: FTE = full-time equivalent. T1-T3 = Tiers 1 through 3 programs. PBIS = Positive Behavioral Interventions and Supports.