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Research article

Economic value of community-based services for problematic sexual behaviors in youth: A mixed-method cost-effectiveness analysis

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ABSTRACT

Background: Problematic sexual behavior in youth represents a significant public health problem in need of evidence-based treatments. Unfortunately, such treatments are not available in most communities.

Objective: This study used a mixed quantitative-qualitative approach to investigate the economics of the implementation of Problematic Sexual Behavior – Cognitive-Behavioral Therapy (PSB-CBT), an evidence-based treatment for problem sexual behaviors in youth.

Participants and setting: Youth (N = 413) participated in PSB-CBT at six program sites in youth service agencies across the United States.

Method: We used cost-effectiveness ratios (CERs) to compare the direct and indirect costs of PSB-CBT to self- and caregiver-reported youth clinical outcomes (i.e., problem sexual behavior as well as secondary behavioral health problems). CERs represented the cost of achieving one standard unit of change on a measure (i.e., d = 1.0). The design and interpretation of those quantitative analyses were informed by qualitative themes about program costs and benefits that were derived from interviews with 59 therapists, administrators, and stakeholders.

Results: CERs (i.e., $ per SD) were $1,772 per youth for problem sexual behavior and ranged from $2,867 to $4,899 per youth for secondary outcomes. These quantitative results, considered alongside the qualitative perspectives of interviewees, suggested that the implementation of PSB-CBT was cost-effective. The results were robust to uncertainty in key parameters under most, but not all, conditions.

Conclusions: The results have important implications for decisions made by administrators, policymakers, and therapists regarding use of community-based approaches to address problematic sexual behavior of youth.

1. Introduction

Problematic sexual behavior (PSB) in youth, defined as youth-initiated sexual behavior that is developmentally inappropriate or potentially harmful to the youth or others (Chaffin et al., 2008), represents a significant public health problem. Types of behaviors

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range from rape to fondling to exposing one's genitals to others. Each year, approximately 89,000 youth are charged with engaging in illegal PSB, of whom 93% are male (Finkelhor, Ormrod, & Chaffin, 2009). PSB peaks in prevalence between the ages of 12 and 14 years (Finkelhor et al., 2009) and is found in children as young as 3 years (Chaffin et al., 2008; Silovsky & Niec, 2002). Long considered youth "curiosity" or "experimentation" (Ryan, Lane, Davis, & Isaac, 1987), PSB is now recognized as causing potential pain and suffering for victims as well as considerable economic impact in medical, behavioral health, social services, and criminal justice systems (Freyd et al., 2005; Letourneau, Eaton, Bass, Berlin, & Moore, 2014). Indeed, approximately 25–33% of child sexual abuse incidents are committed by another youth (Finkelhor et al., 2009; Hackett, 2014; National Children's Alliance, 2016). Therefore, intervention efforts that focus on evidence-based treatment (EBT) for youth PSB have been identified as a promising strategy to reduce the social and economic impact of these behaviors (Chaffin, 2008; Rothman, 2016). Research findings that demonstrate such reductions would be useful for policymakers to consider in their funding decisions about community-based services for PSB in youth.

The present study investigated the economic costs and societal benefits of Problematic Sexual Behavior – Cognitive-Behavioral Therapy (PSB-CBT), a community-based, group-format treatment that has demonstrated significant effects on PSB in youth ages 7 to 14 (see Hanson, Bourgon, Helmus, & Hodgson, 2009; Office of Juvenile Justice & Delinquency Prevention, 2015; Silovsky et al., 2019Silovsky, Hunter, & Taylor, 2019; St. Amand, Bard, & Silovsky, 2008). PSB-CBT takes an early intervention approach by intervening after PSB has been identified by parents or professionals (e.g., teachers, mental health providers) but before significant legal involvement is required. A 10-year follow-up to an initial randomized clinical trial with 135 preadolescent youth (Carpentier, Silovsky, & Chaffin, 2006) found that PSB-CBT resulted in rates of PSB comparable to those observed in youth with no history of PSB (2–3%) and significantly lower than the comparison play therapy group (10%). As part of a more recent implementation effort that expanded PSB-CBT to include additional sessions that addressed the needs of 13- and 14-year-olds, quantitative analyses ($N = 301$ youth) found that PSB-CBT produced large reductions in PSB ($d = 2.08$) as well as improvements in nonsexual behavior problems, emotional problems, and trauma symptoms (Silovsky et al., 2019). Qualitative surveys and interviews with a subset ($n = 30$) of caregivers and youth from that sample reflected gains in relevant skills and knowledge; both caregivers and youth recommended expanded availability of the program (Shields et al., 2018).

Unfortunately, EBTs such as PSB-CBT are not available in most communities. Many youth continue to receive either residential treatment or a relapse-prevention-oriented CBT model that was originally designed for adults with pedophilic disorders and has limited empirical support with youth (see Dopp, Borduin, Rothman, & Letourneau, 2017). Further, few programs actively involve the parents or other caregivers in treatment, yet such involvement is a key component of effective treatment for PSB (Henggeler et al., 2009; St. Amand et al., 2008). Dissemination of PSB-CBT is limited by its complexity; it incorporates community-based services for youth with PSB and their families, as well as training and organizational restructuring processes for provider agencies and their stakeholder partners (Cheung & Brandes, 2011). Not only are complex treatment models challenging to implement, but they also involve considerable financial costs – including direct expenditures, but also indirect costs such as lost productivity or revenue while participating in implementation activities – that represent key barriers to EBT implementation and sustainability (Bond et al., 2012; Okamura et al., 2018; Pfadenhauer et al., 2017). Nevertheless, expenses related to implementing EBTs can be off-set by considerable economic benefits (Borduin & Dopp, 2015). Thus, it seems worthwhile to consider the economic value of investment in PSB-CBT.

In the present study, we contributed to the growing literature on treatment of youth PSB by performing an economic evaluation of PSB-CBT using data from the Community-Based Services for Problematic Sexual Behavior of Youth Project (2011-2017). Cost-effectiveness analysis (see Sanders et al., 2016) compares the costs (in monetary units) and outcomes (in units relevant to that outcome) of clinical services, and is particularly well suited to evaluating outcomes that have intrinsic value to health care recipients and other stakeholders (e.g., improved quality of life, avoided sexual abuse). Moreover, traditional economic evaluation is a purely quantitative set of methods, but a growing group of scholars has advocated for the incorporation of qualitative methods (e.g., interviews, focus groups, content analysis; see e.g., Johnson et al., 2004; Onwuegbuzie & Teddlie, 2003; Rogers, Stevens, & Boymal, 2009; Ziller & Phibbs, 2012). These scholars note shortcomings of quantitative economic evaluations, such as difficulties in fully monetizing the costs of complex interventions or in comparing monetary costs to outcomes whose values are especially challenging to quantify (e.g., pain and suffering). Therefore, we integrated qualitative methods into our cost-effectiveness analysis of PSB-CBT to ensure comprehensive measurement, analysis, and interpretation of the economic costs and outcomes of that treatment. Our mixed-method (i.e., quantitative and qualitative) approach to economic evaluation is an innovative extension of best practices in implementation science (see Palinkas et al., 2011). In addition, as is best practice in cost-effectiveness analysis (Sanders et al., 2016), we used sensitivity analysis to examine the influence of uncertainty in key study parameters on our findings.

In sum, the present study used mixed-method cost-effectiveness analysis to compare the costs of implementing PSB-CBT with key clinical outcomes. To our knowledge, the present study is the first mixed-method economic evaluation for any youth-focused behavioral EBT.

2. Method

2.1. Setting

This study took place at six PSB-CBT program sites, each located in a different state. Each site received a cooperative agreement grant from the United States' Federal Office of Juvenile Justice and Delinquency Prevention (OJJDP) between 2011 and 2015. The grants were designed to support the establishment of community-based, EBT-centered services for youth with PSB, their child victims, and their families. All sites had been active for at least one year at the time that we collected data for the present study. The only site

inclusion criterion for this study was implementation of PSB-CBT with adequate fidelity; our inclusion strategy was intentionally broad to avoid introducing bias into our analyses by only focusing on sites with "ideal" implementation. Six out of eight total sites met the inclusion criterion.

During their funding period, each site: (a) received onsite training (2–3 times, 2–3 days each) in the PSB-CBT model, plus ongoing phone consultation and fidelity monitoring, from PSB-CBT master trainers; (b) established procedures for referrals, intakes, and treatment; and (c) began group treatment programs for youth with PSB and their caregivers. The number of providers per site ranged from 2 to 10 (M = 6.7). Program and service implementation were guided by a multidisciplinary team of representatives from local law enforcement, juvenile justice, child welfare, victim advocacy, community support, and behavioral health agencies.

2.2. Participants

Participants were 413 youth whose families participated in a PSB-CBT program in one of six program sites, with an average of 68.83 (SD = 45.6) youth per site. Clinical referrals to the sites came through a variety of community and state agencies (e.g., child welfare, 34%; children's advocacy centers, 23%; juvenile justice, 8%). To be eligible for PSB-CBT, youth needed to have: (a) been between 10 to 14 years old at the time of the PSB; (b) engaged in PSB with a minor child in their family or social network; (c) at least one caregiver available to participate in treatment; and (d) no prior history of court involvement for PSB. Further, youth were excluded from enrollment if: (e) their PSB did not involve another person (e.g., excessive masturbation); (f) their family lived outside the service area of the program to which they were referred; or (g) they were diagnosed with autism or a developmental disability with functional impairment that would hinder participation in cognitive-behavioral group treatment.

Enrolled youth were on average 12.6 years old (SD = 1.7); 90% were male; and 58% had a birth parent as their primary caregiver. The six sites varied on some demographics of the enrolled youth. Specifically, there were significant differences in the ages of the youth ($F_{5,399}$ = 3.72, $p < 0.01$, R^2 = 0.04), with mean ages per site ranging from 11.6 (SD = 1.3) to 13.1 (SD = 1.3) years. Moreover, race/ethnicity composition differed between sites ($\chi^2(15, N = 413) = 266.5$, $p < 0.001$, $\varphi = 0.40$); the majority of the youth served were Hispanic/Latino at one site (61%), White at three sites (58–67%), African American at one site (75%), and a mix of White and African American at the remaining site (42% and 27%, respectively). Across sites, 23% of youth had been charged with a sexual offense and 32% were court-ordered to receive treatment for PSB; 20% of youth had caregivers who were also court-ordered to receive treatment.

2.3. PSB-CBT

PSB-CBT is an EBT originally designed to treat PSB in youth ages 6 to 12 (Bonner, Walker, & Berliner, 1999). It is a cognitive-behavioral group treatment model, with concurrent groups for youth and their caregivers, as well as sessions that combine the two groups. The model is grounded in behavioral and social learning theories, with core principles emphasizing use of reinforcement contingencies and social modeling to impact behavior and cognitions in a trauma-informed manner. Further, the underlying approach is strengths-based, focusing on the youth as children first with capacity to learn and implement appropriate behavior, make safe decisions, and develop healthy relationships. For the current project, additional content from a group treatment program for adolescents with illegal sexual behavior (Bonner et al., 2009) was added to the PSB-CBT model to extend the treatment to 13- and 14-year old youth (e.g., sex laws and monitoring sexual situations, developmentally appropriate sexual education materials). Sites were permitted to supplement the PSB-CBT group programming with individual, family, and case management services as needed. All sites provided services in English and one site also provided services in Spanish; translation services were provided at some sites.

Of the 680 youth initially referred for PSB, 509 (75%) completed an intake assessment, 413 (81% of those that completed an intake) enrolled in the treatment program, and 245 (59% of those that enrolled) completed the PSB-CBT program. Of the youth who completed the program, the average number of group sessions was similar across sites, ranging from 15 to 27 sessions with an average number across the programs of 21.8 sessions (SD = 10.8). The observed differences in length of treatment arose because graduation from PSB-CBT is determined based on the progress made by the family (e.g., no PSB incidents, demonstrated application of targeted skills by youth and caregivers) rather than a specific number of sessions.

2.4. Procedures

Data were originally collected from the sites for the purposes of program evaluation and quality improvement. All procedures and measures for the evaluation were approved by the sites and the Institutional Review Boards of the University of Oklahoma Health Sciences Center and the sites.

Data were collected using three methods. First, each site entered de-identified information about program recipients into a site-specific database. That database included the following information on youth: demographics; referral source; level of involvement with juvenile justice and child welfare; disposition after the initial assessment; disposition when exiting the program; and a common core of standardized youth- and caregiver-report measures. Each site shared its database (via a secure encrypted file system) with the research team, which merged all site databases into a single evaluation database. Second, semi-structured qualitative interviews were conducted with a purposive sample of site therapists (n = 15) and administrators (n = 12), as well as key stakeholders in the community (e.g., juvenile court judges and attorneys, probation and law enforcement officers, child welfare agents; n = 32). On-site personnel or their assistants identified the most appropriate potential interviewees. Of the 74 potential interviewees contacted, the research team interviewed 59 (response rate of 80%). Each was offered a $25 gift card as compensation for their time. Interviews

were conducted over the phone and double audio recorded; they lasted an average of 40 min (range = 24–78 min). Finally, for the present study, the senior investigator (third author) facilitated completion of a cost interview with a program administrator from each site to collect in-depth, quantitative cost information.

2.5. Measures

2.5.1. Youth symptoms

2.5.1.1. Problematic sexual behaviors. The Youth with Sexual Behavior Problems Inventory (YSBPI; Silovsky, Chaffin, Swisher, & Pierce, 2011) measured PSB in youth for this study. The YSBPI is a 30-item, caregiver-report inventory that assesses the presence, frequency, and functional impact of a range of PSBs over the previous six weeks. The YSBPI was administered pre-treatment as part of the comprehensive intake used to determine whether the youth met inclusion criteria to receive PSB-CBT; every six weeks during treatment; at time of discharge from treatment; and three months after discharge. Internal consistency was strong ($\alpha = 0.89$).

2.5.1.2. Nonsexual behavior problems. Nonsexual behavior problems (e.g., oppositional behavior, hyperactivity) were measured with the broadband Externalizing subscale of the caregiver-completed Child Behavior Checklist (CBCL) and the youth-completed Youth Self-Report (YSR)(both Achenbach & Rescorla, 2001). Each measures a broad range of emotional and behavioral concerns over the past six months. The CBCL is designed for youth ages 6–18 years old, whereas only youth ages 11 and older can complete the YSR. Subscale items were summed and converted to *T*-scores, with *T*-scores greater than 65 considered clinically significant. Both measures have been used extensively in clinical research with children and have demonstrated good reliability and validity (see Achenbach & Rescorla, 2001).

2.5.1.3. Emotional problems. We measured emotional problems (e.g., depression, anxiety) using the broadband Internalizing subscale of the CBCL and the YSR (see above). Subscale item totals were converted to T-scores as described above.

2.5.1.4. Traumatic stress. The caregiver-report version of the University of California-Los Angeles Posttraumatic Stress Disorder Index for DSM-IV (UCLA; Steinberg, Brymer, Decker, & Pynoos, 2004) was used to screen for a youth's exposure to traumatic events (lifetime) and, if a traumatic event was endorsed, DSM-IV traumatic stress symptoms (past month). Symptom items were summed to create a Total Severity Score. Previous research has demonstrated that the UCLA has strong reliability and validity (see Steinberg et al., 2004).

2.5.2. Qualitative interviews

A team of researchers with expertise in qualitative methodology, evidence-based practices, and PSB developed interview guides for each interviewee category (i.e., therapist, administrator, stakeholder). Copies of the interview guides are available from the third author upon request. Therapists were asked about the amount of time spent on multiple activities related to the PSB-CBT program, as well as the personal costs and benefits they experienced as a result of having participated in training for PSB-CBT. Administrators were asked about the costs and current funding sources for the program; benefits of having the program in the community; and sustainability of the program over time. Stakeholders were asked similar questions as the administrators, except they were asked if their agency has any plans to help sustain the program rather than about current funding. Interviews followed a semi-structured format in which respondents were asked the same questions with the opportunity for customized follow ups and suggested probes depending on respondent answers.

Interviews were transcribed verbatim, cross-checked by another researcher, and analyzed by a team of four researchers using QSR NVivo 11, a qualitative data analysis program. Two interviews (3% of all interviews) could not be transcribed due to corrupt audio and were excluded from the analysis. A preliminary codebook was developed through *open coding* by all coding team members, after which two members worked collectively to conduct *focused coding* (Bazeley, 2013; Charmaz, 2014), in which they refined the codebook into a hierarchical coding tree schema. Focused coding was further refined as the two researchers independently recoded 15 randomly selected transcripts (26% percent of all transcripts; 5 from each interviewee type). Discrepancies were discussed and resolved through a consensus building process. Percent agreement for the various themes ranged from 97%–100% and the overall kappa coefficient was 0.66. Both percent agreement and kappa were calculated using NVivo's coding comparison by paragraph query (unweighted).

2.5.3. Interviews for quantitative cost data

For the purposes of the present economic evaluation, we developed a quantitative cost survey that collected information from the program sites about a number of activities, expenses, and other considerations with associated costs that are typically related to running a PSB-CBT program. It was necessary to develop the cost survey because no standardized instrument (see e.g., the Substance Abuse Services Cost Analysis Program; Zarkin, Dunlap, & Homsi, 2004) was available for collecting PSB-CBT program costs. A copy of the survey is available from the first author upon request.

The categories and subcategories covered by the cost survey were informed by initial findings from our qualitative interviews and included: (a) staff activities (i.e., salaries/wages and fringe benefits; time spent on various PSB-CBT treatment, assessment, and administration activities); (b) expenses for training (including number of personnel trained and time spent in training); (c) number of youth served (i.e., to allow for calculation of per-youth expenses); and (d) billing sources for various PSB-CBT activities. For each category, a program administrator reported the resources that their organization dedicated to the PSB-CBT program over the past six

months. We also asked the program administrators to quantify anticipated expenses of outcomes for youth if the PSB-CBT program had not been available (e.g., residential treatment, juvenile detention), but all reported that they had significant challenges in providing specific values for these outcomes; therefore, we relied on information from the qualitative interviews when considering the potential outcomes of not offering the PSB-CBT program.

We facilitated completion of the cost survey by program administrators in three steps. First, the senior investigator provided an electronic copy of the survey to the administrator and oriented that person to the interview during a telephone call. The administrator then independently gathered information needed to complete the cost survey and filled in as many values as possible, consulting with the senior investigator by email or phone as needed. Finally, the senior investigator and the administrator reviewed the survey together in another telephone call and finalized the reported values. All monetary values were reported in 2017 U.S. dollars. In general, administrators were encouraged to provide their best estimate of each value (focusing on a representative or typical estimate for values that varied) and were permitted to skip sub-categories within survey items (e.g., particular staff positions or billing sources) that did not apply to their program. The senior investigator consulted with the first author, an expert in economic evaluation of EBTs, as needed throughout the process.

2.6. Analytic strategy

The present economic evaluation applied cost-effectiveness analysis (see Sanders et al., 2016) to the costs and clinical outcomes of implementing PSB-CBT using four steps: (1) estimation of per-site and per-youth costs, (2) estimation of change in clinical outcomes, (3) calculation and interpretation of cost-effectiveness ratios, and (4) sensitivity analyses. We conducted the analysis from the perspective of the community-based agencies that implemented PSB-CBT. Sanders et al. (2016) state that cost-effectiveness analyses from both the societal and health care system perspectives are valuable for health care decision-making, and we contend that the health care system perspective is particularly relevant to implementation research – where the goal is often to understand a particular system's or agency's efforts to implement an evidence-based practice.

2.6.1. Costs

We calculated the costs of PSB-CBT implementation using four sub-steps. First, for each program site, we summed all direct (i.e., personnel, supplies, training fees) and indirect expenses reported in the cost interview to estimate the full six-month cost of program implementation at each site. For indirect costs, we only considered the incremental costs of implementing PSB-CBT; other types of indirect costs (e.g., overhead, infrastructure, administration) did not vary as a function of implementation in this study, given that program sites provided the treatment using the same, non-modified facilities as for any other services. Specifically, we estimated the incremental indirect costs as: (a) lost productivity of therapists and supervisors for time spent engaged in PSB-CBT training and consultation activities instead of their typical duties; and (b) lost revenue due to provision of PSB-CBT services that were not reimbursed. We estimated those values using the price of alternative uses of a person's time (i.e., "shadow price"; McIntosh, 2010), with all values adjusted to 2017 U.S. dollars using the Consumer Price Index (Bureau of Labor Statistics, 2017a) to account for inflation. For therapist productivity and lost revenue, we used the Medicaid reimbursement rate for an hour of individual psychotherapy in the state where each site was located as the shadow price. These values were publicly available and averaged $83 per session ($SD$ = $16.51); we do not list sources here to protect the confidentiality of participating sites. However, we assumed no lost revenue for non-reimbursed services at sites that provided services free of charge (e.g., children's advocacy centers). For supervisor productivity, we assumed that they spent 10% of their time on direct service delivery and 90% of their time on supervision and administration, following another economic evaluation of EBT implementation (Dopp, Hanson et al., 2017Dopp, Hanson, Saunders, Dismuke, & Moreland, 2017). In this case, we used shadow prices – again, specific to the state in which the site was located – taken from: (a) the aforementioned Medicaid reimbursement rates for direct service delivery; and (b) the hourly wages for social and community service managers in the National Compensation Survey (Bureau of Labor Statistics, 2017b), which averaged $36 ($SD$ = $6.24) across the six states, for supervision and administration.

Next, to calculate the per-youth costs of implementing PSB-CBT at each site, we divided the total cost of PSB-CBT over a six-month period by: (a) the number of youth served at the site within the same time period and (b) the average length (in months) of PSB-CBT group treatment at the site. The latter value adjusted for the fact that a typical course of PSB-CBT did not last exactly six months. Third, we adjusted each average per-youth cost from state-specific values to national average U.S. dollar values using the Council for Community and Economic Research (CCER) Cost of Living Index (Council for Community & Economic Research, 2017) to account for cost of living differences. Finally, we calculated the median per-youth cost of PSB-CBT across all six sites.

2.6.2. Clinical outcomes

We estimated changes in youth symptoms across time (i.e., pre to post) using paired t-tests in the R statistical computing environment (R Core Team, 2017). We used listwise deletion under the assumption that data were missing completely at random; the overall proportion of missing data was generally small (e.g., 3% for the comparison of age across sites), which minimizes the impact of violations of this assumption. We expressed changes in outcome measures using the effect size Cohen's d (i.e., Cohen, 1988), which we calculated such that a positive number represented improvement in scores on the measure over time.

2.6.3. Cost-effectiveness analysis

We calculated a cost-effectiveness ratio (CER), which represented the cost associated with a change of 1 SD unit (i.e., $d = 1.0$) on a given measure, for each clinical outcome by dividing the per-youth cost of PSB-CBT by the observed effect size for that measure.

Table 1
Total costs of PSB-CBT per site and per youth.

	Costs per site ($)[a]					
Analysis	Direct[b]	Indirect[c]	Total[d]	Number of youth served[a]	Average length of treatment (mo.)	Cost per youth ($)[e]
By site						
Site 1	36,483	5,508	41,991	19	7.9	2,925
Site 2	54,175	0	54,175	26	4.1	1,423
Site 3	172,501	95,119	267,620	15	12.6	37,612
Site 4	76,931	12,704	89,634	25	6.2	3,707
Site 5	38,297	0	38,297	23	5.3	1,472
Site 6	89,461	0	89,461	45	9.7	3,228
Overall	65,553[f]	2,754[f]	71,818[f]	24[f]	7.1[f]	3,527

Note. All expenses are in 2017, national average U.S. dollars. PSB-CBT = Problem Sexual Behavior - Cognitive-Behavioral. Therapy. [a]As reported in the cost survey (i.e., for a six-month period). [b]The sum of expenses related to personnel, supplies, and training expenses. [c]The sum of expenses related to lost productivity and lost revenue as a result of PSB-CBT activities (i.e., incremental indirect costs). [d]The sum of direct and indirect costs. [e]The total costs per site, divided by the number of youth served, then divided by [6/average length of treatment in months]. [f]Median values across sites were calculated to avoid undue influence of extreme values from individual sites.

Moreover, we conducted sensitivity analyses (see Sanders et al., 2016) to examine how those CERs were influenced by variation in key parameters. We used our expertise, in combination with information provided in the qualitative interviews, to prioritize key sources of: (a) uncertainty and (b) variability among program sites. We then determined minimum and maximum plausible values for each parameter, and calculated CERs across the range of values.

3. Results

3.1. Costs

Responses on the qualitative interviews with the agency administrators and therapists about program costs and funding strategies informed the categories and subcategories on the quantitative cost survey. The most frequently mentioned costs were intakes and assessments (72%), treatment and direct services (68%), PSB training (64%), case management (56%), supplies (36%), and treatment prep and follow up (36%).

Table 1 presents the per-site and overall costs of PSB-CBT as reported in the quantitative cost survey. Direct costs (i.e., personnel, supplies, and training expenses) ranged from $38,297 to $172,501 per site, whereas indirect costs (i.e., lost productivity and lost revenue) ranged from $0 to $95,119 per site. Taken together, total costs per site ranged from $38,297 to $267,620. It should be noted that one site (Site 3) reported much higher direct and indirect costs than the other sites because the PSB-CBT program at that site: (a) routinely supplemented the program with weekly individual sessions (M = 30) for youth; (b) had therapists perform a large amount of non-reimbursed case management; and (c) operated below capacity during the period in which we measured costs. The median total cost per PSB-CBT site was $71,818 over a six-month period, of which $65,553 (91%) were direct costs and $2,754 (9%) were indirect costs. Table 1 also reports, overall and for each site, calculations for the cost per youth (ns = 15 to 45 youth per site) who received PSB-CBT. Cost per youth ranged from $1,423 to $37,612, with a median of $3,527. With the exception of Site 3, all sites reported a total cost per youth of under $4,000.

3.2. Clinical outcomes

Table 2 reports changes in outcome measures in terms of (a) raw scores; and (b) effect sizes (d), including 95% confidence

Table 2
Test Statistics and Effect Sizes for Changes in Outcome Measures From Pre- to Posttest.

	M (SD)				Cohen's d	
Outcome measure	Pre	Post	Paired t-test	p	M	95% CI
Problematic sexual behaviors	7.6 (7.7)	0.5 (2.1)	t_{154} = -12.32	< 0.001	1.99	(1.51, 2.45)
Nonsexual behavior problems						
Caregiver report	55.9 (10.6)	49.2 (11.1)	t_{114} = -6.33	< 0.001	1.19	(0.65, 1.71)
Youth report	55.4 (10.2)	52.0 (10.3)	t_{114} = -3.86	< 0.001	0.72	(0.20, 1.24)
Emotional problems						
Caregiver report	57.3 (10.9)	50.4 (10.3)	t_{114} = -6.56	< 0.001	1.23	(0.69, 1.75)
Youth report	58.1 (10.1)	51.5 (10.7)	t_{114} = -6.21	< 0.001	1.16	(0.63, 1.69)
Traumatic stress	22.3 (17.0)	15.0 (15.9)	t_{68} = -3.05	< 0.01	0.74	(0.06, 1.41)

Note. ns = 155 for problem sexual behaviors, 115 for nonsexual behavior problems and emotional problems, and 69 for traumatic stress.

Table 3
Cost-Effectiveness of PSB-CBT by Outcome Variable.

Outcome variable	CER($)[a]
Problematic sexual behaviors	1,772
Nonsexual behavior problems	
Caregiver report	2,964
Youth report	4,899
Emotional problems	
Caregiver report	2,867
Youth report	3,041
Traumatic stress	4,766

Note. All expenses are in 2017, national average U.S. dollars. CER = cost-effectiveness ratio; PSB-CBT = Problem Sexual Behavior - Cognitive-Behavioral Therapy. [a]The overall cost per youth ($3,527; see Table 1) divided by the effect size for the specified outcome variable (taken from Table 2).

intervals (*CIs*). Across measures, paired *t*-tests showed significant decreases (*ps* < .01) from pre- to posttreatment of caregiver-reported youth PSB and traumatic stress, as well as nonsexual behavior problems and emotional problems according to both caregiver and youth reports. These changes can be characterized as representing large (*ds* = 1.16–1.99) to moderate (*ds* = 0.72-0.74) decreases in youth symptoms.

3.3. Cost-effectiveness

Table 3 reports the cost-effectiveness of PSB-CBT for each clinical outcome measure. The CER for youth PSB indicated that an expenditure of $1,772 was associated with each unit (*d* = 1.0) decrease in PSB. The CERs for other symptom categories ranged from $2,867 to $4,899.

3.4. Qualitative themes related to value

We focus on describing key emergent qualitative themes from our coding process that informed the subsequent cost-effectiveness analysis and interpretation. See Mundey et al., 2019Mundey, Slemaker, Dopp, Beasley, & Silovsky, (2019) for the full results of our qualitative analyses.

Administrators and stakeholders identified two major groups to whom PSB-CBT added value: (1) families, including youth with PSB, their caregivers, and their victims (if the PSB was interfamilial); and (2) society, including communities in general (e.g., non-familial victims, potential future victims) and specific treatment and stakeholder agencies. It is worth noting that the qualitative interview questions and follow-up prompts were designed to elicit information about barriers and negative outcomes, but administrators and stakeholders overwhelmingly focused on the positive impact of PSB-CBT in their responses.

Overall, interviewees indicated that PSB-CBT has a valuable impact on families and society that is worth the cost of the program. For example, a stakeholder reported the following: “These programs need to be more highly prioritized when state and county budgets are being considered. It’s just as important as transportation or a lot of other things that money gets spent on because we’re talking about investing in peoples’ futures.” An administrator commented more specifically on the economic impact of PSB-CBT: “… [I]f we’re talking residential care, if we’re talking about adult offender program, all those get scary pricy and I think keeping [youth with PSB] in the community, in the home, providing effective treatment really brings that cost factor down and we have a lower rate of recidivism.” Another administrator articulated the tensions between program costs and outcomes (i.e., cost-effectiveness) as follows: “I think that when we enter[ed] this process we were not quite as aware of just how much time doing this program and doing it well really requires us to do. That’s not something you can just show up and do group. You have to be planful, you have to meet, you have to communicate. So, I think that was definitely a learning curve for us.”

3.5. Sensitivity analysis

We selected four key parameters to examine using sensitivity analysis: (1) effect sizes, which represent the basis of estimating PSB-CBT effectiveness; (2) supplemental expenditures on individual services (i.e., therapy, case management), given the observed differences in cost at one site that offered such services as a standard addition for youth also receiving PSB-CBT; (3) incremental indirect costs, which varied considerably between sites and were identified as a key cost of PSB-CBT in interviews; and (4) initial (i.e., start-up) training costs, another key cost identified in the interviews that is especially relevant to implementation of new programs.

To conduct the sensitivity analyses, we first calculated the minimum and maximum plausible values for each parameter. For effect sizes, we selected the upper and lower limits of the 95% confidence interval as the minimum and maximum effect sizes (see Table 2). For the cost of supplemental individual services, we took the cost per youth reported by Site 3 as the maximum value ($37,612; see Table 1) and calculated the median cost per youth from the other five sites (i.e., excluding the outlier site) as the minimum value ($2,925). For indirect costs per site, we took $0 (i.e., the value for three of our six sites) as the minimum value and the median of the

Table 4
Cost-Effectiveness of PSB-CBT with Minimum and Maximum Plausible Values of Parameters.

Parameter	CER[a] for outcome variable ($)					
		Nonsexual behavior problems		Emotional problems		
	Problematic sexual behaviors	Caregiver report	Youth report	Caregiver report	Youth report	Traumatic stress
Effect size[b]						
Minimum	2,336	5,426	17,635	5,112	5,598	58,783
Maximum	1,440	2,063	2,844	2,015	2,087	2,501
Supplemental expenditures on individual services[c]						
Minimum	1,180	1,974	3,262	1,910	2,025	3,174
Maximum	18,901	31,607	52,239	30,579	32,424	50,827
Indirect costs per site[d]						
Minimum	1,618	2,705	4,471	2,617	2,775	4,350
Maximum	1,931	3,230	5,338	3,125	3,313	5,193
Maximum for initial training costs[e]	2,321	3,881	6,415	3,755	3,982	6,241

Note. All expenses are in 2017, national average U.S. dollars. CER = cost-effectiveness ratio; PSB-CBT = Problem Sexual Behavior - Cognitive-Behavioral Therapy. [a]The overall cost per youth divided by the effect size for the respective outcome variable, based on substitution of the specified parameter value. [b]Based on the 95% confidence interval for each measure (see Table 2). [c]Based on per-youth costs for Site 3, which provided these services, versus the median cost for the remaining five sites. [d]Based on sites that incurred indirect costs versus those that did not. [e]Based on direct and indirect costs of initial training activities.

remaining three sites ($12,704), which included Site 3, as the maximum value. Finally, we estimated the initial training costs for each site (accumulated over a period of 2 to 4 years) by summing the direct costs (i.e., fees and travel for trainers) and indirect costs (i.e., lost productivity of trainees). We estimated direct costs and hours of lost productivity from training records, and calculated the monetary value of indirect costs using the same shadow prices as before (i.e., Medicaid reimbursement rates, average hourly wages). The median per-site direct and indirect costs during the initial training period were $78,782 and $15,263, respectively.

We then calculated the cost-effectiveness of PSB-CBT for all outcome measures by successively substituting the minimum and maximum plausible values into our calculations. Table 4 presents CERs for each outcome measure under these conditions. Across outcome measures, CERs remained similar to the primary analysis with two exceptions. First, among the minimum plausible values for effect sizes, CERs were notably larger for traumatic stress ($50,827; 12.3 times greater) and youth-reported nonsexual behavior problems ($17,635; 3.6 times greater). Second, for the site that made supplemental expenditures on individual services, CERs were approximately 10.6 times higher for youth PSB ($18,091) and all secondary outcomes ($30,579 to $52,239).

4. Discussion

Administrators and policymakers have shown increasing interest in the potential of large-scale implementation of EBTs to reduce the social and economic impact of youth PSB while improving public safety (Letourneau et al., 2014; Rothman, 2016). Economic evaluations are important to determining the likelihood that behavioral health service organizations can sustainably provide these EBTs in community settings. In the present mixed-methods economic evaluation, we examined the cost-effectiveness of PSB-CBT as implemented in six communities across the U.S. The study had a number of strengths, including: (a) evaluation of PSB-CBT costs and clinical outcomes at a variety of high-fidelity implementation sites; (b) measurement of a broad range of primary (i.e., PSB) and secondary youth clinical outcomes; (c) a comprehensive cost estimate that included direct and indirect expenses for start-up and established programs; (d) use of quantitative and qualitative interview data to estimate and interpret the cost-effectiveness of PSB-CBT; and (e) use of sensitivity analysis to test the impact of uncertainty in study parameters on our cost-effectiveness estimates.

Our findings demonstrate cost-effectiveness of PSB-CBT across primary and secondary clinical outcomes under most conditions. Unit improvements (i.e., $d = 1.0$) in caregiver-reported youth PSB were the most cost-effective, with costs of $1,772 per youth, whereas improvements in other youth clinical outcomes were associated with costs of $2,867 to $4,899 per youth. It is also important to note that each of the aforementioned CERs includes the total cost of PSB-CBT; thus, the simple sum of these CERs does not represent the cumulative cost-effectiveness for achieving all outcomes, which would be considerably lower, because calculation of a cumulative benefits estimate is beyond the scope of cost-effectiveness analysis. For example, reductions in nonsexual behavior problems and traumatic stress would likely contribute to the cumulative cost-effectiveness of PSB-CBT across all domains of benefit. This is true even though the treatment was not consistently cost-effective when those outcomes were considered individually (per the sensitivity analysis that found CERs 3.6-12.3 times greater for the lowest plausible effect sizes).

The results of our qualitative interviews with therapists, program administrators, and external stakeholders supported the validity of our quantitative analyses in two ways. First, our cost estimate of PSB-CBT was comprehensive and reflected the most salient categories of direct (e.g., personnel) and indirect (e.g., time spent in non-reimbursable clinical and training activities) costs mentioned by interviewees. Second, interviewees reported that PSB-CBT added considerable value to families and society by providing a vital service that kept youth with PSB in the community while enhancing public safety – perspectives that were consistent with the

results of the quantitative CER calculations. Taken together, our main findings suggest that communities with the willingness and capacity to invest in PSB-CBT have potential to achieve beneficial outcomes that exceed the expenses of program implementation and sustainment, even across variability in key parameters (i.e., most clinical effects, start-up/indirect costs).

The major exception to the cost-effectiveness of PSB-CBT involved a site that incurred per-youth costs that were more than 16 times higher than the other five sites in this study, in part due to the supplemental provision of individual therapy and case management services by PSB-CBT therapists, yet produced comparable effects on clinical outcomes. Although it is not conclusive to perform a *post hoc* cost-effectiveness analysis of a single site, our results suggest that inclusion of extensive individual therapy and case management services by PSB-CBT therapists results in inferior cost-effectiveness of the model (e.g., a greater than ten-fold increase in the CER compared to the overall CER across sites). Thus, we recommend that programs emphasize the standard PSB-CBT group-based services for youth and caregivers to maximize clinical and cost-effectiveness. The senior investigator (third author) of this project, who is a PSB-CBT master trainer and familiar with all sites implementing PSB-CBT nationwide, is unaware of any other program sites that provide standard supplemental individual services. Thus, we do not expect such services to be a frequent issue for the cost-effectiveness of the model.

The economic benefits of PSB-CBT observed in the present study have other important implications regarding the design of treatment programs for youth with PSB beyond group versus individual format. More specifically, our findings highlight two key advantages of comprehensive, community-based treatment models such as PSB-CBT. First, PSB-CBT interventions target risk factors in youths (e.g., limited sexual health knowledge, impulsivity) and families (e.g., ineffective parenting skills, feelings of stigma and isolation regarding the youth's PSB) that are related to youth PSB and that potentially place youths on developmental pathways for continued PSB into adulthood. Second, PSB-CBT interventions are provided in the youths' home communities, which helps to facilitate inclusion of families in treatment and avoids restrictive placements (e.g., residential treatment, juvenile detention) that have little bearing on the youths' natural ecologies. Thus, PSB-CBT has the capacity to produce clinical and economic benefits beyond those observed in traditional approaches to youth PSB.

One key issue in the dissemination and implementation of EBTs, such as PSB-CBT, concerns the identification of appropriate funding sources for program start-up and sustainment. Less comprehensive treatments are often cheaper and more profitable for provider agencies to implement, and thus funding for effective family-based treatments must be competitive to ensure their adoption within the provider community. All of the PSB-CBT programs evaluated in the present study were established through funds from OJJDP, but that organization does not have the capacity to fund the establishment of programs in all communities that could benefit from PSB-CBT. Potential long-term solutions include: (a) contracts with stakeholder agencies such as juvenile justice and child welfare; (b) approval of enhanced Medicaid billing rates to cover the cost of non-reimbursed clinical activities; and (c) foundation grants. Many of these solutions are challenging to execute, however, given that the complexity and associated financial requirements of PSB-CBT embody many of the challenges to EBT delivery in community settings. It may be necessary for agencies and policymakers to develop shared funding streams (Clary & Riley, 2016) that "blend" or "braid" (i.e., merge or coordinate) capital from sources that share a common interest in addressing youth PSB.

The present study has several methodological limitations. To start, we were unable to measure outcomes in the absence of PSB-CBT because the present study lacked a comparison group. This limitation is common in research on treatments for youth PSB given the numerous logistical (e.g., low base rates) and ethical (e.g., risk to public safety of assigning youth to an inferior comparison condition) challenges to working with this population (see Dopp, Borduin et al., 2017). Thus, we had to evaluate the benefits of PSB-CBT based on the assumption that those rates would have otherwise remained at pretreatment levels in youth. Nevertheless, accumulating evidence suggests that well-designed observational studies are essential to advancing health services research and, in fact, produce results that are generally consistent with findings from controlled trials (Frieden, 2017). Other areas for improvement of methodological rigor in future evaluations of PSB-CBT include independent data collection and verification of clinical symptoms and diagnoses, rather than reliance on self- and caregiver-report data provided directly to the service site; examination of maintenance of youth outcomes after the conclusion of PSB-CBT over long-term posttreatment follow-ups; reduction in the amount of missing data and attrition, especially for measures of secondary clinical outcomes; and examination of official data on arrests and convictions for illegal sexual behaviors as an external validity check for caregiver-reported PSB. Overall, the present results should be viewed as promising but preliminary, and it will be critical for future research to verify our estimates of PSB-CBT cost-effectiveness using approaches that improve methodological rigor and comprehensiveness.

Another limitation of our study is that we did not measure the impact of PSB-CBT using standard measures of health state preference, such as Quality-Adjusted Life Years, which experts have recommended to promote generalizability of cost-effectiveness research in health (see Sanders et al., 2016). Thus, it is only possible to compare the results from the present study with cost-effectiveness ratios from studies that measured the same clinical outcomes (i.e., PSB and related youth symptoms). We considered attempting to derive a generalizable threshold for cost-effectiveness of these clinical outcomes from relevant economic literature, but ultimately determined that such procedures would require too many assumptions to be viable. Additional health economics research on how to document the impact of PSB on health-related quality of life (for both youth with PSB and those affected by their behavior) would improve the interpretability of results from cost-effectiveness analyses with this population. Relatedly, we measured costs related to the implementation of PSB-CBT but did not examine the cost-effectiveness of key implementation outcomes (e.g., organizational climate, fidelity to PSB-CBT model). We decided to exclude such outcomes because they are rarely cost-effective when evaluated separately from clinical outcomes (see e.g., Dopp et al., 2017). However, there is considerable evidence that many implementation outcomes are strongly associated with clinical outcomes (Proctor et al., 2011), and thus, are important candidate mediators of the clinical and cost-effectiveness of implementation efforts.

In conclusion, many policymakers and government entities are interested in the implementation of evidence-based strategies to

manage juvenile sexual offenders; for example, several states (e.g., Colorado, Illinois) have created Sex Offender Management Boards whose recommendations pertaining to EBTs have become legally enforced standards of care. We encourage decision-making bodies to set standards that are based on the levels of empirical support for the clinical and economic impacts of different treatment models (Chaffin, 2008). When considered along with clinical outcome studies (e.g., Carpentier et al., 2006; Silovsky et al., 2019) and recommendations from professional organizations (e.g., ATSA, 2017; Miner et al., 2006), the present findings suggest that comprehensive community-based treatments hold considerable promise in reducing the financial and social consequences of youth PSB. Of course, EBTs such as PSB-CBT often require substantial changes in the organizational structure (e.g., increased coordination with stakeholder agencies) and culture (e.g., emphasis on measurement-based care) of provider organizations. Thus, we encourage public service agencies to develop strong partnerships with providers to maximize the chances that such programs will achieve positive outcomes for the youth, families, and communities that they serve.

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