Psychology, Public Policy, and Law
2017, Vol. 23, No. 3, 312–323

1076-8971/17/$12.00 http://dx.doi.org/10.1037/law0000134

Long-Term Economic Benefits of Psychological Interventions for Criminality: Comparing and Integrating Estimation Methods

Alex R. Dopp
University of Arkansas

Charles M. Borduin
University of Missouri

Emily C. Willroth
University of California–Berkeley

Amelia A. Sorg
Fordham University

Policymakers have been increasingly interested in psychological interventions for criminality that are both evidence-based and financially sustainable, yet the best method for estimating long-term economic benefits of reductions in crime remains unclear. The present study evaluated two modifications of a cost-benefit analysis model from the Washington State Institute for Public Policy (i.e., WSIPP model) that calculated long-term benefits using (1) an expansive method based on year-by-year arrest rates and (2) a summary method based on average arrest rates over the follow-up period. More specifically, we applied the expansive method to data from previously published studies that had estimated summary economic benefits for (a) a 25-year follow-up of multisystemic therapy (MST) and (b) a 9-year follow-up of MST for problem sexual behaviors (MST-PSB). Results indicated that (a) estimated benefits were more conservative (i.e., negatively biased) yet more stable (i.e., less variable) under the summary method versus the expansive method and (b) excluding years of follow-up with high amounts of missing data resulted in modest increases in stability under the expansive method, although negative bias of the summary method was also less pronounced in this analysis. Given the complementary strengths and limitations of the expansive and summary methods, we recommend an integrative approach that synthesizes results across both methods to yield more balanced conclusions. Implications of these findings for researchers, policymakers, and public service agencies are discussed.

Keywords: cost-benefit analysis, long-term benefits, multisystemic therapy, criminality, evidence-based treatments

Supplemental materials: http://dx.doi.org/10.1037/law0000134.supp

The dissemination of effective interventions to reduce criminality has become a pressing issue on the national social policy agenda (see Andrews & Bonta, 2010; Henggeler & Schoenwald, 2011). Indeed, the social and financial consequences of crime in the United States are staggering, with billions of dollars in expenses pertaining to law enforcement, maintenance and expansion of the correctional system, and treatment for victims (McCollister, French, & Fang, 2010; Post, Mezey, Maxwell, & Wibert, 2002; Welsh et al., 2008). Given the potential public welfare benefits of reducing crime, policymakers have shown increased interest in the adoption of interventions that are clinically effective as well as financially sustainable (Dodge & Mandel, 2012; Drake, Aos, & Miller, 2009; Greenwood & Welsh, 2012). In fact, the decision to adopt a given intervention is often directly influenced by expectations about the monetary costs and benefits of that treatment (Crowley, 2013; Davies et al., 2017; Welsh, Rocque, & Greenwood, 2014). Unfortunately, although several scientific reviews (e.g., McCart & Sheidow, 2016; McGuire, 2008; Office of Justice Programs, 2016) have identified effective psychological interventions for criminality, there has been considerably less research on the economic impact of these interventions.

Of the various methods that are used to evaluate the financial benefits of psychological interventions, the most powerful is cost-benefit analysis (see Boardman, Greenberg, Vining, & Weimer, 2010), which compares the costs of an intervention with its economic benefits by converting all costs and benefits to the same

This article was published Online First June 15, 2017.

Alex R. Dopp, Department of Psychological Science, University of Arkansas; Charles M. Borduin, Department of Psychological Sciences, University of Missouri; Emily C. Willroth, Department of Psychology, University of California-Berkeley; Amelia A. Sorg, Department of Psychology, Fordham University.

This article reports secondary analyses of data that were previously published in the *Journal of Consulting and Clinical Psychology* (Dopp, Borduin, Wagner, & Sawyer, 2014) and *Journal of Family Psychology* (Borduin & Dopp, 2015). Preliminary versions of the data analyses reported in this article were previously reported and discussed at the annual meetings of the Association of Behavioral and Cognitive Therapies (2013), Midwestern Psychological Association (2013, 2014), and the Society for Prevention Research (2014). Charles M. Borduin is a board member of MST Associates, the organization that provides training in MST for youths with problem sexual behaviors.

Correspondence concerning this article should be addressed to Alex R. Dopp, Department of Psychological Science, University of Arkansas, 216 Memorial Hall, Fayetteville, AR 72701. E-mail: dopp@uark.edu

metric (i.e., dollars) rather than relying on study-specific measures of outcomes (e.g., as in cost-effectiveness analysis) that are difficult to compare across studies. To advance research on the economics of treatments for criminality, continued efforts are needed to refine relevant cost-benefit analysis models. An exemplar of such efforts is the Washington State Institute for Public Policy (WSIPP), which developed a comprehensive model (i.e., WSIPP model; see WSIPP, 2015) that estimates the relative costs and benefits of interventions to reduce crime in terms of avoided expenses to taxpayers and crime victims. Since its development, the WSIPP model has been used in several peer-reviewed studies that attest to its validity (Drake et al., 2009; Lee, Drake, Pennucci, Bjornstad, & Edovald, 2012) and is now used for program evaluation in 20 states as part of a joint initiative between Pew Charitable Trusts and the MacArthur Foundation (see Pew Charitable Trusts, 2016). Despite its status as a methodologically rigorous tool for aligning public policy with scientific evidence, close examination of the WSIPP model also reveals important challenges in the application of economic methods to psychological intervention research. For example, the WSIPP model relies on broad assumptions about population characteristics based on large (*N*s in the thousands) research samples. In contrast, research on psychological interventions typically involves collection of more detailed information, such as measurement of continuous outcomes (e.g., mean number of arrests), with relatively small samples of participants whose characteristics are carefully specified (e.g., history of serious and violent offenses).

To allow for more precise estimates of the costs and benefits of various psychosocial interventions, independent researchers have begun to incorporate detailed, sample-specific information about criminal outcomes into the WSIPP model. For example, the WSIPP model has been adapted in two cost-benefit studies of evidence-based treatments for serious juvenile offenders. The first study (Dopp, Borduin, Wagner, & Sawyer, 2014) applied the WSIPP model to data from 25.0-year follow-ups of youth and their closest-in-age siblings who participated in a randomized clinical trial of multisystemic therapy (MST; Henggeler & Borduin, 1990; Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 2009). The second study (Borduin & Dopp, 2015) used data from an 8.9-year follow-up of youth who participated in a randomized clinical trial of MST for problem sexual behaviors (MST-PSB; Borduin & Munschy, 2014), an adaptation of MST for youth who have engaged in illegal sexual behaviors. The results of these studies showed a return on every dollar spent of more than $5 for MST and nearly $50 for MST-PSB, suggesting that psychological treatments for serious juvenile offenders continue to accrue economic benefits well into adulthood.

Despite the promising results of the aforementioned cost-benefit studies, the authors of these studies noted limitations in how they incorporated data from long-term follow-up periods into the WSIPP model (see Dopp et al., 2014). Most critically, they calculated benefits using a summary method that used the average treatment effect observed across a given follow-up period (akin to the use of mean effect sizes from meta-analyses in the original WSIPP model) to estimate benefits, thus minimizing standard errors of estimates and maximizing statistical power but also producing increasingly conservative (i.e., negatively biased) estimates over longer follow-ups. This negative bias results from the effects of economic discounting, an adjustment used to express benefits that accrue into the future (i.e., over a posttreatment follow-up period); specifically, discounting reflects the fact that the value of a dollar today is always greater than the value of the same dollar in a future year, independent of inflation, because the opportunity to use the dollar or invest it to earn additional income is deferred (Hargreaves, Shumway, Hu, & Cuffel, 1998). Dopp et al. (2014) and Borduin and Dopp (2015) discounted benefits to the end of a given follow-up (i.e., as if they accrued 25.0 or 8.9 years, respectively, after treatment); thus, their findings likely underestimated the true benefits of MST and MST-PSB because, with increasing lengths of follow-up, greater discount rates are applied to the earliest years of follow-up (i.e., when treatment effects are likely to be largest; see Dopp et al., 2014).

Unfortunately, the best method for calculating long-term economic benefits of psychosocial interventions for criminality remains unclear. Indeed, it is often difficult to obtain reliable estimates of variables that index crime (e.g., arrests; Walters, 2007)—particularly with small sample sizes or low-frequency criminal activity, as is more likely when considering individual years of follow-up—because such variables often have complex, censored-dependent (i.e., continuous, nonnormal, and nonnegative; Greene, 1993) distributions. Furthermore, missing data become increasingly problematic in later years of long-term follow-ups. Thus, it is unclear whether the application of a standard practice from economics (i.e., calculating and discounting benefits on an annual basis) to data from psychological research would produce more useful results than would analysis using the summary method.

We believe that the ultimate test of an intervention is whether its effects continue into the future and, therefore, that prominent cost-benefit models should be refined for examination of long-term economic benefits. To that end, the present study evaluated two modifications of the WSIPP model that estimated long-term benefits using either (a) a newly developed expansive method based on year-by-year arrest rates (i.e., with a separate discount rate applied to each year of follow-up) or (b) the aforementioned summary method based on overall arrest rates. We used the expansive method to perform secondary analyses of data from Dopp et al. (2014) and Borduin and Dopp (2015), both of which previously estimated benefits using the summary method, to illustrate the application of the expansive method to data from two rigorous clinical trials that varied on key methodological features (e.g., smaller sample size in Borduin & Dopp, 2015). We then evaluated the relative strengths and limitations of each method based on two metrics: (1) amount of negative bias (i.e., tendency to estimate benefits conservatively) and (2) stability (i.e., minimization of variability in plausible benefits). Furthermore, we examined the influence of missing data on the results.

Method

This section provides a brief overview of the methods used by (a) Dopp et al. (2014) in their cost-benefit analysis of MST (hereafter referred to as "MST cost study") and (b) Borduin and Dopp (2015) in their cost-benefit analysis of MST-PSB (hereafter referred to as "MST-PSB cost study"). Additional methodological details are available in the original cost studies, clinical trials (i.e., Borduin et al., 1995, for the MST cost study; Borduin, Schaeffer, & Heiblum, 2009, for the MST-PSB cost study, which included posttreatment follow-up data), and follow-up studies (i.e., of re-

ferred youth [Sawyer & Borduin, 2011] and their closest-in-age siblings [Wagner, Borduin, Sawyer, & Dopp, 2014] for the MST cost study). We subsequently describe our secondary analyses of data from those studies in the *Analytic Strategy*.

Participants

Participants in the MST cost study were 176 serious and violent juvenile offenders and any closest-in-age sibling ($N = 129$) who participated in a clinical trial (Borduin et al., 1995) in which youth and their families were randomly assigned to MST ($ns = 92$ referred youths and 67 siblings) or individual therapy (IT; $ns = 84$ referred youths and 62 siblings). Siblings were included to evaluate whether any reductions in their own criminal activity would result in additional economic benefits of MST beyond those associated with reduced criminality in the referred juvenile offenders (see Dopp et al., 2014). Referred youths had at least two previous arrests for felonies ($M = 3.9$); none of the siblings had been arrested at the time of the trial. In the MST-PSB cost study, participants were 48 youths who participated in a clinical trial (Borduin et al., 2009) in which they were randomized to MST-PSB ($n = 24$) or usual community services (UCS; $n = 24$). All youths had at least one previous arrest for a felony sexual offense ($M = 1.62$) and averaged 4.33 previous felonies overall, including nonsexual ($M = 2.71$) offenses. In both studies, there were no significant differences between treatment conditions in terms of demographic characteristics or arrest histories.

Treatment Conditions

In the MST cost study, youth were randomized to receive MST (Henggeler & Borduin, 1990; Henggeler et al., 2009), a family- and community-based treatment for serious juvenile offenders, or IT. MST targets a comprehensive set of identified risk factors (i.e., across individual, family, peer, school, and neighborhood domains) through individualized interventions that integrate empirically supported clinical techniques from cognitive–behavioral therapies and structural/strategic family therapy into a broad-based ecological framework. MST interventions were delivered to youth and their family members (e.g., caregivers, siblings) in home, school, and neighborhood settings. Therapists were available to respond to clinical problems 24 hr a day, 7 days a week. Similarly, youth in the MST-PSB cost study were randomized to receive MST-PSB, an adaptation of MST for youth who have engaged in serious (e.g., violent) or repeated illegal sexual behavior (Borduin & Munschy, 2014), or UCS. MST-PSB was guided by the same principles and used the same model of service delivery as in standard MST (i.e., for nonsexual offenders) but focused on aspects of the youth's social ecology that were functionally related to the illegal sexual behavior (e.g., safety planning, reducing caregiver and youth denial).

In contrast, youth in both comparison conditions (i.e., IT and UCS) received individually focused services. In the MST cost study, therapists in the IT condition used an eclectic mix of psychodynamic, client-centered, and behavioral approaches. Regardless of their specific clinical approach, IT therapists focused on intervening with the individual youth rather than with his or her social ecology. In the UCS condition of the MST-PSB study, all of the youth received group and individual treatment through the local juvenile office. Group treatment (with 4–6 youths) used a cognitive–behavioral relapse prevention model; individual treatment was designed to reinforce group treatment goals.

Procedures

All procedures and measures for the original clinical trials and cost studies were approved by the Institutional Review Board of the University of Missouri. Procedures and measures relevant to the present study are described here.

Collection of criminal conviction data. Participants' juvenile and adult criminal records were obtained within the state of Missouri (where the clinical trials were conducted) during the original studies as well as subsequent follow-up studies of clinical outcomes. A search of criminal records in other states was not possible because participants' fingerprints would have been required to conduct a national records check, and these were not obtained at the time of the original study. Multiple sources (e.g., arrest records, driver's license records, caregivers) were used to determine whether each individual had lived in Missouri during the follow-up period and thus could have had an arrest record in the state. Although it was not possible to confirm continuous residency, all participants were determined to have lived in Missouri during at least part of the respective follow-up periods (i.e., 25.0 years for the MST cost study, 8.9 years for the MST-PSB cost study). Juvenile criminal arrest data were obtained from juvenile office records whereas adult criminal arrest data were obtained from public court records. Only arrests that resulted in convictions were recorded to provide a conservative estimate of criminal activity; court records did not index arrests without convictions or provide details about reductions in charges (e.g., plea bargains). If charges from the same incident resulted in more than one conviction, then each conviction was separately recorded. All outcomes were evaluated using intent-to-treat analyses, in which treatment completers and noncompleters are analyzed together within the condition to which they were assigned.

Original cost-benefit studies. The MST cost study (Dopp et al., 2014) and MST-PSB cost study (Borduin & Dopp, 2015) applied the WSIPP model (Aos, Phipps, Barnoski, & Lieb, 2001) to the arrest records of participants from the respective randomized clinical trial. The WSIPP model provides monetary estimates of expenditures pertaining to (a) taxpayer expenses, (b) tangible losses to victims, and (c) intangible losses to victims. Two of the procedures used in the model bear mention. First, all monetary values were adjusted to a baseline year value using the Consumer Price Index (CPI; Bureau of Labor Statistics, 2015) to account for inflation. For ease of interpretation, all monetary values from Dopp et al. (2014) and Borduin and Dopp (2015) discussed in this article are presented in 2015 dollars (i.e., the year in which data analyses for the present study were completed) rather than in the baseline year values from the respective studies. Second, an annual discount rate of 3% (i.e., the standard rate, based on the average interest rate for federal bonds, recommended by Gold, Siegel, Russell, & Weinstein, 1996) was used to express any benefits that accrued over the follow-up period. As noted previously, Dopp et al. (2014) and Borduin and Dopp (2015) calculated long-term benefits using a summary method in which average arrest rates across a given follow-up period were substituted into the WSIPP model and subsequently discounted to the end of the follow-up

period. Thus, this procedure discounted all benefits by 53.3% (i.e., across 25 years) in the MST cost study and 24.0% (i.e., across 9 years) in the MST-PSB cost study.

Measures

Convictions. On the basis of verified criminal records, all arrests that resulted in convictions were classified into six felony offense categories (i.e., murder/manslaughter, sexual, robbery, assault, property, drug) and five misdemeanor offense categories (i.e., theft/larceny, stolen property, fraud, misdemeanor assault, and misdemeanor drug). These categories were subsequently used to assign benefits (i.e., avoided expenses) of reductions in crime.

Costs. The MST and MST-PSB cost-benefit studies used the annual budgets of provider organizations in Missouri with MST or MST-PSB programs, respectively, to estimate the operating costs of those programs. These budgets captured costs related to quality assurance mechanisms (i.e., staff training, organizational support, and tracking and feedback systems) and service delivery (e.g., travel to homes, cell phone service contracts) that differ from those of usual outpatient treatment services. Furthermore, the studies used hourly reimbursement rates reported by counseling centers to estimate the cost of comparison treatments (i.e., IT in the MST cost study and UCS in the MST-PSB cost study). Average costs per youth in 2015 dollars were $12,052 for standard MST, $13,056 for MST-PSB, $2,276 for IT, and $5,670 for UCS.

Benefits. The WSIPP model defines benefits of avoided crimes to taxpayers and crime victims (tangible and intangible benefits). Taxpayer benefits (i.e., the cost offset to taxpayers) are defined for all 11 offense categories based on estimates of the annual marginal capital and operating expenses for various public agencies (i.e., police, court processing, and probation/incarceration costs). Tangible benefits to crime victims are estimated as avoided monetary consequences of victimization, including out-of-pocket expenses and those covered by insurance, associated with a given offense category (e.g., property damage, medical and mental health care, lost productivity; see Cohen & Miller, 1998; Miller, Cohen, & Wiersema, 1996). Intangible (i.e., quality-of-life) benefits provide a more expansive assessment of avoided expenses to crime victims by placing a monetary value on the pain and suffering associated with various offense categories (i.e., based on "willingness-to-pay" studies and examination of jury awards; see Miller et al., 1996; Miller, Fisher, & Cohen, 2001). Data were not available to calculate benefits associated with other youth outcomes (e.g., secondary school graduation, employment).

Analytic Strategy

Model assumptions. In the present study, we performed secondary analyses of the arrest data used in the MST cost study (Dopp et al., 2014) and MST-PSB cost study (Borduin & Dopp, 2015). Other than the use of an expansive method to calculate long-term benefits, we retained the analytic strategy of the original WSIPP model. All monetary values were converted to a baseline year of 2015 using the CPI (Bureau of Labor Statistics, 2015), and all benefits were calculated based on the number of arrests that resulted in convictions (i.e., actual conviction rates). Furthermore, in all analyses, we assumed that (a) every offense category (i.e., murder/manslaughter, sexual, robbery, felony assault, felony property, felony drug, theft/larceny, stolen property, fraud, misdemeanor assault, misdemeanor drug) resulted in taxpayer expenditures and (b) property crimes resulted in tangible but not intangible losses to victims. We did not include any crime victim tangible or intangible losses for six categories of offenses because (a) two of the categories (i.e., felony and misdemeanor drug) were assumed to be victimless and (b) a distribution of expected crimes was not available from any source (including WSIPP, 2015) for four other categories of misdemeanor offenses (i.e., theft/larceny, stolen property, fraud, misdemeanor assault) that Dopp et al. (2014) and Borduin and Dopp (2015) added to the model. Moreover, the MST cost study (Dopp et al., 2014) analyzed data at the level of sibling pairs (i.e., the referred youth and sibling, if any, from a given family) to account for a lack of independence of data for referred youths and siblings from the same family.

As in the original WSIPP model, we calculated crime victim benefits for treatment versus comparison conditions using an assumption of multiple victimizations per arrest (see Miller et al., 1996; WSIPP, 2015). This assumption is based on a large body of evidence (e.g., Bureau of Justice Statistics, 2015; Lee et al., 2012) suggesting that the actual numbers of offenses that are committed across various types of crimes are much greater than the numbers of arrests for such offenses. Multiple victimization analyses were based on values taken from the WSIPP model for lambda, an estimate of how many offenses an individual commits per arrest for a given type of crime. In addition, as part of the multiple victimization analyses, we used a distribution of expected crimes (also included in the WSIPP model) that accounts for the varying frequencies of undetected crimes in different offense categories.

The results from all analyses were expressed in terms of a net benefit estimate (i.e., incremental benefits minus costs) and a benefit–cost ratio (i.e., incremental benefits divided by costs) for (a) MST over IT, based on data from Dopp et al. (2014), and (b) MST-PSB over UCS, based on data from Borduin and Dopp, 2015. The MST/MST-PSB condition was considered cost beneficial relative to the respective comparison treatment condition if the net benefit was positive and the benefit–cost ratio exceeded 1.00, following standard economic decision rules for comparing costs and benefits (see Boardman et al., 2010).

Expansive method. Our expansive method for calculation of long-term benefits in the WSIPP model differs from the previously used summary method in that benefits were calculated separately for each year of follow-up (and discounted accordingly) rather than as a total benefit across all years of follow-up. Specifically, for each estimated benefit (i.e., taxpayer, crime victim tangible, and crime victim intangible) in a given year, we applied the 3% annual discount rate to obtain the final expected value of the incremental benefit of the MST/MST-PSB condition in that year (i.e., to account for the time between the end of treatment and the year in which the benefit accrued). We accomplished this by multiplying the benefit of the MST/MST-PSB condition over the comparison condition in each year of follow-up by a discount factor of 0.97^{y}, where y is the year of follow-up. Thus, the discount factor had a relatively small effect in earlier years of follow-up (e.g., 0.941 in Year 2) versus later years of follow-up (e.g., 0.544 in Year 20).

Comparison of Expansive Versus Summary Methods. We used sensitivity analyses (see Briggs & Gray, 1999) to compare the

cumulative net benefits derived from the WSIPP model using the expansive versus summary methods. As a first step, we compared the magnitude of each estimated benefit to determine the amount of negative bias that resulted from calculating benefits using the summary method. Next, we examined the influence of plausible variability in posttreatment arrest rates (as a function of observed variance and sample size) on the relative stability of the estimated net benefits of MST and MST-PSB under the expansive versus summary methods. Finally, we evaluated the effect of missing data on our results by repeating all analyses (including the previous sensitivity analyses) after excluding data from years of follow-up in which arrest statistics were missing for a significant portion of the sample (i.e., >20%, based on the recommendation of the Centre for Evidence-Based Medicine, 2009). Given that the participants in each of the original clinical trials (i.e., MST and MST-PSB) varied in their lengths of follow-up (i.e., based on different dates of treatment completion among participants within each trial), the sensitivity analysis for missing data excluded the latest years of follow-up—which were not yet available for all participants—from each cost analysis.

Results

We completed the expansive cost analyses for MST (vs. IT) and MST-PSB (vs. UCS) in four steps. First, we calculated rearrest statistics for each year of follow-up. Second, we applied the WSIPP model to those rearrest statistics to estimate year-by-year and cumulative benefits (i.e., across all years of follow-up) to taxpayers and crime victims. Third, we computed net benefits and benefit–cost ratios based on the relative costs and benefits of each treatment. Finally, we used sensitivity analyses to compare the results of the expansive and summary methods.

Rearrests

We calculated the percentages (i.e., recidivism rates), means, and standard deviations of felony and total (i.e., across all offense categories) arrests by treatment group for each year of follow-up. Thus, we obtained a series of nonoverlapping rearrest statistics that began with the first year after the posttreatment assessment (i.e., Year 0) and included all subsequent years of follow-up. Because of variations in lengths of follow-up for participants in the original cost-benefit studies, the follow-up extended through Year 26 for the expansive MST cost analysis and through Year 10 for the expansive MST-PSB cost analysis, with each set of rearrest statistics (i.e., for MST and MST-PSB) based on the number of participants available that year. When a given confidence interval included values below zero, the minimum bound of the interval was set to zero because it is not possible to have a negative number of arrests.

Rearrest statistics for selected years of follow-up are presented for the expansive MST cost analysis in Table 1 (Years 0, 1, 5, 15, and 25) and for the expansive MST-PSB cost analysis in Table 2 (Years 0, 1, 2, 5 and 10). Results for the remaining years of follow-up are presented in Tables S1 and S2, respectively, in the online supplemental material. Each table provides the number of participants available for follow-up, by treatment condition, in every year of follow-up. In both expansive analyses, rearrest rates were higher during earlier years of follow-up. For example, in the expansive MST cost analysis, 16.30% of MST sibling pairs (M = 0.25; SD = 0.74; 95% confidence interval [CI] = 0.10–0.40) and 23.81% of IT sibling pairs (M = 0.43; SD = 1.08; 95% CI = 0.20–0.66) were rearrested for any crime during Year 0 of follow-up. Similarly, in the expansive MST-PSB cost analysis, 20.83% of MST-PSB youths (M = 0.38; SD = 0.88; 95% CI = 0.03–0.73) and 45.83% of their UCS counterparts (M = 1.58; SD = 2.39; 95% CI = 0.62–2.54) committed at least one crime in Year 0.

In contrast, rates of reoffending were low across conditions in later years of follow-up for both of the expansive cost-benefit analyses. For example, in Year 25 of follow-up for the expansive MST cost analysis (n = 94), 2.63% of MST sibling pairs (M = 0.03; SD = 0.10; 95% CI = 0.01–0.05) and 3.57% of IT sibling pairs (M = 0.07; SD = 0.34; 95% CI = 0.00–0.14) were rearrested. Similarly, in Year 10 of follow-up for the expansive MST-PSB cost analysis (n = 23), 0.00% of MST-PSB participants and 8.33% of UCS participants (M = 0.08; SD = 0.29; 95% CI = 0.00–0.24) committed at least one crime of any type.

Table 1
Rearrest Statistics in Selected Years of Follow-Up for Expansive MST Cost Analysis

Year	Variable	%	M	SD	95% CI[a]
0	Total crimes				
	MST	16.30	0.25	0.74	(0.10 to 0.40)
	IT	23.81	0.43	1.08	(0.20 to 0.66)
	Felony crimes				
	MST	7.61	0.12	0.47	(0.02 to 0.22)
	IT	14.29	0.24	0.74	(0.08 to 0.40)
1	Total crimes				
	MST	14.13	0.23	0.66	(0.09 to 0.36)
	IT	17.86	0.27	0.77	(0.11 to 0.44)
	Felony crimes				
	MST	6.52	0.11	0.48	(0.01 to 0.21)
	IT	7.14	0.08	0.32	(0.02 to 0.15)
5	Total crimes				
	MST	8.70	0.13	0.45	(0.04 to 0.22)
	IT	17.86	0.30	0.83	(0.12 to 0.48)
	Felony crimes				
	MST	4.35	0.07	0.32	(0.00 to 0.13)
	IT	5.95	0.12	0.55	(0.00 to 0.24)
15	Total crimes				
	MST	8.70	0.21	0.90	(0.02 to 0.39)
	IT	5.95	0.07	0.30	(0.01 to 0.14)
	Felony crimes				
	MST	4.35	0.13	0.65	(0.00 to 0.26)
	IT	1.19	0.01	0.11	(0.00 to 0.04)
25	Total crimes				
	MST (n = 38)	2.63	0.03	0.10	(0.01 to 0.05)
	IT (n = 56)	3.57	0.07	0.34	(0.00 to 0.14)
	Felony crimes				
	MST (n = 38)	2.63	0.03	0.10	(0.01 to 0.05)
	IT (n = 56)	1.79	0.04	0.20	(0.00 to 0.08)

Note. MST = multisystemic therapy. Sample sizes for conditions are MST (n = 92) and IT (n = 84) unless indicated otherwise.
[a] When a given CI included values below zero, the minimum bound of the interval was set to zero because it is not possible to have a negative number of arrests.

Treatment Benefits

Estimated benefits (i.e., to taxpayers and crime victims) for selected years of follow-up, as well as cumulative benefits across

Table 2
Rearrest Statistics in Selected Years of Follow-Up for Expansive MST-PSB Cost Analysis

Year	Variable	%	*M*	*SD*	95% CI[a]
0	Total crimes				
	MST-PSB	20.83	0.38	0.88	(0.03–0.73)
	UCS	45.83	1.58	2.39	(0.62–2.54)
	Felony crimes				
	MST-PSB	16.67	0.29	0.75	(0.00–0.59)
	UCS	45.83	1.21	1.74	(0.51–1.91)
1	Total crimes				
	MST-PSB	8.33	0.13	0.45	(0.00–0.31)
	UCS	45.83	1.75	4.37	(0.00–3.50)
	Felony crimes				
	MST-PSB	0.00	0.00	0.00	—
	UCS	41.67	1.50	4.28	(0.00–3.21)
2	Total crimes				
	MST-PSB	8.33	0.21	0.83	(0.00–0.54)
	UCS	12.50	0.13	0.34	(0.00–0.27)
	Felony crimes				
	MST-PSB	4.17	0.17	0.82	(0.00–0.50)
	UCS	8.33	0.08	0.28	(0.00–0.19)
5	Total crimes				
	MST-PSB	8.33	0.17	0.64	(0.00–0.43)
	UCS	12.50	0.21	0.59	(0.00–0.45)
	Felony crimes				
	MST-PSB	8.33	0.17	0.64	(0.00–0.43)
	UCS	12.50	0.21	0.59	(0.00–0.45)
10	Total crimes				
	MST-PSB (n = 11)	0.00	0.00	0.00	—
	UCS (n = 12)	8.33	0.08	0.29	(0.00–0.24)
	Felony crimes				
	MST-PSB (n = 11)	0.00	0.00	0.00	—
	UCS (n = 12)	0.00	0.00	0.00	—

Note. MST-PSB = multisystemic therapy for problem sexual behaviors; UCS = usual community services. Sample sizes for therapy conditions are MST-PSB (n = 24) and UCS (n = 24) unless indicated otherwise.
[a] When a given CI included values below zero, the minimum bound of the interval was set to zero because it is not possible to have a negative number of arrests.

the entire follow-up, are presented in Table 3 for the expansive MST cost analysis and in Table 4 for the expansive MST-PSB cost analysis. Estimated benefits for the remaining years of follow-up are presented in Tables S3 and S4, respectively, in the online supplemental material. Discount factors (i.e., 0.97^{y}) for given years of follow-up are listed in the second column of each table. We calculated cumulative benefits by summing the final expected values of benefits across all years of follow-up for the expansive MST cost analysis (i.e., Years 0 through 26) and the expansive MST-PSB cost analysis (i.e., Years 0 through 10), respectively, in the taxpayer and crime victim tangible/intangible domains. We also calculated annual and cumulative total benefits (i.e., taxpayer and crime victim benefits combined) for MST or MST-PSB in each expansive cost-benefit analysis.

Taxpayer benefits. The expected taxpayer benefits of MST over IT varied widely by year of follow-up, from a maximum of $5,101 in Year 2 to a minimum of –$1,398 in Year 12. The cumulative benefit of MST to taxpayers over 26 years of follow-up was $14,550 per sibling pair. Similarly, the expected taxpayer benefits of MST-PSB over UCS ranged from $75,259 in Year 0 to –$969 in Year 2. Across 10 years of follow-up, the cumulative benefit of MST-PSB to taxpayers was $135,731 per referred youth.

Crime victim tangible benefits. In the expansive MST cost analysis, the expected tangible benefits to crime victims of MST over IT ranged from a maximum of $8,849 in Year 2 to a minimum of –$3,092 in Year 15. Over 26 years of follow-up, the cumulative tangible benefit of MST to crime victims was $17,870 per sibling pair. In the expansive MST-PSB cost analysis, the expected tangible benefits to crime victims of MST-PSB over UCS varied even more widely by year of follow-up, with a high of $59,947 in Year 1 and a low of -$3,231 in Year 2. The cumulative tangible benefit of MST-PSB to crime victims was $120,209 per referred youth across 10 years of follow-up.

Crime victim intangible benefits. The results for the expansive MST cost analysis showed that expected intangible benefits to crime victims of MST over IT ranged from a maximum of $14,885 in Year 2 to a minimum of –$5,192 in Year 15, with a cumulative intangible benefit of $29,997 per sibling pair across 26 years of follow-up. In the expansive MST-PSB cost analysis, the expected intangible benefits to crime victims of MST-PSB over UCS also varied across the 10-year follow-up, from a maximum of $100,640 in Year 1 to a minimum of –$5,423 in Year 2. The cumulative intangible benefit of MST-PSB to crime victims was $201,812 per referred youth.

Total benefits. The total cumulative expected benefits to taxpayers and crime victims were $62,417 per sibling pair in the expansive MST cost analysis. The total cumulative expected benefits were $457,752 per referred youth in the expansive MST-PSB cost analysis.

Cost-benefit analysis. To perform cost-benefit calculations, we first obtained the incremental cost of the respective treatment condition. For the expansive MST cost analysis, calculations were based on the incremental treatment cost of MST over IT (i.e., $9,776; see Dopp et al., 2014). For the expansive MST-PSB cost analysis, we used the incremental treatment cost of MST-PSB over UCS (i.e., $7,386; see Borduin & Dopp, 2015). Next, we subtracted the respective incremental cost of treatment from each cumulative expected benefit (i.e., taxpayer, crime victim tangible, crime victim intangible, and total) to obtain the cumulative net benefits of MST per sibling pair (over IT) and of MST-PSB per referred youth (over UCS). Finally, we divided each cumulative expected benefit by the respective incremental treatment cost to calculate cumulative benefit–cost ratios for MST and MST-PSB.

Table 3 also summarizes the costs and expansive benefits (i.e., net present values and benefit–cost ratios) of providing MST relative to IT across 26 years of follow-up. The expected net present values of MST were $4,774 in the taxpayer domain, $8,094 in the crime victim tangible domain, and $20,221 in the crime victim intangible domain for a total of $52,641 per sibling pair. The average benefit–cost ratios of MST were 1.49 for taxpayer benefits, 1.83 for crime victim tangible benefits, and 3.07 for crime victim intangible benefits, for a total return of $6.38 per dollar spent on MST. In a similar vein, Table 4 summarizes the costs and expansive benefits of providing MST-PSB relative to UCS across 10 years of follow-up. The expected net present values of MST-PSB were $128,345 in the taxpayer domain, $112,823 in the crime victim tangible domain, and $194,426 in the crime victim intangible domain, for a total of $450,366 per referred youth. The

Table 3
Expected Values for Expansive Benefits of MST in Selected Years of Follow-Up and for Cumulative Benefits Across Entire Follow-Up

Year	Discount factor[a]	Taxpayer	Crime victim tangible	Crime victim intangible	Total
Year 0	1.000	2,416	4,883	8,199	15,498
Year 1	0.970	1,182	(1,014)	(1,702)	(1,534)
Year 5	0.859	1,234	1,905	3,197	6,336
Year 15	0.633	(1,096)	(3,092)	(5,192)	(9,380)
Year 25	0.467	112	181	303	596
Cumulative (Years 0–26)	—	14,550	17,870	29,997	62,417
Net present value[b]	—	4,774	8,094	20,221	52,641[c]
Benefit–cost ratio[d]	—	1.49	1.83	3.07	6.38

Note. All expenses are expressed in 2015 dollars. Dollar amounts in parentheses indicate negative savings. Year of follow-up ranges from 0 to 26. MST = multisystemic therapy.
[a] 0.97^{y}, where y is the year of follow-up. [b] The difference between the benefit and the incremental cost of providing MST over IT (i.e., \$9,776). [c] Because taxpayer, crime victim tangible, and crime victim intangible net present values each include the incremental cost of MST over IT, the total value is not the simple sum of these benefits and has been adjusted to reflect a single incremental cost of MST. [d] The benefit divided by the incremental cost of providing MST over IT.

average return per dollar spent on MST-PSB was \$18.38 for taxpayer benefits, \$16.28 for crime victim tangible benefits, and \$27.32 for crime victim intangible benefits, with an overall benefit–cost ratio of 61.98.

Comparison of Expansive Versus Summary Methods

We used sensitivity analyses to compare the expansive versus summary methods. Specifically, we examined differences in cumulative benefits (i.e., negative bias) across the two estimation methods as well as the influence of variation in a key model parameter, posttreatment arrest rates, on the stability of estimated benefits. We then evaluated the influence of missing data on study results.

Negative bias. We evaluated the amount of negative bias that the summary method introduced to estimated benefits (i.e., due to discounting all benefits to the end of the follow-up period), as compared with the expansive method, for each category of cumulative benefit (i.e., taxpayer, crime victim tangible, crime victim intangible, and total). Specifically, we calculated the difference between the cumulative benefit under the summary and expansive methods, divided that difference by the cumulative benefit under the expansive method, then multiplied the result by 100%. Table 5 presents the (a) cumulative benefits of MST under the summary (as reported by Dopp et al., 2014) and expansive methods, (b) cumulative benefits of MST-PSB under the summary (as reported by Borduin & Dopp, 2015) and expansive methods, and (c) percentage of negative bias in each value from the summary method. Estimates of negative bias ranged from 20.89% to 21.09% for MST benefits and from 21.71% to 22.18% for MST-PSB, with the negative bias of the total benefits estimates calculated at 21.03% and 21.87%, respectively.

Stability. To examine the stability of estimated benefits, we followed the approach taken by Borduin and Dopp (2015) to examine the influence of posttreatment arrest rates on estimated

Table 4
Expected Values for Expansive Benefits of MST-PSB in Selected Years of Follow-Up and for Cumulative Benefits Across Entire Follow-Up

Year	Discount factor[a]	Taxpayer	Crime victim tangible	Crime victim intangible	Total
Year 0	1.000	75,259	37,767	63,404	176,430
Year 1	0.970	39,264	59,947	100,640	199,851
Year 2	0.941	(969)	(3,231)	(5,423)	(9,623)
Year 5	0.859	2,516	1,474	2,475	6,465
Year 10	0.737	184	0	0	184
Cumulative (Years 0–10)	—	135,731	120,209	201,812	457,752
Net present value[b]	—	128,345	112,823	194,426	450,366[c]
Benefit–cost ratio[d]	—	18.38	16.28	27.32	61.98

Note. All expenses are expressed in 2015 dollars. Dollar amounts in parentheses indicate negative savings. Year of follow-up ranges from 0 to 10. MST-PSB = multisystemic therapy for problem sexual behaviors.
[a] 0.97^{y}, where y is the year of follow-up. [b] The difference between the benefit and the incremental cost of providing MST-PSB over usual community services (UCS; i.e., \$7,386). [c] Because taxpayer, crime victim tangible, and crime victim intangible net present values each include the incremental cost of MST-PSB over UCS, the total value is not the simple sum of these benefits and has been adjusted to reflect a single incremental cost of MST-PSB. [d] The benefit divided by the incremental cost of providing MST-PSB over UCS.

Table 5
Negative Bias of Cumulative Benefits of MST and MST-PSB Under Summary Versus Expansive Methods

Treatment model	Estimation method	Cumulative benefits ($)				Total cumulative benefit adjusting for missing data[a] ($)
		Taxpayer	Crime victim tangible	Crime victim intangible	Total	
MST						
	Expansive	14,550	17,870	29,997	62,417	56,614
	Summary[b]	11,511	14,106	23,671	49,288	49,311
	Negative bias[c]	20.89%	21.07%	21.09%	21.03%	12.90%
MST-PSB						
	Expansive	135,731	120,209	201,812	457,752	442,658
	Summary[d]	105,621	94,113	157,917	357,651	354,020
	Negative bias[c]	22.18%	21.71%	21.75%	21.87%	20.02%

Note. All expenses are expressed in 2015 dollars. MST = multisystemic therapy; MST-PSB = multisystemic therapy for problem sexual behaviors.
[a] Excludes years of follow-up in which data are missing for more than 20% of participants. [b] Originally reported in Dopp et al. (2014), except for the missing data analysis. [c] Calculated as the difference between the cumulative benefits under the summary and expansive methods divided by the cumulative benefit under the expansive method, then multiplied by 100%. [d] Originally reported in Borduin and Dopp (2015), except for the missing data analysis.

benefits in the WSIPP model. We first calculated the plausible range of posttreatment arrest rates under the summary and expansive methods. In all cases, we took the limits of the 95% CIs ($M \pm 1.96^{*}SD/\sqrt{N}$) for felony and total rearrest rates in the MST and IT conditions (for the MST cost analysis) and the MST-PSB and UCS conditions (for the MST-PSB cost analysis) to represent the minimum and maximum plausible values for each group. We then calculated the cumulative net benefit of MST or MST-PSB by successively substituting the minimum and maximum plausible values of each parameter into the model. For the summary method, we calculated values for the MST cost analysis from means and standard deviations of posttreatment arrests reported by Dopp et al. (2014); results for the MST-PSB cost analysis were previously reported by Borduin and Dopp (2015). For the expansive method, we took the minimum and maximum CIs for each year of follow-up from the MST cost analysis and MST-PSB cost analysis (see Tables 1 and 2, respectively, for values from selected years of follow-up, and Tables S1 and S2, respectively, in the online supplemental material for values from all years of follow-up) to calculate the plausible range of cumulative benefits for each treatment.

Table 6 reports the plausible range of cumulative net benefits and associated benefit–cost ratios (i.e., returns) for MST and MST-PSB under the expansive and summary methods. The net benefits of MST ranged from $17,028 to $85,975 per sibling pair under the expansive method, with returns of $2.74 to $9.79

Table 6
Cumulative Benefits of MST and MST-PSB by Estimation Method for Plausible Range of Posttreatment Arrest Rates

Treatment model	Estimation method	Minimum plausible value		Maximum plausible value	
		Net benefit[a]	Benefit–cost ratio[b]	Net benefit[a]	Benefit–cost ratio[b]
MST					
	All years of follow-up				
	Expansive	17,028	2.74	85,975	9.79
	Summary	36,723	4.76	41,845	5.28
	Missing data analysis[c]				
	Expansive	16,520	2.69	74,695	8.64
	Summary	36,129	4.70	42,214	5.32
MST-PSB					
	All years of follow-up				
	Expansive	83,885	12.36	864,169	118.00
	Summary[d]	112,504	16.23	586,957	80.47
	Missing data analysis[c]				
	Expansive	83,885	12.36	830,137	101.04
	Summary	120,035	17.35	581,147	79.68

Note. All expenses are expressed in 2015 dollars. MST = multisystemic therapy; MST-PSB = multisystemic therapy for problem sexual behaviors.
[a] The difference between the benefit and the incremental cost of providing the treatment model over the respective comparison condition. [b] The benefit divided by the incremental cost of providing the treatment model over the respective comparison condition. [c] Excludes years of follow-up in which data are missing for more than 20% of participants. [d] Originally reported in Borduin and Dopp (2015).

per dollar spent, and from $36,723 to $41,845 per sibling pair under the summary method, with returns from $4.76 to $5.28. For MST-PSB, the net benefits per participant ranged from $83,885 to $864,169 (returns from $12.36 to $118.00 per dollar spent) under the expansive method and from $112,504 to $586,957 (with $16.23 to $80.47 returned per dollar spent) under the summary method. Thus, for both MST and MST-PSB, the highest and lowest plausible values were observed when calculating benefits with the expansive method.

Missing data. To examine whether missing data influenced the study results, we excluded from analyses those years in which more than 20% of participants were not available for follow-up (i.e., Years 24 through 26 for the MST cost study; Years 8 through 10 for the MST-PSB cost study) and then recalculated net benefits, as well as negative bias and stability, using the summary and expansive methods. We found modest differences in results when years of follow-up with significant missing data were excluded compared with the original analyses that included all years of follow-up. As shown in Table 5, net benefits under the expansive method were 11.02% lower for the MST cost study and 3.35% lower for the MST-PSB cost study, whereas net benefits under the summary method were nearly unchanged in both cases (+0.06% and −1.04%, respectively). As a result of the differential change in net benefits for the summary versus expansive methods, negative bias was decreased to 12.90% (a 41.01% decrease) for the MST cost study and to 20.02% (a 8.43% decrease) for the MST-PSB cost study (see Table 5). Finally, as shown in Table 6, the stability of expansive benefits was increased in both studies, with the plausible range of benefits reduced by 28.98% for MST and by 1.59% for MST-PSB. In sum, exclusion of years of follow-up with significant missing data was associated with smaller, but more stable, net benefit estimates under the expansive method.

Discussion

The continued refinement of economic evaluation methods is necessary to better inform policymakers and administrators in their decisions about the adoption of evidence-based psychological interventions for criminality. Indeed, the use of such interventions in community settings remains limited. The purpose of the present study was to compare methods for incorporating data on long-term criminal activity into a well-validated cost-benefit model (i.e., the WSIPP model; WSIPP, 2015). We evaluated both an expansive method (i.e., year-by-year) and a summary method (i.e., average across follow-up) in terms of their relative amount of negative bias and relative stability of results. As such, we sought to develop best practices for incorporation of participant-level data on long-term outcomes of treatment (i.e., a psychological research method) into cost-benefit analysis (i.e., an economic research method).

The present results suggest that modeling of long-term benefits is important, inasmuch as previous estimates of the benefits of MST (Dopp et al., 2014) and MST-PSB (Borduin & Dopp, 2015) using the summary method underestimated the benefits of each treatment by 21–22%. The average cumulative net benefits of MST under the expansive method were $52,641 per sibling pair, representing an additional savings of $13,426 per family (i.e., $1,235,192 across the 92 families in the MST condition) compared with the summary method. For MST-PSB, the average cumulative net benefit of $450,366 per referred youth under the expansive method represented an additional savings of $100,925 per youth (i.e., $2,422,200 across the 24 youths who received MST-PSB) over the summary method. We suggest that the difference in expected benefits between the expansive versus summary methods is a result of the increased accuracy of the former in applying the annual discount rate across the respective follow-up periods (i.e., lack of negative bias). However, we also found that estimated benefits had lower stability under the expansive method. In fact, compared with the summary method, the observed range of plausible net benefits under the expansive method was 13.46 times greater for MST ($5,122 vs. $68,946) and 1.64 times greater for MST-PSB ($474,453 vs. $780,284). Moreover, the smallest net benefits estimates for each treatment model were obtained using the expansive method. Thus, it appears that the analytic challenges resulting from the characteristics of criminal activity indices (i.e., continuous, nonnormal, and nonnegative distributions; Greene, 1993; Walters, 2007) are amplified under the conditions of the expansive method. In particular, compared with the summary method, arrest rates for individual years of follow-up included more zero values (and thus decreased power due to a lower expected effect size); thus, the means estimated from those arrest rates had greater variances (see Gardner, Mulvey, & Shaw, 1995).

Taken together, our findings suggest that administrators and policymakers who are interested in the long-term benefits of interventions to reduce criminality would find utility in an integrative approach that balances the strengths and limitations of the expansive (eliminates negative bias but lowers stability) and summary (maximizes stability but suffers from negative bias) methods. Under this integrative approach, researchers would use (a) estimates from the summary method to establish a stable "floor" for intervention benefits based on the available outcome data; (b) cumulative results from the expansive method to establish a plausible, albeit less stable, "ceiling" for intervention benefits; and (c) year-by-year results from the expansive method to provide detailed information to facilitate interpretation of the established range of potential benefits. For example, our findings suggest that public service agencies that provide funding for an MST program will likely accrue $49,000 (summary floor) to $57,000 (expansive ceiling) per youth in averted crime-related expenses over the 25 years after treatment and will likely "break even" on their investment within the first year after completion of treatment (based on year-by-year benefits estimates under the expansive method). In all cases, findings from both methods must be accompanied by appropriate caveats about their aforementioned limitations. Of course, many other aspects of a given economic analysis (e.g., comprehensiveness of cost estimates, appropriateness of outcome measures) will also affect its relevance to the decisions of administrators and policymakers, and the relative importance of various aspects of the integrative approach (floor vs. ceiling vs. year-by-year data) will depend on the scientific and policy questions being considered. Nevertheless, in general, we believe that use of a comprehensive approach to modeling long-term benefits could help increase the salience of data regarding the economic benefits of psychological interventions in key policy decisions.

The results of the sensitivity analysis suggested that it may be beneficial to exclude years of follow-up with significant missing data (i.e., >20% of the sample) when calculating long-term benefits under the expansive method. Indeed, we found decreased negative bias and increased stability after data from those years

were removed from analyses. The observed differences were modest; nevertheless, it is possible that inclusion of years with significant missing data inflated the benefits estimate under the expansive model (thus giving the appearance of greater negative bias) and decreased stability by calculating benefits based on small samples that lacked adequate power to detect between-group differences. Unfortunately, we could not examine those possibilities statistically because the procedures for imputing data and calculating power under censored-dependent distributions (e.g., negative binomial; Zhu & Lakkis, 2014) are prohibitively complex. Therefore, we propose that many of the remaining challenges in calculating the economic benefits of crime reduction will require an interdisciplinary "team science" approach involving psychologists, criminologists, statisticians, and health economists. As another example, experts from these disciplines could collaborate to define specific discount rates for different offense categories (e.g., to account for the different amounts of time over which various crime-related expenses accrue) that would be substituted for the uniform 3% discount rate used in the present study and more widely in the literature (see Gold et al., 1996).

Although comparison of the economic benefits of standard MST and MST-PSB was not a goal of the present study, it is notable that the economic benefits of MST-PSB were found to be greater than those of MST. There are several reasons to expect that an effective treatment for youth who have engaged in illegal sexual behavior would produce exceptionally large cost savings. First, sexual crimes are associated with considerable financial consequences (Post et al., 2002), particularly due to the devastating effects of such crimes on victims (Chapman, Dube, & Anda, 2007; Letourneau, Resnick, Kilpatrick, Saunders, & Best, 1996). Therefore, evidence-based treatments that are designed for and delivered to youth who are at increased risk for continued sexual offending (e.g., MST-PSB) have the potential to reduce long-term rates of crimes that have a particularly large economic impact. Second, the incremental cost per youth of MST-PSB ($7,386) was lower than that of MST ($9,776) because of the more comprehensive services (and associated higher costs) in the UCS condition. Thus, the threshold for MST-PSB to be considered cost beneficial is lower than the respective threshold for standard MST. Taken together, the present findings suggest that it is worthwhile for researchers to examine the long-term costs and benefits of treatments for complex, high-acuity populations (e.g., youth who engage in serious or repeated illegal sexual behavior) because such treatments may produce especially large economic benefits. Of course, it is important to recognize that many youth who commit sexual offenses have low rates of sexual recidivism (Caldwell, 2016; Trivits & Reppucci, 2002); thus, treatments designed for the general population of juveniles who engage in illegal sexual behavior may produce more modest economic benefits.

Several methodological limitations of the present study should be noted. First, individuals may not have continuously resided in Missouri throughout the follow-up period. As a result, a portion of the sample may have committed crimes in other states, a possibility that highlights the importance of conducting a national criminal records check (i.e., with fingerprints) in future research. However, it seems unlikely that length of residency in Missouri or that crimes committed outside of the state would vary systematically across treatment conditions. Second, treatment costs were each generated from single provider sites and may not generalize to other service providers or different psychological interventions for criminality. Even so, we expect that the proposed integrative approach to estimating long-term benefits will be useful for evaluating the generalizability of our results. Third, although this study included a broad range of benefits, it is likely that other savings (e.g., reduced use of social welfare services, higher income tax revenue resulting from increased secondary school graduation and employment; see Karoly et al., 1998; Nores, Belfield, Barnett, & Schweinhart, 2005) were not captured because resources were not available to track all possible outcomes associated with MST or MST-PSB. Future work should directly assess various domains of functioning among former MST and MST-PSB participants (e.g., employment stability, marital quality, parenting effectiveness) as well as the costs and benefits associated with these outcomes. Fourth, our study did not explore cost-shifting to other sectors (e.g., mental health, primary care), although there is some evidence that MST-related reductions in out-of-home placements (e.g., psychiatric hospitalizations) are not offset by increased use of other services (Schoenwald, Ward, Henggeler, & Rowland, 2000). Fifth, although the WSIPP model estimates average incarceration expenses for a given offense category (Aos et al., 2001), we were not able to directly measure the costs (e.g., personnel and facilities) or benefits (e.g., less opportunity to commit crimes) of incarceration using Missouri public records, which report time sentenced to prison but not actual time served. Sixth, replication of our findings is necessary given the small sample size in the original studies (particularly the MST-PSB cost study). Nevertheless, our sensitivity analyses suggest that the expansive method can provide useful information even with small samples, which are typical in randomized trials with juvenile sexual offenders (Dopp, Borduin, Rothman, & Letourneau, 2016). Finally, we only performed sensitivity analyses relevant to the comparison of the summary versus expansive methods, but other such analyses could also improve understanding of the calculation of long-term benefits (e.g., inclusion of all convictions vs. one primary conviction per incident; see Bierie, 2009).

In conclusion, the present findings suggest that an integrative approach—incorporating results from both summary (i.e., overall) and expansive (i.e., year-by-year) methods to estimate and interpret a range of potential benefits—is ideal for economic evaluation of psychological interventions that reduce crime (e.g., MST, MST-PSB). Considering the importance of selecting effective and cost-beneficial interventions for criminality, researchers should continue to refine economic models (e.g., WSIPP, 2015) to generate more detailed information about the costs and benefits of those interventions. Moreover, we encourage researchers who develop and evaluate psychological interventions for criminality to collect data regarding the long-term clinical (e.g., arrests, level of functioning, symptomatology) and economic outcomes of those interventions. Of course, we recognize that such efforts require considerable investments of time and effort, complex procedures to obtain necessary records while attending to issues of confidentiality and informed consent, and the development of long-term partnerships between researchers and government agencies.

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Received December 21, 2016
Revision received May 3, 2017
Accepted May 5, 2017 ■