

COST-BENEFIT ANALYSIS OF MULTISYSTEMIC THERAPY  
FOR SERIOUS AND VIOLENT JUVENILE OFFENDERS AND THEIR SIBLINGS

---

A Thesis  
Presented to  
The Faculty of the Graduate School  
at the University of Missouri – Columbia

---

In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts

---

by  
ALEX R. DOPP  
Dr. Charles Borduin, Thesis Supervisor

JULY 2012

The undersigned, appointed by the dean of the Graduate School, have examined the thesis  
entitled

COST-BENEFIT ANALYSIS OF MULTISYSTEMIC THERAPY  
FOR SERIOUS AND VIOLENT JUVENILE OFFENDERS AND THEIR SIBLINGS

presented by Alex R. Dopp,

a candidate for the degree of Master of Arts in Psychology,

and hereby certify that, in their opinion, it is worthy of acceptance.

---

Professor Charles M. Borduin

---

Curators' Professor David C. Geary

---

Professor Judith I. Stallmann

To Mom and Dad. I owe it all to you.

## ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. Charles Borduin, for his invaluable support and mentorship throughout this process. I would also like to thank David Wagner and Dr. Aaron Sawyer for their own support, guidance, and contributions. In addition, I would like to thank the other members of my thesis committee, Drs. David Geary and Judith Stallman, for their feedback and support. Finally, I would like to thank Nicholas Hall for his services as my research assistant.

## TABLE OF CONTENTS

ACKNOWLEDGEMENTS .....	ii
LIST OF TABLES .....	v
ABSTRACT .....	vi
Chapter	
1. INTRODUCTION .....	1
2. PRESENT STUDY .....	7
3. METHOD .....	9
Participants	
Treatment Conditions	
MST	
IT	
Procedures	
Original outcome study	
Follow-up studies	
Present study	
Measures	
Effectiveness	
MST costs	
IT costs	
Taxpayer benefits	
Crime victim tangible benefits	
Crime victim intangible benefits	

4. ANALYTIC STRATEGY .....	20
5. RESULTS .....	23
Taxpayer benefits	
Crime victim benefits	
Tangible benefits	
Intangible benefits	
Cumulative benefits	
Sensitivity analyses	
Crime victim intangible benefits	
Sibling juvenile arrest rates	
Discount rates	
6. DISCUSSION .....	28
REFERENCES .....	34
FOOTNOTES .....	41

## LIST OF TABLES

Table	Page
1. Taxpayer Expenses for Referred Youths per Arrest Category by Therapy Condition .....	42
2. Taxpayer Expenses for Siblings per Arrest Category by Therapy Condition .....	43
3. Taxpayer Expenses for Sibling Pairs per Arrest Category by Therapy Condition .....	44
4. Expected Number of Posttreatment Arrests for All Crimes by Therapy Condition .....	45
5. Expected Number of Posttreatment Arrests for Felony Crimes by Therapy Condition .....	46
6. Crime Victim Expenses Avoided for Multisystemic Therapy per Referred Youth .....	47
7. Crime Victim Expenses Avoided for Multisystemic Therapy per Sibling .....	48
8. Crime Victim Expenses Avoided for Multisystemic Therapy per Sibling Pair .....	49
9. Cumulative Benefit of Multisystemic Therapy to Taxpayers and Crime Victims .....	50
10. Sensitivity Analysis: Effect of Crime Victim Intangible Benefits on Cumulative Benefit of Multisystemic Therapy .....	51
11. Estimated Maximum Number of Sibling Juvenile Felony Arrests by Treatment Group .....	52
12. Sensitivity Analysis: Effect of Sibling Juvenile Arrest Rates on Cumulative Benefit of Multisystemic Therapy .....	53
13. Sensitivity Analysis: Effect of Discount Rates on Cumulative Benefit of Multisystemic Therapy .....	54

# COST-BENEFIT ANALYSIS OF MULTISYSTEMIC THERAPY FOR SERIOUS AND VIOLENT JUVENILE OFFENDERS AND THEIR SIBLINGS

Alex Dopp

Dr. Charles Borduin, Thesis Supervisor

## ABSTRACT

This study investigated the economic benefits of an intensive family-based treatment (multisystemic therapy, MST) versus individual therapy (IT) using arrest data from 25-year follow-ups of referred serious and violent juvenile offenders ( $n = 176$ ) and their closest-in-age siblings ( $n = 110$ ). Three categories of benefits were evaluated: (1) taxpayer benefits (i.e., avoided criminal justice system costs), (2) tangible benefits to crime victims (i.e., avoided tangible losses), and (3) intangible benefits to crime victims (i.e., avoided pain and suffering). Results indicated that reductions in criminality for juvenile offenders and siblings in the MST versus IT conditions were associated with substantial benefits to both taxpayers and crime victims. Cumulative benefits of MST over IT ranged up to \$34,955 per referred youth and up to \$37,433 per family (i.e., when siblings were included). Overall, it was estimated that every dollar spent on MST recovered up to \$4.98 in the years ahead by preventing future crimes. Sensitivity analyses also indicated that estimates of savings were robust to variations in crime victim intangible benefits, sibling juvenile arrest rates, and discount rates. The economic benefits of MST are important for administrators and policymakers to consider when allocating scarce financial resources to interventions for serious juvenile offenders.



## **Introduction**

The considerable financial and social consequences of criminal behavior have made crime reduction an important public policy issue. More than 20 million crimes are committed each year in the United States, resulting in nearly \$200 billion in costs to society and crime victims (Bureau of Justice Statistics, 2010; Cohen & Miller, 1998; Federal Bureau of Investigation, 2008; McCollister, French, & Fang, 2010; Miller, Fisher, & Cohen, 2001). Juvenile crime is of particular interest to policymakers, as youths under the age of 18 years commit 15% to 24% of all serious crimes (Office of Juvenile Justice and Delinquency Prevention, 2011) and thus contribute greatly to the overall costs of crime (Melton, Lyons, & Spaulding, 1998; Miller et al., 2001). Juvenile offenders are also at risk for a number of negative outcomes, including mental and physical health problems, substance abuse, low academic and occupational achievement, interpersonal difficulties, and continued criminality in adulthood (Laub & Sampson, 1994; Lyons, Baerger, Quigley, Erlich, & Griffin, 2001; Moffitt, Caspi, Harrington, & Milne, 2002; Shufelt & Coccozza, 2006). Reviewers have called for the use of clinically effective and cost-beneficial treatment approaches to reduce both the financial and social impacts of serious juvenile crime (e.g., Skowrya & Coccozza, 2007).

Traditional mental health and juvenile justice services have had little success in reducing serious antisocial behavior of youths (Kazdin, 2000; Ogden & Halliday-Boykins, 2004). These services have been limited in their ability to reduce criminality because they are difficult for youths and families to access, often rely on restrictive out-of-home placements (e.g., residential treatment centers, psychiatric hospitalization), and

fail to address the causes and correlates of serious juvenile offending. Recently, though, a number of comprehensive family-based treatments have shown effectiveness in reducing serious and violent juvenile offending (Borduin, Dopp, & Taylor, 2012; Eyberg, Nelson, & Boggs, 2008; Kazdin, 2007a; National Institutes of Health, 2006). The economic costs and benefits of these treatments, however, have seldom been evaluated. This is unfortunate because research findings demonstrating the economic benefits of family-based treatments for serious and violent juvenile offenders would be useful for administrators and policymakers to consider in their funding decisions about mental health services.

Multisystemic therapy (MST; Borduin & Henggeler, 1990; Henggeler & Borduin, 1990; Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 2009) is a well-established family-and community-based treatment for serious and violent juvenile offenders (see Kazdin, 2007b; National Institutes of Health, 2006; National Registry of Evidence-based Programs and Practices, n.d.; U.S. Department of Health and Human Services, 2001). Indeed, the results of randomized clinical trials by the developers of MST (e.g., Borduin, Henggeler, Blaske, & Stein, 1990; Borduin, Schaeffer, & Heiblum, 2009; Borduin et al., 1995; Henggeler, Melton, & Smith, 1992; Henggeler, Pickrel, & Brondino, 1999) and independent groups of investigators (e.g., Ogden & Halliday-Boykins, 2004; Timmons-Mitchell, Bender, Kishna, & Mitchell, 2006) have demonstrated that MST is clinically effective for serious and violent juvenile offending. In addition, long-term follow-ups have demonstrated that MST produces lasting reductions in criminal behavior at 13.7 years (Schaeffer & Borduin, 2005) and 21.9 years (Sawyer & Borduin, 2011) after treatment completion. Despite these positive findings, however, much less is known about the economic costs and benefits of MST. The present

study investigated the costs and benefits of MST for serious juvenile offenders approximately 25 years following treatment.

Economic analysis provides a framework for analyzing information on clinical effectiveness in concert with information on economic costs and benefits (see Drummond, Sculpher, Torrance, O'Brien, & Stoddart, 2005; Gold, Siegel, Russell, & Weinstein 1996; Hargeaves, Shumway, Hu, & Cuffel, 1998). Researchers have begun to use economic analysis to compare different mental health treatments by weighing the costs of treatment against the resulting benefits to patients, institutions, or society (Fals-Stewart, Yates, & Klostermann, 2005; Singe, Hawthorne, & Vos, 2001). Results from such studies yield useful decision tools for individuals or agencies that select and administer treatment programs (Barnett, 2000; Mihalopoulos, Vos, Perkis, & Carter, 2011; Weisz, Hawley, Pilkonis, Woody, & Follette, 2000) and can help to provide patients with clinically effective treatments at the lowest possible cost (Chisholm, 1998; Marsh, Chalfin, & Roman, 2008). Furthermore, findings from such studies demonstrate when a treatment has become financially viable (i.e., an important prerequisite for dissemination) and can suggest areas in which a treatment could be further refined and improved to achieve cost savings (Weisz & Hawley, 1998; Yates, Haven, & Thoresen, 1979).

Cost-benefit analysis is the most powerful and versatile of a number of different methods of economic analysis (see Boardman, Greenberg, Vining, & Weimer, 2010; French, Salome, Sindelar, & McLellan, 2002). This method directly compares the costs of a treatment with its economic benefits, with all costs and benefits measured in dollar amounts (i.e., on the same metric). In contrast, other economic analysis methods (e.g.,

cost-effectiveness analysis, cost-utility analysis) tend to rely on study-specific outcome measures (e.g., quality adjusted life years, improved marital satisfaction, reductions in partner violence), making between-study comparisons of treatments with different outcomes more difficult.

Although cost-benefit analysis procedures are available and could be useful in mental health research, treatment studies have tended to focus exclusively on clinical outcomes and have neglected to include cost-benefit analyses or other forms of economic analysis (for reviews, see Byford, McCrone, & Barrett, 2003; Evers, Van Wijk, & Ament, 1997; French et al., 2002; Kaplan & Groessl, 2002). Cost-benefit analyses of treatment programs for juvenile offenders are particularly scarce and are often limited by methodological issues, including small sample sizes, design flaws in the treatment study (e.g., cost-benefit analyses of randomized controlled trials are rare), and errors in the cost-benefit analysis procedures. An exception is a series of cost-benefit analyses of programs for juvenile offenders, including MST, conducted by the Washington State Institute for Public Policy (WSIPP; Aos, Lieb, Mayfield, Miller & Pennucci, 2004; Aos, Phipps, Barnoski & Lieb, 2001; Aos et al., 2011; Drake, Aos & Miller, 2009). The WSIPP developed a cost-benefit analysis model (hereafter referred to as the WSIPP model) to estimate an expansive range of costs and benefits for both taxpayers and crime victims and created computational routines to obtain the “bottom line” economics (i.e., the return on investment) of each program. Regarding MST, WSIPP researchers reported net benefits ranging from \$9,316 to \$131,918 for each participant, resulting in returns of \$2.64 to \$28.81 for every dollar spent on MST (Aos et al., 2001, 2004, 2011; Drake et al., 2009). As such, these researchers identified MST as a treatment program that was likely

to reduce taxpayer and crime victim costs and that was worthy of implementation by state and local governments.

Although encouraging, the WSIPP findings were limited by the procedures used to estimate long-term clinical outcomes and program costs, including (a) calculation of an expected rate of future offenses rather than an actual rate based on rearrest data, (b) use of a sample drawn from a heterogeneous population of juvenile offenders rather than the population for which MST was developed (i.e., serious and violent juvenile offenders), (c) treatment of rearrest outcomes as a dichotomous variable (i.e., arrested or not) rather than a continuous variable (i.e., average number of arrests per recidivist), and (d) estimation of the costs of implementing MST on the basis of market rates for labor and services rather than direct estimates of program costs. To date, only one study has examined the long-term costs and benefits of MST using procedures that addressed these limitations.

Klietz, Borduin, and Schaeffer (2010) adapted the WSIPP model to a 13.7-year follow-up (Schaeffer & Borduin, 2005) of a randomized clinical trial of MST versus individual therapy (IT) for serious and violent juvenile offenders (Borduin et al., 1995). Klietz et al. improved on the original application of the WSIPP model (Aos et al., 2001) through (a) calculation of an actual offense rate based on rearrest data, (b) use of a sample of serious and violent juvenile offenders, (c) treatment of rearrest outcomes as a continuous variable, and (d) estimation of MST program costs with data from a real-world provider agency. Results showed that reductions in criminality in the MST versus IT conditions were associated with net benefits of \$75,110 to \$199,374 per MST participant, resulting in returns of \$9.51 to \$23.59 for each dollar spent on MST.

Although the Klietz et al. (2010) study represented a significant advance in estimating the economics of MST, the study did not capture two likely economic benefits of the treatment. First, the study calculated benefits only from avoided felony crimes. However, in their 21.9-year follow-up of the same sample as used in Klietz et al. (2010), Sawyer and Borduin (2011) found that the frequency of misdemeanor offending was 5.0 times lower for MST participants than for IT participants. Thus, focusing only on felony crimes does not capture the likely benefits of MST-related decreases in non-felony criminal acts (i.e., misdemeanors). Fortunately, some previous studies of the economics of crime have included estimates of expenses for misdemeanor crimes (see McCollister, French, Sheidow, Henggeler, & Halliday-Boykins, 2007; McCollister et al., 2010; Nores, Belfield, Barnett, Schweinhart, 2005), which can be incorporated into the WSIPP model to capture the likely benefits of treatment effects on misdemeanor crimes.

Second, there is evidence that the positive clinical effects of MST are not limited to youths targeted by treatment but also extend to the siblings of those youths. Indeed, in a randomized clinical trial, Rowland, Chapman, and Henggeler (2008) demonstrated that closest-in-age siblings of juvenile offenders who received MST evidenced a greater reduction in self-reported substance use at 18 months after baseline than did siblings of offenders who received usual community services. More recently, in a 25-year follow-up of the Borduin et al. (1995) clinical trial, Wagner, Borduin, and Sawyer (2012) reported that arrest rates for closest-in-age siblings of MST participants were significantly lower than for their counterparts in the IT condition (43.3% vs. 72.0%, respectively). In addition, the odds of felony arrest were three times greater for siblings in the IT condition than in the MST condition, and the odds of sentencing to incarceration or probation

during adulthood were two times greater for siblings in the IT condition. It seems likely that the MST-related reductions in sibling criminal behavior observed in these two studies would produce economic benefits beyond those associated with MST-related reductions in criminal behavior of referred youths. To date, however, cost-benefit analyses of MST have captured only benefits from treatment effects on referred youths.

The Klietz et al. (2010) findings regarding the costs and benefits of MST were also limited to the extent that the study did not assess the possible effects of variations in key parameters of the WSIPP model (e.g., estimates of benefits for avoided crimes, discount rates) on the study results. Sensitivity analysis can be used to examine the influence of uncertainty in an economic analysis by varying a parameter of interest across a range of plausible values (see Briggs & Gray, 1999; Briggs, Sculpher, & Buxton, 1994). In particular, sensitivity analysis indicates whether estimates of net benefits (i.e., benefits minus costs) are robust to variation in the selected parameter over the plausible range.

### **Present Study**

The aim of the present study was to examine the costs and benefits of MST by adapting the WSIPP model (see Aos et al., 2001) to long-term (i.e., 25-year) MST clinical outcome data for referred youths and their closest-in-age siblings. More specifically, the study investigated the benefits of MST using three sets of measures: (1) effectiveness (i.e., long-term clinical outcomes); (2) costs (i.e., resources used to provide each treatment condition); and (3) benefits, which included avoided costs of crime

associated with taxpayer expenses, tangible losses to victims, and intangible losses to victims (i.e., pain, suffering, reduced quality of life) for each treatment condition.

The present study improved on Klietz et al.'s (2010) application of the WSIPP model by estimating a broader range of benefits across different types of crimes (i.e., misdemeanors as well as felonies) and multiple family members (i.e., siblings as well as referred youths). In addition, sensitivity analyses examined the influence of three model parameters on the study results, including (1) crime victim intangible benefits, which are the largest component of benefits in the WSIPP model; (2) sibling juvenile arrest rates, which were estimated from the juvenile arrest rates of target youth; and (3) discount rates, which were used to express benefits over the 25-year follow-up period of the study.

The costs and benefits of MST were expressed using both (a) net benefit estimates (i.e., benefits minus costs) and (b) benefit-cost ratios (i.e., benefits divided by costs). A positive net benefit and a benefit-cost ratio greater than 1.00 would indicate a greater return on investment for MST compared to individual therapy (IT), whereas a negative net benefit and a benefit-cost ratio less than 1.00 would indicate a greater return for IT. The treatment with the greater return on investment would be considered the better choice because it would maximize the benefits attained for each dollar spent (Singh, Hawthorne, & Vos, 2001). It was hypothesized that the net benefit would be positive and that the benefit-cost ratio would be greater than 1.00 for MST, indicating a greater return on investment for MST. Furthermore, it was hypothesized that plausible variations in the estimates of crime victim intangible benefits, sibling juvenile arrest rates, and discount rates would not result in a negative net benefit or a benefit-cost ratio less than 1.00 for



MST, indicating that the WSIPP model was robust to plausible variation in these parameters.

## **Method**

### **Participants**

Participants were 176 youths who originally participated in a randomized clinical trial (Borduin et al., 1995) and each youth's closest-in-age sibling, if any, who was living in the home at the time of the trial. In those families in which a biological sibling was not present in the home, the closest-in-age step-sibling or cousin, if any, living in the home was included. Hereafter, I use the term "siblings" to refer to closest-in-age siblings, step-siblings, or cousins.

In the original study, 176 serious and violent juvenile offenders and their families were referred consecutively by juvenile court personnel and randomly assigned to MST ( $n = 92$ ) or IT ( $n = 84$ ). Families were eligible to participate in the study if the referred youth (a) had at least two prior arrests for criminal offenses, (b) was currently living with at least one parent figure, and (c) showed no evidence of psychosis or dementia. Treatment completers and dropouts were collapsed in each condition (i.e., intent-to-treat) to provide a conservative test of MST effects. Of the 176 families, 129 had a non-referred sibling in the home ( $n = 67$  for MST,  $n = 62$  for IT). Referred youths averaged 3.9 previous arrests for felonies ( $SD = 1.9$ ), and 47.8% of the youths had at least one arrest for a violent crime (e.g., sexual assault, assault and battery with intent to kill, aggravated assault). All youths had been detained for at least four weeks prior to participation in the study. The mean age of referred youths at the time of treatment was 14.5 years ( $SD =$

1.40); 69.3% were male; and 76.1% were White and 22.2% were African-American. The mean age of siblings at the time of treatment was 13.4 years ( $SD = 3.7$ ); 50.0% were male; 79.1% were White and 20.9% were African-American; and 60.0% were younger siblings, 38.2% were older siblings, and 1.8% were twins. The mean number of children in the home was 3.2 ( $SD = 1.9$ ); 56.8% of the families included two parental figures (biological parents, stepparents, foster parents, grandparents); and 63.4% of the families were of lower socioeconomic status (Class IV or V; Hollingshead, 1975).

Data for the present study were drawn primarily from two sources: (1) a 21.9-year follow-up in which Sawyer and Borduin (2011) tracked criminal activity in the 176 referred youths from the original clinical trial; and (2) a 25-year follow-up in which Wagner et al. (2012) tracked criminal activity in 110 siblings ( $n = 60$  for MST,  $n = 50$  for IT) of those referred youths. In the present study, the follow-up of referred youths was extended to 25.0 years to equate the length of follow-up for referred youths and their siblings.

### **Treatment Conditions**

The mean numbers of treatment hours were 20.7 ( $SD = 7.4$ ) for the MST group and 22.5 ( $SD = 10.6$ ) for the IT group. These means were not significantly different,  $F(1, 175) = 1.85, p = .176$ . Details about the therapists, supervision practices, and treatment fidelity in each condition are provided in Borduin et al. (1995).

**MST.** MST interventions, service delivery methods, and case examples are described in a clinical volume (Henggeler & Borduin, 1990) and subsequent treatment manual (Henggeler et al., 2009). Interventions integrate empirically-supported clinical techniques (e.g., from behavioral and cognitive-behavioral therapies and

structural/strategic family therapy), which have historically focused on a limited aspect of the youth's social ecology (e.g., individual youth, family), into a broad-based ecological framework. These interventions are designed to address causes and correlates of serious delinquent behavior (for reviews, see Biglan, Brennan, Foster, & Holder, 2005; Guerra, Williams, Tolan & Modecki, 2008; Kazdin, 2007b; Loeber & Farrington, 1998), including variables related to the individual youth (e.g., problem-solving deficits, hostile attributions) and his or her family relations (e.g., low family warmth, poor parental monitoring of the youth), peer relations (e.g., social skills deficits, association with deviant peers), school functioning (e.g., academic problems, youth-teacher conflicts), and neighborhood (e.g., high crime, absence of resources for families). Services are delivered to youths and their caregivers in home, school, and neighborhood settings at times convenient to the family (including evenings and weekends). Therapists match intensity of treatment to clinical need, spending more time with families in the initial weeks of therapy (e.g., 3-4 times per week if indicated) and tapering off during a relatively brief (i.e., average 4 to 6 months) course of treatment.

**IT.** The therapy in this condition represented the usual community outpatient treatment for juvenile offenders in the local judicial district as well as nationwide (see Loeber & Farrington, 1998). Interventions were an eclectic blend of psychodynamic (e.g., promoting insight and expression of feelings), client-centered (e.g., providing empathy and warmth), and behavioral (e.g., reinforcing school attendance and other positive behaviors) therapies. Although there were some variations in the therapists' strategies (e.g., some therapists provided less empathy or were more directive than other therapists),

all focused on intervening with the individual youth rather than with his or her social ecology.

## **Procedures**

All procedures and measures were approved by the Institutional Review Board of the University of Missouri. Those relevant to the present study are described below.

**Original outcome study.** Families were contacted by a research assistant and invited to participate in a 1.5-hour research assessment approximately one week before the beginning of treatment and again approximately one week after the end of treatment (see Borduin et al., 1995). The research team emphasized to families that refusing to participate in the assessments, or discontinuing participation at any time, would not jeopardize the receipt of treatment services through the juvenile court. Youths remained under the jurisdiction of the court regardless of participation in treatment or in the research assessments. Family members provided written consent or assent for the research and follow-up procedures.

**Follow-up studies.** Juvenile criminal arrest data (i.e., number and type of arrests) for referred youths were obtained yearly through juvenile office records; juvenile arrest records are closed in Missouri once a youth reaches age 17 and therefore could not be obtained for siblings at the time of the 25-year follow-up. Adult criminal arrest data were obtained for referred youths and siblings from Missouri State Police records. An arrest was classified as having taken place during the follow-up period if it occurred after the date of the posttreatment assessment (or after the date of termination from treatment for dropouts). Multiple sources (e.g., arrest records, driver's license records, parents) were

used to determine whether each individual had lived in Missouri and thus was available to have an arrest record during the follow-up period.

A search of criminal records in other states was not possible because participants' fingerprints, which would have been required to conduct a national criminal records check, were not obtained at the time of the original trial. Therefore, it is possible that some individuals committed crimes outside of Missouri. Nevertheless, I assumed that arrest rates for individuals residing outside of Missouri would not be systematically different from individuals residing continuously in the state, and that variation in arrest rates between treatment groups would be consistent whether individuals resided within or outside of Missouri.

**Present study.** The present study applied the WSIPP model (see Aos et al., 2001) to the MST clinical effectiveness data obtained for referred youths in Sawyer and Borduin (2011) and for their closest-in-age siblings in Wagner et al. (2012). The WSIPP model, which operates using Microsoft Excel, is an integrated set of estimates and computational routines designed to produce internally consistent benefit-cost ratios. The model provides monetary estimates of a vast range of costs associated with felony crimes; these costs can be broadly categorized as pertaining to (a) taxpayer expenses, (b) tangible losses to victims, and (c) intangible losses to victims. Furthermore, the model provides formulas for comparison of the relative costs and benefits of programs with each other (i.e., the MST vs. IT treatment effect size). All computational routines from the original application of the WSIPP model (Aos et al., 2001) were retained in the present study.

The present study used a baseline year of 2012 for all monetary values. Specifically, estimates of program costs for MST and IT, and estimates of crime expenses, were adjusted to 2012 values using the Consumer Price Index (CPI; Bureau of Labor Statistics, 2012) to account for inflation. In addition, for crime expenses that were originally derived in other states, those values were adjusted to reflect the cost of living in the state of Missouri using the American Chamber of Commerce Researchers Association (ACCRA) Cost of Living Index (ACCRA, n.d.). I also used economic discounting to express any benefits of one treatment over another that accrued into the future (in the present case, over the 25 years following treatment) in terms of their present (i.e., 2012) value.<sup>1</sup> Discounting adjusts benefits to reflect the fact that the value of a dollar obtained in the future decreases as a function of the delay before receiving that dollar, independent of inflation, because the opportunity to use the dollar or invest it to earn additional income is deferred (Hargreaves, Shumway, Hu & Cuffel, 1998). The present study used a standard 3% annual discount rate, which was derived using interest rates on federal bonds to index the government's expected rate of return on capital (see Gold, Siegel, Russell & Weinstein, 1996).

The procedures described thus far comprise the base case for this cost-benefit study (i.e., uncertainties about model parameters were addressed by using the most plausible estimate for each parameter value). Additionally, sensitivity analyses were conducted by successively varying the values of three selected parameters (i.e., crime victim intangible benefits, sibling juvenile arrest rates, and discount rates) across a plausible range while holding all other parameters constant at their base case values (see Boardman et al., 2006). The net benefit was considered robust to uncertainty about a

given parameter if the balance (i.e., positive or negative) of the net benefit did not change across the range selected for that parameter.

## **Measures**

**Effectiveness.** Borduin et al. (1995) obtained juvenile criminal records for referred youths in the original clinical trial through yearly juvenile office record searches. In subsequent follow-ups, Sawyer and Borduin (2011) and Wagner et al. (2012) obtained adult criminal records for referred youths and their closest-in-age siblings, respectively. Adult criminal records, which are publically available in the state of Missouri, were obtained using an online court records database searched independently by multiple research assistants who were blind to a given participant's treatment group status.

In the present study, I lengthened the 21.9-year follow-up of referred youths conducted by Sawyer and Borduin (2011) to 25.0 years. To accomplish this task, a research assistant who was blind to treatment group status used the aforementioned court records database to extend the follow-up from July 2007 (i.e., the end date used by Sawyer & Borduin, 2011) to December 2010 (i.e., the end date used by Wagner et al., 2012). Searches were conducted using individuals' names, including known aliases, alternative first names (e.g., Jim for James), and alternative last names for women whose names may have changed due to marriage (based on state-level court records and county-level marriage records). Several steps were taken to rule out false positives when searched names were present in court records. First, individuals were matched to records by date of birth, middle name or middle initial, and suffixes (e.g., Jr.). Second, if those indicators were absent for a specific case, individuals were matched to records based on similarities to cases that met the first search criterion, including previously recorded

addresses, court locations, and names of other individuals (e.g., spouses) listed on the court docket. If an individual could not be matched to a given case by this rule-out process, no information was recorded for that case. Thus, the data for the present study provided a conservative estimate of criminal activity in the state of Missouri. I checked for reliability by independently conducting a court records search for one in every 10 referred youths and comparing my results with those from the research assistant. No discrepancies were found between the results obtained by the research assistant and myself.

For verified criminal records, data were coded by crime classification (i.e., felony vs. misdemeanor) and date of arrest. Felonies and misdemeanors were further classified based on 11 offense categories used in the WSIPP model (Aos et al., 2001) and in other pertinent cost-benefit studies (see McCollister et al., 2007, 2010; Nores et al., 2005): (1) murder/manslaughter, (2) sexual (e.g., sexual assault, molestation), (3) robbery, (4) felony assault (e.g., with intent to kill, with a deadly weapon), (5) felony property (e.g., auto theft, property damage), (6) felony drug (e.g., distribution of controlled substance, driving under the influence – persistent offender), (7) theft/larceny (e.g., stealing, non-payment of child support), (8) stolen property (e.g., receiving stolen property), (9) fraud (e.g., bad check, credit fraud), (10) misdemeanor assault (e.g., third degree, domestic), and (11) misdemeanor drug (e.g., marijuana possession, public intoxication). No arrests were recorded for cases that were dismissed or that were not yet disposed at the time of data collection (i.e., only arrests resulting in convictions were included). Traffic court records, which include minor traffic violations (e.g., speeding), were not recorded.



**MST costs.** The operating costs of an MST program differ from those of usual outpatient treatment services in the community in two key ways. First, MST programs are funded by state or local public service agencies (i.e., mental health, juvenile justice, social welfare) and typically are implemented by private service organizations. These organizations contract with MST Services, Inc., the national licensing entity for MST programs. MST Services, Inc. employs quality assurance mechanisms (i.e., staff training, organizational support, and tracking and feedback systems) to ensure the fidelity of program implementation. Second, MST program budgets capture the costs associated with service delivery (e.g., family therapy, school meetings) and related activities (e.g., travel to homes, participation in training, supervisory meetings).

Klietz et al. (2010) used the annual budget of a private service organization delivering MST in St. Louis, MO in 2008 to estimate the operating costs of an MST program in a community setting. The budget included personnel costs (e.g., therapist salaries, supervisor salaries, payroll taxes, employee health insurance, professional fees), non-personnel expenditures (e.g., supplies, rent, utilities, maintenance, parking, depreciation), cell phone service contracts, and mileage reimbursement to therapists for travel related to providing MST. All expenses involved in operating the MST program were summed and divided by the number of youths who received MST that year to calculate the cost of MST per youth. This cost, adjusted for (a) the difference in cost of living between St. Louis, MO and Columbia, MO (i.e., the site of the original clinical trial) using the ACCRA Cost of Living Index (ACCRA, n.d.) and (b) its 2012 value using the CPI (Bureau of Labor Statistics, 2012), was \$11,595 per MST participant. This estimate is on the high end for MST programs nationally (i.e., \$6,000 to \$12,000 per

youth; K. B. Strother, President, MST Services, Inc., personal communication, March 12, 2010) and, as such, provides a conservative estimate of MST benefits.

**IT costs.** In contrast to MST, usual community outpatient services for juvenile offenders do not involve licensing or quality assurance costs (i.e., because treatments are eclectic and are selected and implemented at therapists' discretion) and use a fee-for-service model in which therapist salaries and operating expenses are captured through hourly session rates. Klietz et al. (2010) estimated the cost of IT using information provided by the counseling center that provided IT to youth in the original clinical trial. Specifically, the reimbursement rate per session for IT in 2008 was multiplied by the mean number of IT sessions provided in Borduin et al. (1995) to calculate the cost of IT per youth. For the present study, this estimate was adjusted to its 2012 value using the CPI (Bureau of Labor Statistics, 2012), resulting in a cost of \$2,190 per IT participant.

**Taxpayer benefits.** Taxpayer benefits of avoided felony crimes are defined in the WSIPP model for murder/manslaughter, sexual, robbery, felony assault, felony property, and felony drug offense categories. These values are based on estimates of the annual marginal capital and operating expenses for the following six public agencies: (a) police and sheriffs' offices (arrest expenditures and arrest rates), (b) superior courts and county prosecutors (court processing expenditures and conviction rates), (c) jail and community supervision for adult felons (expenditures and detention rates), (d) juvenile detention and supervision (average daily populations and lengths of stay, annual capital costs of facility construction), (e) state juvenile rehabilitation (expenditures and average daily populations), and (f) adult detention (average daily populations and lengths of stay, annual capital costs of facility construction).

The values for taxpayer benefits of avoided crimes for theft/larceny, stolen property, and fraud offenses were taken from McCollister et al. (2010). The value for misdemeanor assault offenses was taken from McCollister et al. (2007), and the value for misdemeanor drug offenses was taken from Nores et al. (2005). In all cases, these values are based on estimates of similar expenses to those used in the WSIPP model, namely, police protection costs, court processing and adjudication costs, and corrections costs.

**Crime victim tangible benefits.** Tangible benefits to crime victims (Cohen & Miller, 1998; Miller et al., 1996) in the WSIPP model are defined in terms of avoided expenses in the following six areas: (a) property damage or loss (including insurance claim processing expenditures), (b) medical care (e.g., hospital and physician costs, emergency transport, rehabilitation, prescriptions), (c) mental health care (e.g., services by psychiatrists, psychologists, social workers, and pastoral counselors), (d) police and fire services, (e) victim services (e.g., legal advocacy, safe housing), and (f) lost productivity (i.e., wages, fringe benefits, and school days lost by victims; productivity lost by coworkers and supervisors). Miller et al. (1996) originally estimated the values for each offense category based on data from the National Crime Victimization Survey (Bureau of Justice Statistics, 1993).

**Crime victim intangible benefits.** Intangible benefits to crime victims (Miller et al., 1996) in the WSIPP model provide a more expansive assessment of avoided expenses by placing a monetary value on the pain and suffering of victims. For murder/manslaughter, victim intangible benefits were based on more than 50 technically sound “willingness to pay” studies (Miller et al., 2001) that estimated the amount of money that people spend to reduce risks of death. For nonfatal crimes, Miller et al. (1996)

estimated intangible benefits by subtracting tangible expenses associated with the crime from the amount of compensatory damages awarded by a jury. Because cases that receive jury awards may not be representative of all cases for that offense category, Miller et al. estimated average jury awards for typical cases from quantitative models of the relations between tangible expenses, victim characteristics, severity of injuries, and jury awards.

### **Analytic Strategy**

Cost-benefit analyses of MST were based on three sets of measures: (1) effectiveness (i.e., reductions in arrests during the 25-year follow-up for referred youths and their siblings who received MST vs. IT), (2) costs (i.e., resources used to provide MST vs. IT), and (3) benefits to taxpayers and crime victims (i.e., for MST vs. IT). Results of these analyses were expressed in terms of a net benefit estimate and a benefit-cost ratio; MST was considered cost-beneficial relative to IT if the net benefit was positive and the benefit-cost ratio exceeded 1.00.

Analyses were conducted using three models, each with identical model assumptions and analytic strategies. For the first model, data for referred youths were analyzed to capture the benefit to MST participants relative to IT participants. For the second model, data for siblings in each treatment group were analyzed to capture the relative benefit to MST siblings; the costs of treatment for both MST and IT were set to zero for this model because no incremental costs were associated with including siblings in treatment (i.e., the costs of delivering MST to siblings were captured in the overall cost of MST, and IT was never delivered to siblings). For the third model, data for referred youths and siblings were analyzed together to capture the cumulative benefit to MST

sibling pairs (i.e., the referred youth and his or her sibling, if any) relative to IT sibling pairs.

Consistent with Aos et al. (2001) and Klietz et al. (2010), I made several assumptions about the benefits of avoided crimes. I assumed that (a) all categories of offenses (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; (b) felony property crimes resulted in tangible, but not intangible, losses to victims; and (c) felony drug crimes did not result in any losses (i.e., tangible or intangible) to victims. In addition, to calculate crime victim tangible and intangible crime expenses, I used a distribution of expected crimes (from Aos et al., 2001) that accounts for the varying frequencies of undetected crimes in different offense categories (e.g., sexual crimes are less likely than property crimes). Finally, I did not include any crime victim tangible or intangible losses for five categories of offenses (i.e., theft/larceny, stolen property, fraud, misdemeanor assault, and misdemeanor drug crimes) because (a) Aos et al. (2001) did not include those categories in their distribution of expected crimes and (b) estimates of losses for those categories were not available elsewhere.

Furthermore, crime victim benefits were calculated using an assumption of multiple victimizations per arrest (see Aos et al., 2001; Miller et al., 1996). Previous cost-benefit analyses of MST calculated benefits to crime victims using both (a) a multiple victimization assumption and (b) a conservative assumption of one victimization per arrest. The latter assumption views criminal convictions as an accurate representation of the number of offenses committed by a given sample. However, a large body of evidence

(e.g., Bureau of Justice Statistics, 2010; Elliott, 1995) suggests 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. Therefore, the present study calculated crime victim benefits only under the multiple victimization assumption.

Criminologists use lambda, an estimate of how often individuals commit a given type of crime, for multiple victimization analyses. Lambdas account for the distribution of arrests and the probability of conviction for different categories of offenses. For the present study, lambdas for the various offense categories were taken from Aos et al. (2001) and are as follows: murder/manslaughter, 0.01; sexual, 0.12; robbery, 0.69; felony assault, 1.05; felony property, 19.70. Lambdas were not used for the felony drug, theft/larceny, stolen property, fraud, misdemeanor assault, or misdemeanor drug offense categories, as these crimes were assumed to not result in losses to victims.

The analyses described thus far comprised the base case for this cost-benefit study (i.e., all parameters were set at the most plausible value). Additionally, minimum and maximum plausible values were selected for each selected parameter (i.e., crime victim intangible benefits, sibling juvenile arrest rates, and discount rates), and sensitivity analyses were conducted for each model (i.e., referred youths, siblings, and siblings pairs) by successively varying the values of each parameter while holding other parameter values at their base case value. Net benefits were calculated using the analyses described for the base case.

## Results

### Taxpayer Benefits

I initially calculated the average present (i.e., 2012) value expense to taxpayers for a single arrest in each treatment condition. As illustrated in Table 1 (referred youths), Table 2 (siblings), and Table 3 (sibling pairs), I began by multiplying the expense (listed in Column 2 in each table) associated with each offense category by the distribution (%) of that crime among MST and IT recidivists (Columns 3 and 5, respectively, in each table) to calculate the expected taxpayer expense per arrest category for each treatment condition (Columns 4 and 6, respectively, in each table). Next, I summed the expected taxpayer expenses for all offense categories to calculate the total taxpayer expense (i.e., average present value expense) for one arrest in the MST and IT conditions for referred youths, siblings, and sibling pairs, respectively.

I then took several steps to calculate the benefit to taxpayers of providing MST over IT. First, for each treatment condition, I multiplied the total recidivism rate (i.e., across all offense categories) by the average number of arrests per recidivist for referred youths, siblings, and sibling pairs, respectively, to obtain the expected numbers of posttreatment arrests; Table 4 presents these values. I then multiplied the average taxpayer expense for one arrest in each treatment condition (derived in Tables 1, 2, and 3) by the expected number of posttreatment arrests per referred youth, sibling, and sibling pair in each condition. Next, as recommended by Aos et al. (2001), I multiplied each product by the constant 0.9 (i.e., an arbitrary percentage reduction in the taxpayer value of reducing crime to avoid the chance that taxpayer benefits could be overstated) to

obtain the expected taxpayer expense for each referred youth, sibling, and sibling pair, respectively, in MST and IT. Finally, I subtracted the expected expense in MST from the expected expense in IT to calculate the incremental benefit to taxpayers of providing MST per referred youth (\$11,570), sibling (-\$760), and sibling pair (\$10,515).

### **Crime Victim Benefits**

**Tangible benefits.** To calculate crime victim tangible benefits of MST over IT, I used the distribution of expected crimes from Aos et al. (2001). For each condition, I multiplied the felony recidivism rate (i.e., across felony offenses only) by the average number of felony arrests per recidivist for referred youths, siblings, and sibling pairs, respectively, to obtain the expected numbers of posttreatment felony arrests; Table 5 presents these values. I then subtracted the number of expected offenses for MST from the number of expected offenses for IT to calculate the expected change in felonies for MST relative to IT for referred youths, siblings, and sibling pairs, respectively.

Table 6 (referred youths), Table 7 (siblings), and Table 8 (sibling pairs) show the expected tangible benefits (i.e., avoided expenses) to crime victims per MST participant. For each offense category, I calculated avoided tangible expenses by taking the product of (a) lambda, (b) the expected change in felonies for MST over IT, (c) the crime victim tangible expense for the offense category, and (d) the frequency of the offense category under the expected distribution. I then summed the products across offense categories to calculate the total avoided tangible expense to crime victims per referred youth (\$12,244), sibling (\$3,211), and sibling pair (\$13,563) in the MST vs. IT conditions.

**Intangible benefits.** Tables 6, 7, and 8 also summarize the expected intangible benefits (i.e., avoided expenses) to crime victims per MST vs. IT participant. I calculated



the total avoided intangible expense to crime victims per referred youth (\$20,547), sibling (\$5,388), and sibling pair (\$22,761) in the MST vs. IT conditions using the same procedures as described for tangible benefits.

### **Cumulative Benefit**

I summed the benefits to taxpayers and crime victims to calculate the total expected benefits per referred youth, sibling, and sibling pair in the MST and IT conditions, respectively. I then subtracted the value of a given expected benefit for MST (i.e., taxpayer, crime victim tangible, crime victim intangible, and total) from the value of the corresponding expected benefit for IT to calculate each incremental expected benefit (i.e., avoided costs to taxpayers and crime victims) of MST over IT for referred youths, siblings, and sibling pairs, respectively. Next, I subtracted the present value cost of providing IT per referred youth (i.e., \$2,190) from the present value cost of providing MST per referred youth (i.e., \$11,595) to calculate the incremental treatment cost of MST relative to IT (i.e., \$9,405). I then subtracted the incremental treatment cost of MST (i.e., \$9,405 for referred youths, \$0.00 for siblings, and \$9,405 for sibling pairs) from each incremental expected benefit to obtain the net benefit of MST over IT for referred youths, siblings, and sibling pairs, respectively. Finally, I divided each incremental expected benefit by the incremental treatment cost to calculate benefit-cost ratios of MST over IT for referred youths and sibling pairs, respectively. Note that I did not calculate a benefit-cost ratio for siblings, as this would require dividing by zero.

Table 9 summarizes the costs and benefits (i.e., net benefits and benefit-cost ratios) of providing MST relative to IT for referred youths, siblings, and sibling pairs. The cumulative net benefits of MST over IT were \$34,955 per referred youth, \$7,839 per

sibling, and \$37,433 per sibling pair. The cumulative incremental benefit of MST per dollar of cost was \$4.72 for referred youths and \$4.98 for sibling pairs.

### **Sensitivity Analyses**

**Crime victim intangible benefits.** The minimum and maximum plausible values for crime victim intangible benefits were based on Miller et al. (1996), who reported a confidence interval of  $\pm$  \$1.3 million for intangible benefits of avoided murders (based on willingness-to-pay studies), and maximum standard errors of  $\pm$  39% for intangible benefits of avoided nonfatal crimes (based on jury awards). I calculated (a) minimum and maximum plausible values for murder/manslaughter by subtracting and adding, respectively, \$1.3 million to the base case value; and (b) minimum and maximum plausible values for nonfatal crimes by multiplying the base case value by 0.61 and 1.39, respectively. I then calculated net benefits for referred youths, siblings, and siblings pairs, respectively, with crime victim intangible benefits for all arrest categories set to the minimum and maximum plausible values. The net benefits, which were positive for all analyses, are presented in Table 10.

**Sibling juvenile arrest rates.** I used the base case value (i.e., no arrests) as the minimum plausible value for the sibling juvenile arrest rate. I calculated the highest plausible value for the rate based on the assumption that the ratio of sibling to referred youth arrests for juvenile crimes was the same as the ratio of sibling to referred youth arrests for adult crimes. I took three steps to calculate the maximum plausible number of sibling juvenile arrests for each offense category in each treatment condition: first, I divided the number of sibling arrests during adulthood by the number of referred youth arrests during adulthood; next, I multiplied the ratio of sibling to referred youth arrests in

adulthood by the number of juvenile arrests for referred youths; finally, I multiplied the value obtained from the first two steps by the ratio of sibling to referred youth mean days to adulthood (i.e., days from the end of treatment until the sibling turned 17 years of age) for that treatment condition. The last step accounted for the differing lengths of time during which referred youths and their siblings could have been arrested as juveniles during the follow-up period. Table 11 presents the maximum plausible values for sibling juvenile arrests by treatment condition and offense category.

I calculated the maximum plausible number of sibling arrests for MST and IT for each offense category by adding the maximum plausible number of sibling juvenile arrests to the observed number of sibling adult arrests. In addition, I calculated the maximum plausible recidivism rate for siblings in each treatment group by adding the maximum plausible number of additional offenses committed by siblings (i.e., across all offense categories) to the observed number of recidivists among siblings. I then calculated net benefits for siblings and sibling pairs, respectively, with the number of posttreatment arrests and the recidivism rates for siblings in each treatment group set to the maximum plausible values. The net benefits, which were positive for all analyses, are presented in Table 12.

**Discount rates.** The minimum and maximum plausible values for the discount rate were based on data reported by Gold et al. (1996). Although the authors recommended a standard discount rate of 3%, they also reported that rates of return on federal bonds (i.e., the values used to estimate the discount rate) ranged from 2.5% to 5%. Therefore, the minimum plausible discount rate was set at 2% and the maximum plausible discount rate was set at 5%. I calculated net benefits for referred youths,

siblings, and siblings pairs, respectively, with the discount rate set to the maximum and minimum plausible values. The net benefits, which were positive for all analyses, are presented in Table 13.

## **Discussion**

Administrators and policymakers are under increasing pressure to provide effective interventions for juvenile offenders that are also cost-beneficial, as the financial and social consequences of serious juvenile crime are of great public concern. The present study examined the costs and long-term benefits to taxpayers and crime victims of MST, an empirically supported and widely disseminated family- and community-based treatment for serious and violent juvenile offenders. The study had several methodological strengths, including use of (a) both felony and misdemeanor arrest data, (b) criminal outcomes for both referred youths and their siblings, and (c) sensitivity analyses to examine the influence of key model parameters on study conclusions.

The findings demonstrate that MST produced lasting benefits to both taxpayers and crime victims when compared to usual community outpatient treatment. In the taxpayer domain, MST resulted in savings of \$1,110 per family (i.e., sibling pair). Stated differently, one dollar spent on MST returned \$1.12 to taxpayers over the 25 years following treatment. Although the benefits to taxpayers were relatively modest, MST did produce larger cost offsets in the crime victim domain. Indeed, MST resulted in tangible benefits ranging from \$2,839 per referred youth to \$4,158 per family, with benefit-cost ratios of 1.30 to 1.44. Moreover, MST resulted in intangible benefits ranging from \$11,142 per referred youth to \$13,356 per family, with benefit-cost ratios of 2.19 to 2.42. Taken together, the net cumulative benefit (i.e., combining taxpayer and crime victim

benefits) of providing MST over IT was \$37,433 per family, indicating a return of \$4.98 per dollar spent. These results are consistent with other recent findings demonstrating that MST is a cost-beneficial treatment compared with usual community services (Aos et al., 2011; Drake et al., 2009; Klietz et al., 2010).

The present results also demonstrate previously unrecognized economic benefits of MST treatment effects on siblings. Reductions in sibling criminality were associated with a total savings (i.e., to taxpayers and crime victims) of \$7,839 per sibling in the MST vs. IT conditions. Furthermore, the savings increased to \$8,099 when sibling juvenile arrests were estimated. These findings may be due to two important characteristics of comprehensive family-based treatment models such as MST. First, interventions target various risk factors (e.g., access to delinquent peers, modeling of antisocial behavior) in the multiple systems (e.g., family, neighborhood) shared by referred youth and their siblings. Second, interventions focus on caregivers as the primary conduits of change, and are designed to enhance caregivers' skills (e.g., monitoring, conflict management) and resources (e.g., increased social support). By addressing shared risk factors and increasing caregivers' capacities for effective parenting, MST may reduce future criminality for both offenders and their closest-in-age siblings. Researchers conducting cost-benefit analyses in the future would do well to focus more broadly on treatment effects beyond the youth targeted by treatment.

Sensitivity analyses demonstrated that the conclusions of the present study were not influenced by plausible variations in crime victim intangible benefits, sibling juvenile arrest rates, or discount rates. Thus, the net benefits of MST remained positive when the minimum plausible benefits were estimated. This finding should encourage the

developers of other evidence-based treatments for juvenile offenders to use the WSIPP model in their own research. Previous studies by WSIPP researchers (Aos et al., 2001, 2004, 2011; Drake et al., 2009) found favorable benefit-cost ratios for multidimensional treatment foster care (Chamberlain, 2003) and functional family therapy (Alexander & Parsons, 1982; Sexton, 2011), but additional cost-benefit analyses will be necessary to address the methodological limitations of those studies (e.g., use of dichotomous data on criminal outcomes). Furthermore, the WSIPP model could be readily applied to adaptations of MST, such as MST for Problem Sexual Behaviors (Borduin et al., 1990; Borduin et al., 2009; Letourneau et al., 2009). Although such adaptations have achieved clinical outcomes comparable to standard MST, the associated costs and benefits have yet to be evaluated.

Although the economic gains from MST are maintained until participants reach midlife, it should be noted that the use of a lengthy follow-up period (i.e., 25 years) resulted in smaller estimates of economic benefits than in previous cost-benefit studies of MST (see Aos et al., 2001, 2004, 2011; Drake et al., 2009; Kliez et al., 2010). Indeed, the WSIPP model discounts benefits for the entire length of the follow-up period, rather than accruing benefits annually, because the demonstrated savings (i.e., benefits from the observed treatment effect) are fully realized at the end of the follow-up (i.e., at the point when the observed treatment effect is achieved). Thus, the results of the present study provide a conservative estimate of cost savings associated with MST because real-world public service agencies can expect to realize financial benefits from crime reduction every year rather than only after 25 years. Another reason for this conservative estimate of savings is that treatment effects on arrest outcomes can become obscured over long

follow-up periods because all but the most persistent offenders desist from criminal activity without intervention (Brandt 2006; Greenberg 1985; Hirschi & Gottfredson, 1983). As a result, cumulative rates of offending in treatment and control groups become more similar over time. Despite these considerations, the economic benefits of MST remain impressive after 25 years.

Administrators and policymakers would benefit from consideration of the cost savings identified in this study when making funding decisions allocating scarce financial resources. Otherwise, the high initial costs of providing MST (i.e., \$11,595 per youth) relative to less intensive community services might suggest that MST is not a sustainable practice. Furthermore, funding decisions are typically made on an annual basis and thus might neglect the potential for long-term cost savings. However, in addition to the long-term economic benefits of MST demonstrated herein, it should be noted that public service agencies that invest in MST will likely recoup their costs in the first few years after starting a program (see Aos et al., 2001). Indeed, other findings with the sample used in the present study showed that most of the recidivists in the MST and IT conditions had reoffended within the first 2 years following treatment (see Schaeffer & Borduin, 2005). Thus, communities can expect to do no worse than break even in the short run and save a considerable amount of money in the long run using a cost-beneficial treatment program such as MST.

The present study has several methodological limitations. First, individuals may not have continuously resided in Missouri throughout the follow-up period. As a result, it is possible that a portion of the sample committed crimes in other states. However, it seems unlikely that length of residency in Missouri would vary systematically across

treatment conditions. Second, it is possible that treatment as usual for serious juvenile offenders (i.e., IT) has changed since the time of the original clinical trial (e.g., increased use of manualized treatments such as cognitive-behavioral therapy). To date, however, there are no empirically supported individual treatments for serious and violent juvenile offenders (Borduin et al., 2012; National Institutes of Health, 2006). Third, MST and IT treatment costs were each estimated from the records of a single provider site, and thus our findings may not generalize to other service providers. Fourth, although the estimated cost of MST in this study (i.e., \$11,595 per youth in 2012) appears to be high in the context of other licensed MST programs (as reported by the licensing entity for MST), a national survey of such costs does not exist. Fifth, although the present study included a broad range of costs and benefits, it is likely that additional costs and benefits were not captured because resources were not available to track all possible outcomes associated with crime reduction (e.g., crime victim expenses for misdemeanor crimes, income tax revenue resulting from increased employment). Service utilization data could be used to explore the possibility of cost-shifting to other sectors (e.g., social welfare, mental health, primary care), although previous work has found that MST-related reductions in utilization, at least for certain services (i.e., hospitalization), were not offset by increased use of other services (Schoenwald, Ward, Henggeler, & Rowland, 2000). Furthermore, an examination of service utilization across sectors could capture benefits other than reductions in recidivism (e.g., reduced use of social welfare services).

The cost savings identified in the present study provide further support for increased funding of MST and other cost-beneficial family treatments for serious juvenile offenders, as well as decreased funding of individually focused treatments. Successful



efforts to reduce the financial and social burdens of juvenile crime will require increased use of cost-beneficial treatment programs such as MST, which in turn will require several qualitative shifts in the structure and organizational culture of service providers. Indeed, administrators and policymakers should encourage the adoption and sustainability of these treatments within our communities by ensuring funding of evidence-based treatments for juvenile offenders. Moreover, treatment developers should use rigorous economic analysis methods, including a wide range of costs and benefits, to demonstrate the economic strengths of their programs. Furthermore, to maximize the benefits of these efforts, communities will need to provide a range of evidence-based treatments for juvenile offenders and tailor those treatments to specific offender populations. For example, integrated systems of care have been developed (e.g., Gustle, Hansson, Sundell, Lundh, & Löfholm, 2007) that provide MST and multidimensional treatment foster care for more serious offenders and functional family therapy for less serious offenders. Strong partnerships and communication between treatment developers, provider organizations, and policymakers will be essential to achieve jointly desired positive outcomes and economic sustainability of interventions.

## References

- American Chamber of Commerce Researchers Association. (n.d.). *ACCRA Cost of Living Index*. Retrieved from <http://www.coli.org/>
- Aos, S., Lee, S., Drake, E., Pennucci, A., Klima, T., Miller, M., ... Burley, M. (2011). *Return on investment: Evidence-based options to improve statewide outcomes*. Olympia, WA: Washington State Institute for Public Policy. Retrieved from <http://www.wsipp.wa.gov/pub.asp?docid=11-07-1201>
- Aos, S., Lieb, R., Mayfield, J., Miller, M., & Pennucci, A. (2004). *Benefits and costs of prevention and early intervention programs for youth*. Olympia, WA: Washington State Institute for Public Policy. Retrieved from <http://www.wsipp.wa.gov/pub.asp?docid04-07-3901>
- Aos, S., Phipps, P., Barnoski, R., & Lieb, R. (2001). *The comparative costs of and benefits of programs to reduce crime*. Olympia, WA: Washington State Policy Institute. Retrieved from <http://www.wsipp.wa.gov/pub.asp?docid=01-05-1201>
- Barnett, W. S. (2000). Economics of early childhood intervention. In J. P. Shonkoff & S. J. Meisels (Eds.), *Handbook of early childhood intervention* (2<sup>nd</sup> ed.) (pp. 589-610). New York: Cambridge University Press.
- Biglan, A., Brennan, P. A., Foster, S. L., & Holder, H. D. (2004). *Helping adolescents at risk: Prevention of multiple behavior problems*. New York: The Guilford Press.
- Boardman, A. E., Greenberg, D. H., Vining, A. R., & Weimer, D. L. (2010). *Cost-benefit analysis: Concepts and practice* (4<sup>th</sup> ed). Upper Saddle River, NJ: Prentice Hall.
- Borduin, C. M., Dopp, A. R., & Taylor, E. K. (2012). Evidence-based interventions for serious and violent juvenile offenders. In L. A. Craig, L. Dixon, & T. A. Gannon (Eds.), *What works in offender rehabilitation: An evidence-based approach to assessment and treatment*. New York: Wiley. Chapter accepted for publication.
- Borduin, C. M., & Henggler, S. W. (1990). A multisystemic approach to the treatment of serious delinquent behavior. In R. J. McMahon & R. D. Peters (Eds.), *Behavior disorders of adolescence: Research, intervention, and policy in clinical and school settings* (pp. 63-80). New York: Plenum.
- Borduin, C. M., Henggeler, S. W., Blaske, D. M., & Stein, R. (1990). Multisystemic treatment of adolescent sexual offenders. *International Journal of Offender Therapy and Comparative Criminology*, 34, 105-113.  
doi:10.1177/0306624X9003400204
- Borduin, C. M., Mann, B. J., Cone, L. T., Henggeler, S. W., Fucci, B. R., Blaske, D. M., & Williams, R. A. (1995). Multisystemic treatment of serious juvenile offenders: Long-term prevention of criminality and violence. *Journal of Consulting and Clinical Psychology*, 63, 569-578. doi:10.1037/0022-006X.63.4.569

- Borduin, C. M., Schaeffer, C. M., & Heiblum, N. (2009). A randomized clinical trial of multisystemic therapy with juvenile sexual offenders: Effects on youth social ecology and criminal activity. *Journal of Consulting and Clinical Psychology, 77*, 26-37. doi:10.1037/a0013035
- Brandt, D. (2006). *Delinquency, development and social policy*. New Haven, CT: Yale University Press.
- Briggs, A. H., & Gray, A. M. (1999). Handling uncertainty in economic evaluations of healthcare interventions. *British Medical Journal, 319*, 635-638. doi:10.1136/bmj.319.7210.635
- Briggs, A., Sculpher, M., & Buxton, M. (1994). Uncertainty in the economic evaluation of health care technologies: The role of sensitivity analysis. *Health Economics, 3*, 95-104. doi:10.1002/hec.4730030206
- Bureau of Justice Statistics. (2010). *Criminal victimization in the United States, 2009*. Washington, DC: U.S. Department of Justice.
- Bureau of Justice Statistics. (1993). *Criminal victimization in the United States, 1992*. Washington, DC: U.S. Department of Justice.
- Bureau of Labor Statistics. (2012). *Inflation calculator*. Retrieved from [http://www.bls.gov/data/inflation\\_calculator.htm](http://www.bls.gov/data/inflation_calculator.htm)
- Byford, S., McCrone, P., & Barrett, B. (2003). Developments in the quantity and quality of economic evaluations in mental health. *Current Opinion in Psychiatry, 16*, 703-707. doi:10.1097/00001504-200311000-00017
- Chisholm, D. (1998). Economic analyses. *International Review of Psychiatry, 10*, 323-330. doi:10.1080/09540269874682
- Cohen, M. A., & Miller, T. R. (1998). The cost of mental health care for victims of crime. *Journal of Interpersonal Violence, 13*, 93-110. doi:10.1177/088626098013001006
- Cohen, M. A., Miller, T. R., & Rossman, S. B. (1994). The costs and consequences of violent behavior in the United States. In A. J. Reiss, Jr., and J. A. Roth (Eds.), *Understanding and preventing violence* (pp. 67-166). Washington, DC: National Research Council, National Academy Press.
- Drake, E. K., Aos, S., & Miller, M. G. (2009). Evidence-based public policy options to reduce crime and criminal justice costs: Implications in Washington State. *Victims and Offenders, 4*, 170-196. doi:10.1080/15564880802612615
- Drummond, M., Sculpher, M. J., Torrance, G. W., O'Brien, B. J., Stoddart, G. L. (2005). *Methods for the economic evaluation of health care programmes* (3rd ed.). New York: Oxford University Press.

- Elliott, D. S. (1995). *Lies, damn lies, and arrest statistics*. Boulder, CO: Center for the Study and Prevention of Violence.
- Evers, S. V., Van Wijk, A., & Ament, A. (1997). Economic evaluation of mental health care interventions: A review. *Health Economics*, *6*, 161-177.  
doi:10.1002/(SICI)1099-1050(199703)6:2<161::AID-HEC258>3.0.CO;2-I
- Eyberg, S. M., Nelson, M. M., & Boggs, S. R. (2008). Evidence-based psychosocial treatments for children and adolescents with disruptive behavior. *Journal of Clinical Child and Adolescent Psychology*, *37*, 215-237.  
doi:10.1080/15374410701820117
- Fals-Stewart, W., Yates, B. T., & Klostermann, K. (2005). Assessing the costs, benefits, cost-benefit ratio, and cost-effectiveness of marital and family treatments: Why we should and how we can. *Journal of Family Psychology*, *19*, 28-39.  
doi:10.1037/0893-3200.19.1.28
- Federal Bureau of Investigation (2008). *Crime in the United States: Uniform Crime Reports*. Washington, DC: U.S. Department of Justice.
- French, M. T., Salome, H. J., Sindelar, J. L., & McLellan, A. T. (2002). Benefit-cost analysis of addiction treatment: Methodological guidelines and empirical application using the DATCAP and ASI. *Health Services Research*, *37*, 433-455.  
doi:10.1111/1475-6773.031
- Gold, M. R., Siegel, J. E., Russell, L. B., & Weinstein, M. C. (1996). *Cost-effectiveness in health and medicine*. New York: Oxford University Press.
- Greenberg, D. F. (1985). Age, crime, and social explanation. *American Journal of Sociology*, *91*, 1-21. doi:10.1086/228242
- Guerra, N. G., Williams, K. R., Tolan, P. H., & Modecki, K. L. (2008). Theoretical and research advances in understanding the causes of juvenile offending. In R. D. Hoge, N. G. Guerra, & P. Boxer (Eds.), *Treating the juvenile offender* (pp. 33-53). New York: The Guilford Press.
- Gustle, L., Hansson, K., Sundell, K., Lundh, L., & Lofholm, C. A. (2007). Blueprints in Sweden. Symptom load in Swedish adolescents in studies of functional family therapy (FFT), multisystemic therapy (MST) and multidimensional treatment foster care (MTFC). *Nordic Journal of Psychiatry*, *61*, 443-451.  
doi:10.1080/08039480701773196
- Hargreaves, W. A., Shumway, M., Hu, T., & Cuffel, B. (1998). *Cost-outcome methods for mental health*. San Diego, CA: Academic Press.
- Henggeler, S. W., & Borduin, C. M. (Eds.). (1990). *Family therapy and beyond: A multisystemic approach to treating the behavior problems of children and adolescents*. Pacific Grove, CA: Brooks/Cole.

- Henggeler, S. W., Melton, G. B., & Smith, L. A. (1992). Family preservation using multisystemic therapy: An effective alternative to incarcerating serious juvenile offenders. *Journal of Consulting and Clinical Psychology, 60*, 821-833. doi:10.1037/0022-006X.60.6.953
- Henggeler, S. W., Pickrel, S. G., & Brondino, M. J. (1999). Multisystemic treatment of substance abusing and dependent delinquents: Outcomes, treatment fidelity, and transportability. *Mental Health Services Research, 1*, 171-184. doi:10.1023/A:1022373813261
- Henggeler, S. W., Schoenwald, S. K., Borduin, C. M., Rowland, M. D., & Cunningham, P. B. (Eds.). (1998). *Multisystemic treatment of antisocial behavior in children and adolescents*. New York: The Guilford Press.
- Henggeler, S. W., Schoenwald, S. K., Borduin, C. M., Rowland, M. D., & Cunningham, P. B. (2009). *Multisystemic therapy for antisocial behavior in children and adolescents* (2<sup>nd</sup> ed.). New York: Guilford Press.
- Hirschi, T., & Gottfredson, M. R. (1994). Age and the explanation of crime. *American Journal of Sociology, 89*, 552-84. doi:10.1086/227905
- Hollingshead, A. B. (1975). *The four-factor index of social status*. Unpublished manuscript, Yale University, New Haven, CT.
- Kaplan, R. M., & Groessl, E. J. (2002). Applications of cost-effectiveness methodologies in behavioral medicine. *Journal of Consulting and Clinical Psychology, 70*, 482-193. doi:10.1037/0022-006X.70.3.482
- Kazdin, A. E. (2000). Treatments for aggressive and antisocial children. *Child and Adolescent Psychiatric Clinics of North America, 9*, 841-858.
- Kazdin, A. E. (2007a). Progress in treating children referred for severe aggressive and antisocial behavior. *NYS Psychologist, 19*, 7-12.
- Kazdin, A. E. (2007b). Psychosocial treatments for conduct disorder. In P. E. Nathan & J. M. Gorman (Eds.), *A guide to treatments that work* (3<sup>rd</sup> ed.) (pp. 71-104). New York: Oxford University Press.
- Klietz, S. J., Borduin, C. M. & Schaeffer, C. M. (2010). Cost-benefit analysis of multisystemic therapy with serious and violent juvenile offenders. *Journal of Family Psychology, 24*, 657-666. doi:10.1037/a0020838
- Laub, J. H., & Sampson, R. J. (1994). Unemployment, marital discord, and deviant behavior: The long-term correlates of childhood misbehavior. In T. Hirschi and M. R. Gottfredson (Eds.), *The generality of deviance* (pp. 235-252). New Brunswick, NJ: Transaction.

- Letourneau, E. J., Henggeler, S. W., Borduin, C. M., Schewe, P. A., McCart, M. R., Chapman, J. E., & Saldana, L. (2009). Multisystemic therapy for juvenile sexual offenders: 1-year results from a randomized effectiveness trial. *Journal of Family Psychology, 23*, 89-102. doi:10.1037/a0014352
- Loeber, R., & Farrington, D. P. (1998). *Serious and violent juvenile offenders: Risk factors and successful interventions*. Thousand Oaks, CA: Sage.
- Lyons, J. S., Baerger, D. R., Quigley, P., Erlich, J., & Griffin, E. (2001). Mental health service needs of juvenile offenders: A comparison of detention, incarceration, and treatment settings. *Children's Services: Social Policy, Research, and Practice, 4*, 69-85. doi:10.1207/S15326918CS0402\_2
- Marsh, K., Chalfin, A., & Roman, J. K. (2008). What does cost-benefit analysis add to decision making? Evidence from the criminal justice literature. *Journal of Experimental Criminology, 4*, 117-135. doi:10.1007/s11292-008-9049-1
- McCollister, K. E., French, M. T., & Fang, H. (2010). The cost of crime to society: New crime-specific estimates for policy and program evaluation. *Drug and Alcohol Dependence, 108*, 98-109. doi:10.1016/j.drugalcdep.2009.12.002
- McCollister, K. E., French, M. T., Sheidow, A. J., Henggeler, S. W., & Halliday-Boykins, C. A. (2007). Estimating the differential costs of criminal activity for juvenile drug court participants: Challenges and recommendations. *Journal of Behavioral Health Services and Research, 36*, 111-126. doi:10.1007/s11414-007-9094-y
- Melton, G. B., Lyons, P. M., & Spaulding, W. J. (Eds.). (1998). *No place to go: The civil commitment of minors*. Lincoln, NE: University of Nebraska Press.
- Mihalopoulos, C., Vos, T., Pirkis, J., & Carter, R. (2011). The economic analysis of prevention in mental health programs. *Annual Review of Clinical Psychology, 7*, 169-201. doi:10.1146/annurev-clinpsy-032210-104601
- Miller, T. R. (1992). *Costs of Injuries to Employers: A NETS Compendium*. Washington, DC: National Highway Traffic Safety Administration.
- Miller, T. R., Cohen, M. A., & Wiersema, B. (1996). *Victim costs and consequences: A new look*. Washington, DC: National Institute of Justice.
- Miller, T. R., Fisher, D. A., & Cohen, M. A. (2001). Costs of juvenile violence: Policy implications. *Pediatrics, 107*, e3. Retrieved from <http://www.pediatrics.org/cgi/content/full/107/1/e3>
- Moffitt, T. E., Caspi, A., Harrington, H., & Milne, B. J. (2002). Males on the life-course-persistent and adolescence-limited pathways: Follow-up at age 26 years. *Development and Psychopathology, 14*, 179-207. doi:10.1017/S0954579402001104

- National Institutes of Health. (2006). National Institutes of Health State-of-the-Science Conference Statement. *Journal of Abnormal Child Psychology*, *34*, 457-470. doi:10.1007/s10802-006-9043-x
- National Registry of Evidence-based Programs and Practices. (2007). *Multisystemic therapy (MST) for juvenile offenders*. Retrieved from <http://nrepp.samhsa.gov/ViewIntervention.aspx?id=26>
- Nelson, D. W. (1991). The public policy implications of family preservation. In K. Wells & D. E. Biegel (Eds.), *Family preservation services: Research and evaluation* (pp. 207-222). Thousand Oaks, CA: Sage.
- Nores, M., Belfield, C. R., Barnett, W. S., & Schweinhart, L. (2005). Updating the economic impacts of the High/Scope Perry Preschool Program. *Educational Evaluation and Policy Analysis*, *27*, 245-261. doi:10.3102/01623737027003245
- Office of Juvenile Justice and Delinquency Prevention (2011). *Juvenile Arrests 2009*. Washington, DC: U. S. Department of Justice.
- Ogden, T., & Halliday-Boykins, C. A. (2004). Multisystemic treatment of antisocial adolescents in Norway: Replication of clinical outcomes outside of the US. *Child and Adolescent Mental Health*, *9*, 77-83. doi:10.1111/j.1475-3588.2004.00085.x
- Rowland, M. D., Chapman, J. E., & Henggeler, S. W. (2008). Sibling outcomes from a randomized trial of evidence-based treatments with substance abusing juvenile offenders. *Journal of Child and Adolescent Substance Abuse*, *17*, 11-26. doi:10.1080/15470650802071622
- Sawyer, A. M., & Borduin, C. M. (2011). Effects of multisystemic therapy through midlife: A 21.9-year follow-up to a randomized clinical trial with serious and violent juvenile offenders. *Journal of Consulting and Clinical Psychology*, *79*, 643-652. doi:10.1037/a0024862
- Schaeffer, C. M., & Borduin, C. M. (2005). Long-term follow-up to a randomized clinical trial of multisystemic therapy with serious and violent juvenile offenders. *Journal of Consulting and Clinical Psychology*, *73*, 445-453. doi:10.1037/0022-006X.73.3.445
- Schoenwald, S. K., Ward, D. M., Henggeler, S. W., & Rowland, M. D. (2000). Multisystemic therapy versus hospitalization for crisis stabilization of youth: Placement outcomes 4 months postreferral. *Mental Health Services Research*, *2*, 3-12. doi:10.1023/A:1010187706952
- Sexton, T. L. (2011). *Functional family therapy in clinical practice: An evidence-based treatment model for working with troubled adolescents*. New York: Taylor & Francis.

- Shufelt, J. S., & Cocozza, J. J. (2006). *Youth with mental health disorders in the juvenile justice system: Results from a multi-state prevalence study*. Retrieved from <http://ncmhjj.com/pdfs/publications/PrevalenceRPB.pdf>
- Singh, B., Hawthorne, G., & Vos, T. (2001). The role of economic evaluation in mental health care. *Australian and New Zealand Journal of Psychiatry*, 35, 104-117. doi:10.1046/j.1440-1614.2001.00845.x
- Skowyra, K. R. & Cocozza, J. J. (2007). *Blueprint for change: A comprehensive model for the identification and treatment of youth with mental health needs in contact with the juvenile justice system*. Retrieved from [http://www.umt.edu/sociology/faculty\\_staff/burfeind/documents/Soc438\\_SkowyraCocozza2007\\_s08.pdf](http://www.umt.edu/sociology/faculty_staff/burfeind/documents/Soc438_SkowyraCocozza2007_s08.pdf)
- Timmons-Mitchell, J., Bender, M. B., Kishna, M. A., & Mitchell, C. (2006). An independent effectiveness trial of multisystemic therapy with juvenile justice youth. *Journal of Clinical Child and Adolescent Psychology*, 35, 227-236. doi:10.1207/s15374424jccp3502\_6
- U.S. Department of Health and Human Services. (2001). *Youth violence: A report of the Surgeon General*. Washington, DC: Author.
- Wagner, D. V., Borduin, C. M., and Sawyer, A. M. (2012). *Long-term preventive effects of multisystemic therapy on criminality in siblings of juvenile offenders*. Manuscript under review.
- Weisz, J. R., & Hawley, K. M. (1998). Finding, evaluating, refining, and applying empirically supported treatments for children and adolescents. *Journal of Clinical Child Psychology*, 27, 206-216. doi:10.1207/s15374424jccp2702\_7
- Weisz, J. R., Hawley, K. M., Pilkonis, P. A., Woody, S. R., & Follette, W. C. (2000). Stressing the (other) three Rs in the search for empirically supported treatments: Review procedures, research quality, and relevance to practice and the public interest. *Clinical Psychology: Science and Practice*, 7, 243-258. doi:10.1093/clipsy.7.3.243
- Wells, K. (1995). Family preservation services in context: Origins, practices, and current issues. In I. M. Schwartz & P. AuClaire (Eds.), *Home-based services for troubled children* (pp. 1-28). Lincoln, NE: University of Nebraska Press.
- Yates, B. T., Haven, W. G., & Thoresen, C. E. (1979). Cost-effectiveness analyses at Learning House: How much change for how much money? In J. S. Stumphauzer (Ed.), *Progress in behavior therapy with delinquents* (pp. 186-222). Springfield, IL: Charles C. Thomas.



## Footnotes

<sup>1</sup>I refer to monetary values as “present” values when they are expressed in baseline year (i.e., 2012) dollars. These values are more accurately referred to as future values because they are expressed in dollar values corresponding to the last year of the study follow-up period. I use the term “present value” here, however, because the study has already been completed.

Table 1

*Taxpayer Expenses for Referred Youths per Arrest Category by Therapy Condition*

Arrest category	Arrest expense (\$)	Therapy condition			
		Multisystemic therapy (MST)		Individual therapy (IT)	
		Arrest distribution (%)	Expected taxpayer expense (\$) <sup>a</sup>	Arrest distribution (%)	Expected taxpayer expense (\$) <sup>a</sup>
Murder/ manslaughter	307,519	0.00	0	0.00	0
Sexual	78,458	0.68	536	0.82	642
Robbery	80,826	0.34	275	0.27	219
Felony assault	49,183	1.71	840	4.63	2,279
Felony property	9,438	21.84	2,062	15.26	1,441
Felony drug	13,927	8.53	1,189	11.17	1,556
Theft/larceny	1,465	18.43	271	23.43	344
Stolen property	3,482	2.39	84	2.72	95
Fraud	3,336	10.24	342	6.81	228
Misdemeanor assault	2,287	12.63	289	16.62	381
Misdemeanor drug	3,759	23.21	873	18.26	687
Total	-----	100.00	6,755	100.00	7,867

*Note.* All expenses are expressed in 2012 dollars. Sample sizes for therapy conditions are MST ( $n = 92$ ) and IT ( $n = 84$ ).

<sup>a</sup>Product of arrest expense/loss and arrest distribution for therapy condition.

Table 2

*Taxpayer Expenses for Siblings per Arrest Category by Therapy Condition*

Arrest category	Arrest expense (\$)	Therapy condition			
		Multisystemic therapy (MST)		Individual therapy (IT)	
		Arrest distribution (%)	Expected taxpayer expense (\$) <sup>a</sup>	Arrest distribution (%)	Expected taxpayer expense (\$) <sup>a</sup>
Murder/ manslaughter	307,519	0.00	0	0.00	0
Sexual	78,458	4.62	3,622	1.39	1,090
Robbery	80,826	0.00	0	1.39	1,116
Felony assault	49,183	7.69	3,784	1.39	684
Felony property	9,438	4.62	436	8.33	787
Felony drug	13,927	4.62	643	12.50	1,741
Theft/larceny	1,465	13.85	203	18.06	265
Stolen property	3,482	3.08	108	0.00	0
Fraud	3,336	20.00	668	26.39	881
Misdemeanor assault	2,287	10.77	247	8.33	191
Misdemeanor drug	3,759	30.77	1,157	22.22	836
Total	-----	100.00	10,863	100.00	7,586

*Note.* All expenses are expressed in 2012 dollars. Sample sizes for therapy conditions are MST ( $n = 60$ ) and IT ( $n = 50$ ).

<sup>a</sup>Product of arrest expense/loss and arrest distribution for therapy condition.

Table 3

*Taxpayer Expenses for Sibling Pairs per Arrest Category by Therapy Condition*

Arrest category	Arrest expense (\$)	Therapy condition			
		Multisystemic therapy (MST)		Individual therapy (IT)	
		Arrest distribution (%)	Expected taxpayer expense (\$) <sup>a</sup>	Arrest distribution (%)	Expected taxpayer expense (\$) <sup>a</sup>
Murder/ manslaughter	307,519	0.00	0	0.00	0
Sexual	78,458	1.40	1,096	0.91	715
Robbery	80,826	0.28	225	0.46	366
Felony assault	49,183	2.79	1,374	4.10	2,017
Felony property	9,438	18.72	1,767	14.12	1,333
Felony drug	13,927	7.82	1,090	11.39	1,587
Theft/larceny	1,465	17.60	258	22.55	331
Stolen property	3,482	2.51	88	2.28	80
Fraud	3,336	12.01	401	10.02	335
Misdemeanor assault	2,287	12.29	282	15.26	350
Misdemeanor drug	3,759	24.58	924	18.91	711
Total	-----	100.00	7,501	100.00	7,821

*Note.* All expenses are expressed in 2012 dollars. Sample sizes for therapy conditions are MST ( $n = 92$ ) and IT ( $n = 84$ ).

<sup>a</sup>Product of arrest expense/loss and arrest distribution for therapy condition.

Table 4

*Expected Number of Posttreatment Arrests for All Crimes by Therapy Condition*

	Therapy condition	Total rearrest rate	Average number of crimes per recidivist	Expected number of crimes per participant
Referred youths				
	MST	64.13%	4.97	3.18
	IT	76.19%	5.73	4.37
Siblings				
	MST	36.67%	2.96	1.08
	IT	64.00%	2.25	1.44
Sibling pairs				
	MST	71.74%	5.42	3.89
	IT	82.14%	6.36	5.23

*Note.* Sample sizes for groups are as follows: referred youth ( $n = 176$ ; 92 in MST, 84 in IT), siblings ( $n = 110$ ; 60 in MST, 50 in IT), sibling pairs ( $n = 176$ ; 92 in MST, 84 in IT).

Table 5

*Expected Number of Posttreatment Arrests for Felony Crimes by Therapy Condition*

	Therapy condition	Felony rearrest rate	Average number of felonies per recidivist	Expected number of felonies per participant
Referred youths				
	MST	38.04%	3.71	1.41
	IT	57.14%	3.23	1.85
Siblings				
	MST	15.00%	2.44	0.37
	IT	32.00%	1.55	0.48
Sibling pairs				
	MST	44.57%	3.71	1.65
	IT	61.90%	3.44	2.13

*Note.* Sample sizes for groups are as follows: referred youth ( $n = 176$ ; 92 in MST, 84 in IT), siblings ( $n = 110$ ; 60 in MST, 50 in IT), sibling pairs ( $n = 176$ ; 92 in MST, 84 in IT).

Table 6

*Crime Victim Expenses Avoided for Multisystemic Therapy per Referred Youth*

Arrest category	Arrest expense (\$)	Distribution of expected offenses (%) <sup>a</sup>	Avoided expense/loss (\$) <sup>b</sup>
Murder/ manslaughter			
Tangible	900,117	0.01	6,572
Intangible	1,670,239	0.01	12,194
Sexual			
Tangible	5,447	0.07	279
Intangible	72,188	0.07	3,689
Robbery			
Tangible	2,059	0.41	616
Intangible	5,096	0.41	1,526
Felony assault			
Tangible	1,277	0.62	579
Intangible	6,936	0.62	3,140
Felony property <sup>c</sup>			
Tangible	493	11.66	4,200
Intangible	0	11.66	0
Felony drug			
Tangible	0	87.23	0
Intangible	0	87.23	0
Total			
Tangible	-----	100.00	12,244
Intangible	-----	100.00	20,547

*Note.* All expenses are expressed in 2012 dollars.

<sup>a</sup>From Aos et al. (2001). <sup>b</sup>Product of lambda (168.91), expected change in felony offenses (0.44), arrest expense/loss, and distribution of expected offenses. <sup>c</sup>Based on the total number of felony property crimes, including felonies that were included in the Theft/larceny, Stolen property, and Fraud categories for the taxpayer benefit analyses.

Table 7

*Crime Victim Expenses Avoided for Multisystemic Therapy per Sibling*

Arrest category	Arrest expense (\$)	Distribution of expected offenses (%) <sup>a</sup>	Avoided expense/loss (\$) <sup>b</sup>
Murder/ manslaughter			
Tangible	900,117	0.01	1,724
Intangible	1,670,239	0.01	3,198
Sexual			
Tangible	5,447	0.07	73
Intangible	72,188	0.07	968
Robbery			
Tangible	2,059	0.41	162
Intangible	5,096	0.41	400
Felony assault			
Tangible	1,277	0.62	152
Intangible	6,936	0.62	824
Felony property <sup>c</sup>			
Tangible	493	11.66	1,102
Intangible	0	11.66	0
Felony drug			
Tangible	0	87.23	0
Intangible	0	87.23	0
Total			
Tangible	-----	100.00	3,211
Intangible	-----	100.00	5,388

*Note.* All expenses are expressed in 2012 dollars.

<sup>a</sup>From Aos et al. (2001). <sup>b</sup>Product of lambda (168.91), expected change in felony offenses (0.11), arrest expense/loss, and distribution of expected offenses. <sup>c</sup>Based on the total number of felony property crimes, including felonies that were included in the Theft/larceny, Stolen property, and Fraud categories for the taxpayer benefit analyses.



Table 8

*Crime Victim Expenses Avoided for Multisystemic Therapy per Sibling Pair*

Arrest category	Arrest expense (\$)	Distribution of expected offenses (%) <sup>a</sup>	Avoided expense/loss (\$) <sup>b</sup>
Murder/ manslaughter			
Tangible	900,117	0.01	7,280
Intangible	1,670,239	0.01	13,508
Sexual			
Tangible	5,447	0.07	309
Intangible	72,188	0.07	4,087
Robbery			
Tangible	2,059	0.41	683
Intangible	5,096	0.41	1,690
Felony assault			
Tangible	1,277	0.62	641
Intangible	6,936	0.62	3,478
Felony property <sup>c</sup>			
Tangible	493	11.66	4,653
Intangible	0	11.66	0
Felony drug			
Tangible	0	87.23	0
Intangible	0	87.23	0
Total			
Tangible	-----	100.00	13,563
Intangible	-----	100.00	22,761

*Note.* All expenses are expressed in 2012 dollars.

<sup>a</sup>From Aos et al. (2001). <sup>b</sup>Product of lambda (168.91), expected change in felony offenses (0.48), arrest expense/loss, and distribution of expected offenses. <sup>c</sup>Based on the total number of felony property crimes, including felonies that were included in the Theft/larceny, Stolen property, and Fraud categories for the taxpayer benefit analyses.

Table 9

*Cumulative Benefit of Multisystemic Therapy to Taxpayers and Crime Victims*

Benefit	Analyses	
	Net present value (\$) <sup>a</sup>	Benefit-cost ratio <sup>b</sup>
Referred youths		
Taxpayer	2,165	1.23
Crime Victim Tangible	2,839	1.30
Crime Victim Intangible	11,142	2.19
Cumulative	34,955 <sup>c</sup>	4.72
Siblings <sup>d</sup>		
Taxpayer	(760)	-----
Crime Victim Tangible	3,211	-----
Crime Victim Tangible	5,388	-----
Cumulative	7,839	-----
Sibling pairs		
Taxpayer	1,110	1.12
Crime Victim Tangible	4,158	1.44
Crime Victim Intangible	13,356	2.42
Cumulative	37,433 <sup>c</sup>	4.98

*Note.* All expenses are expressed in 2012 dollars. Dollar amounts in parentheses indicate negative savings.

<sup>a</sup>The difference between the given benefit and the incremental cost of providing MST over IT (i.e., \$9,405), unless otherwise specified. <sup>b</sup>The given benefit divided by the incremental cost of providing MST over IT, unless otherwise specified. <sup>c</sup>Because taxpayer, tangible crime victim, and intangible crime victim net present values each include the incremental cost of MST over IT, cumulative values are not the simple sums of these benefits and have been adjusted to reflect a single incremental cost of MST.

<sup>d</sup>Because there is no incremental cost for sibling treatment effects, the incremental cost of MST over IT was set to \$0 for these calculations.

Table 10

*Sensitivity Analysis: Effect of Crime Victim Intangible Benefits on Cumulative Benefit of Multisystemic Therapy*

Benefit	Maximum plausible value		Minimum plausible value	
	Net present value (\$) <sup>a</sup>	Benefit-cost ratio <sup>b</sup>	Net present value (\$) <sup>a</sup>	Benefit-cost ratio <sup>b</sup>
Referred youths	47,703	6.07	22,207	3.36
Siblings <sup>c</sup>	11,181	-----	4,496	-----
Sibling pairs	51,556	6.48	23,312	3.48

*Note.* All expenses are expressed in 2012 dollars.

<sup>a</sup>The difference between the cumulative benefit and the incremental cost of providing MST over IT (i.e., \$9,405), unless otherwise specified. <sup>b</sup>The cumulative benefit divided by the incremental cost of providing MST over IT, unless otherwise specified. <sup>c</sup>Because there is no incremental cost for sibling treatment effects, the incremental cost of MST over IT was set to \$0 for these calculations.

Table 11

*Estimated Maximum Number of Sibling Juvenile Felony Arrests by Treatment Group*

Arrest category	Estimated maximum number of arrests	
	MST	IT
Murder/manslaughter	0	0
Sexual	0	0
Robbery	0	0
Felony assault	3	1
Felony property		
Taxpayer benefit analyses	1	2
Crime victim benefit analyses <sup>a</sup>	3	3
Felony drug	0	1
Theft/larceny	6	6
Stolen property	1	0
Fraud	0	0
Misdemeanor assault	4	2
Misdemeanor drug	2	1

<sup>a</sup>Based on the total number of felony property crimes, including felonies that were included in the Theft/larceny, Stolen property, and Fraud categories for the taxpayer benefit analyses.

Table 12

*Sensitivity Analysis: Effect of Sibling Juvenile Arrest Rates on Cumulative Benefit of Multisystemic Therapy*

Benefit	Maximum plausible value	
	Net present value (\$) <sup>a</sup>	Benefit-cost ratio <sup>b</sup>
Siblings <sup>c</sup>	8,099	-----
Sibling pairs	36,245	4.85

*Note.* All expenses are expressed in 2012 dollars.

<sup>a</sup>The difference between the cumulative benefit and the incremental cost of providing MST over IT (i.e., \$9,405), unless otherwise specified. <sup>b</sup>The cumulative benefit divided by the incremental cost of providing MST over IT, unless otherwise specified. <sup>c</sup>Because there is no incremental cost to sibling treatment effects, the incremental cost of MST over IT is set to \$0 for these calculations.

Table 13

*Sensitivity Analysis: Effect of Discount Rates on Cumulative Benefit of Multisystemic Therapy*

Benefit	2% discount rate		5% discount rate	
	Net present value (\$) <sup>a</sup>	Benefit-cost ratio <sup>b</sup>	Net present value (\$) <sup>a</sup>	Benefit-cost ratio <sup>b</sup>
Referred youths	40,239	5.28	26,158	3.78
Siblings <sup>c</sup>	8,759	-----	6,300	-----
Sibling pairs	43,008	5.57	28,152	3.99

*Note.* All expenses are expressed in 2012 dollars.

<sup>a</sup>The difference between the cumulative benefit and the incremental cost of providing MST over IT (i.e., \$9,405), unless otherwise specified. <sup>b</sup>The cumulative benefit divided by the incremental cost of providing MST over IT, unless otherwise specified. <sup>c</sup>Because there is no incremental cost to sibling treatment effects, the incremental cost of MST over IT is set to \$0 for these calculations.