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Michael F. Caldwell, Michael Vitacco and Gregory J. Van Rybroek

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Are Violent Delinquents Worth Treating?

A Cost–Benefit Analysis

Michael F. Caldwell

University of Wisconsin–Madison

Michael Vitacco

Mendota Mental Health Institute, Madison, WI

Gregory J. Van Rybroek

University of Wisconsin–Madison

This study reports on the cost benefits of an intensive treatment program for unmanageable juvenile delinquent boys, compared to the usual treatment in a secured juvenile corrections facility. A total of 101 boys who received the majority of their treatment services in a specialized program providing intensive mental health treatment were matched to a group of 101 juveniles who received treatment as usual (TAU) in a secured juvenile corrections setting on the basis of treatment propensity scores. Outcome data included the number and type of criminally charged offenses over an average follow-up period of 53 months (range 14 to 92 months). Borrowing from Cohen criminal justice processing costs for each offense was calculated in 2001 dollars. The initial costs of the program were offset by improved treatment progress and lowered recidivism, especially violent recidivism. The treatment group yielded a benefit-cost ratio of more than 7 to 1 over the TAU group. The results are discussed and compared to cost-benefit analyses of other juvenile treatment programs.

Keywords: *cost-benefit analysis; violent delinquents; treatment of juvenile delinquents*

Correctional policy decision-makers are faced with the unenviable task of allocating scarce financial resources to those services and programs they believe will prove most worthwhile. Unfortunately, in allocating resources, decision-makers are typically persuaded by the initial unit cost of a treatment program rather than long-term cost-benefit analysis. The initial cost of a program of treatment, however, is often a poor measure of its eventual value, and its impact on state tax resources. This is particularly true of interventions for young offenders. Cohen (1998) has estimated that the mon-

etary value of deflecting an individual "high risk" youth from a lifetime of crime to be between 1.3 and 1.5 million dollars. This potential benefit would more than cover initial costs of treatment, even if the treatment is only marginally effective in diverting treated delinquents from a criminal career.

Although widely used in many areas of public policy, cost-benefit analysis has been slow to appear in criminal-justice policy studies and studies of treatment effectiveness. Although more common, studies that are limited to the crime-reducing efficacy of treatment methods have typically suffered from substantial methodological shortcomings. For decades, authors have decried the poor quality of the research on efficacy of treatment interventions, particularly for more serious and violent youth (Martinson 1974; Lipsey and Wilson 1998; Tate, Reppucci, and Mulvey 1995). These reviews commonly cite the lack of an adequate comparison group, poorly defined dependent variables, inconsistent and unclear definitions of the treated populations, and a failure to control for potentially confounding variables. The empirical information most needed to assist policy decision-makers generally falls short on both efficacy and cost questions.

Even less usable information is available regarding the cost-effectiveness and cost-benefits of treatment programs for serious and violent juvenile delinquents. Although several researchers have conducted cost-benefit analyses of sentencing or disposition options (see Aos et al. 2001; Fass and Pi 2002; McDougall et al. 2003 for reviews) very few researchers have responded to Yates' (1994) call for more analysis of the cost-benefits of treatment programs. In an extensive review of available literature, Farrington, Petrosino, and Welsh (2001) found only nine experimental or quasi-experimental studies that addressed the cost-benefits of correctional treatment interventions. Three years later, Welsh and Farrington (2000) provided an update that identified 14 studies. Although these studies suffered from individual limitations and constitute a less than exhaustive examination of the issue, all but two studies demonstrated a positive cost-benefit. Specifically, among the 12 studies that showed a cost-benefit, each dollar or British pound invested in treatment returned a benefit ranging from \$1.13 to \$269.86, (only three returned benefits greater than \$5.00 for each dollar invested). Although preliminary, these results suggest cost-benefits should be a useful addition when evaluating treatment efficacy. Of the 14 cost-benefit studies in Welsh and Farrington (2000) only three involved interventions with juvenile delinquents (Robertson, Grimes, and Rogers 2001).

Roberts and Camasso (1991) looked at the impact of two programs on arrests, crime-victim expenses, social-service use, and five-year earnings in community samples of status offenders and delinquent youth. Using a pre- and postdesign (one study included a control group), they found that a family-therapy program returned \$269.86, and a wilderness challenge program

returned \$124.81 for every dollar invested. Both studies were limited by design flaws and intervened with juveniles whose behavioral problems were not severe.

Robertson et al. (2001) examined the value of a cognitive-behavior therapy for 153 juveniles placed in community settings in three Mississippi counties. Utilizing a pre- and posttest design, they found the treatment group returned \$1.96 for every dollar invested when compared to intensive supervision and regular probation services. Due in part to the difficulty of calculating direct and indirect victim costs (e.g., pain and suffering) and community costs (e.g., increased fear of crime), they included only direct criminal-justice costs in this calculation.

Fass and Pi (2002) analyzed the costs and benefits of the trend toward "get tough" sentencing of juvenile delinquents in Texas. Using an innovative analysis of various disposition options and recidivism patterns, they found that the net cost to the community to substitute probation for deferred prosecution is at least \$157,000 for each prevented delinquent act. Similarly, substituting local out-of-home placement for intensive supervision costs \$380,000, and substituting secured placement for local placement cost \$22,000 for each prevented delinquent act.

More recently, Aos (2004) completed a cost-benefit analysis of the Family Integrated Transitions (FIT) program, an intensive, family-based, reentry pilot project conducted in four counties in the state of Washington. The study found no significant difference between 104 project treatment-group participants and a comparison group ($n = 169$) in general or violent recidivism; however, the treatment group was 14 percent less likely to be convicted of a felony during an 18-month follow-up. Costs and benefits were estimated from projected lifetime figures and included approximations of the indirect benefits (e.g., avoided criminal victimizations). The results found the project generated a benefit of \$3.15 to every dollar invested through savings on avoided criminal-justice costs and indirect victim costs. The results illustrate the fact that even modest treatment efficacy can produce substantial social and financial benefits.

Certainly, the cost of juvenile crime is sufficient to make the cost-efficiency of intervention services a relevant issue (for an excellent review of the utility of cost-benefit analysis see McDougall et al. 2003). Cohen, Miller, and Rossman (1994) estimated the cost of all crime in the United States in 1987 to be more than \$257 billion dollars. Because persons under age 18 account for 22 percent of all arrests in 1987 (Federal Bureau of Investigation 1996), the costs of crime attributable to juvenile offenders in that year would total more than \$56.7 billion dollars.

Several studies have found that a small proportion of juvenile offenders account for the majority of serious and violent juvenile crimes (Howell and Bilchick 1995), and are more likely to persist in criminal activity into adulthood (Hamparian, Schuster, Davis, and White 1985; Moffitt 1993; Moffitt and Caspi 2001; Moffitt, Caspi, Harrington, and Milne 2002). Likewise, this subgroup of serious and violent juvenile offenders accounts for a disproportionate amount of the social and tangible costs of crime. Looking at the costs to victims of violent crime in Pennsylvania in 1993, (excluding criminal justice costs with the offender) Miller, Fisher, and Cohen (2001) reported that juvenile violent crime accounted for 47 percent of the cost to victims of all violent crime. Although studies of community-based and prevention programs are certainly worthwhile, the most serious and violent juvenile delinquents are more apt to be found in secured facilities. Considering that secured placement services are the most costly to deliver the lack of studies of secured treatment services represents a significant gap in the literature.

Cost-efficiency and cost-benefit analyses are complex and require a number of assumptions. Cost-benefit analysis involves comparisons of the costs and accrued benefits of an intervention or public policy with dollar values assigned to the costs of implementing the program and benefits in the form of monetized outcomes, such as lowered criminal justice or victim costs. The less rigorous cost-effectiveness analysis generally compares costs of two alternative ways of managing a social issue, without monetized estimates of the accrued benefits to society (Yates, 1985).

The Current Study

In the current study, we analyze the cost-benefits of an intensive treatment program for difficult-to-manage incarcerated delinquent boys. Unlike previous studies, the current study focuses on severe and violent delinquent offenders who are, unless effectively treated, likely to persist in serious offending into adulthood, and are thus likely to absorb substantial tax-funded resources. The treatment program studied is funded through state tax revenue. Thus, we have limited our analysis to costs that are directly paid from those revenues. Because the initial costs associated with providing an intensive treatment program of this type are substantial, the effectiveness of the program at reducing future tax-related costs is highly relevant. The study uses a matched comparison group of youth that received the usual juvenile correctional services, and calculates the actual cost of treatment and follow-up criminal activity and incarceration for each youth.

Method

The Setting

The Mendota Juvenile Treatment Center (MJTC) was established in 1995 as part of a broad reform of juvenile justice legislation in the State of Wisconsin. The program was intended to provide mental health treatment to the most disturbed juvenile boys held in the state's secured correctional facilities. The program has a unique clinical and/or correctional hybrid structure. Although operated under the administrative code of the Department of Corrections as a secured correctional facility, the program is housed on the grounds of a state psychiatric hospital, and the staff is employed by the hospital.

The program differs from the customary services provided in the secured juvenile correctional institutions (JCIs) in several significant ways. First, the treatment program consisted of three units with 14 or 15 single-bed rooms, compared to cottages of up to 50 double-bunked youth in the conventional JCIs. The program has more than twice the ratio of clinical staff-to-residents compared to more typical JCI units. Day-to-day administration of the MJTC program is the responsibility of a psychiatric nurse manager, whereas the JCI units are typically run by experienced security staff. The MJTC program emphasizes interpersonal processes, social-skill acquisition, and the development of conventional social bonds to displace delinquent associations and activities (Gottfredson and Hirschi 1990; Hirschi 1969; Sherman 1993; Sherman et al. 1992). The program relies on a variation of the "Decompression" treatment model (Caldwell 1994; Caldwell and Van Rybroek 2001, 2002; Monroe, Van Rybroek, and Maier 1988) to engage highly disruptive youth in the treatment program, along with Aggression Replacement Training (Goldstein et al. 1986), a cognitive-behavioral treatment approach.

The population of youth studied here has been previously described by Caldwell and Van Rybroek (in press); however, all current analyses are original. The "treatment" sample is composed of 101 consecutively released male youth that obtained the majority of their treatment and rehabilitation services from MJTC and were released when their commitment expired (usually due to aging out of the juvenile system). Each "treatment" youth was matched to a "comparison" youth who had been admitted to MJTC briefly for assessment or stabilization services and then returned to the sending secured correctional institution for the majority of their treatment. The resulting sample consists of 202 youth who were placed on MJTC over a 2.5-year period.

The youth studied here were transferred to MJTC from the two primary secured juvenile corrections institutions (JCI). The staff at the JCI selected

and transferred the youths to and from MJTC with no screening from MJTC staff. Youth were generally transferred to MJTC due to their failure to adjust to the correctional institutional setting. They have been sufficiently disruptive or aggressive that they have, in effect, been “expelled” from traditional rehabilitation services. There are no exclusion criteria such as low IQ, psychosis, neurological deficits, or antagonistic resistance to treatment that would eliminate a juvenile for consideration for MJTC. Indeed, any of these conditions may serve as the basis of a decision to transfer the youth to MJTC.

Comparison Variables

Every youth received an in-depth multidisciplinary assessment upon their admission to MJTC. These assessments included psychodiagnostic interviews, academic and psychological testing, and collection of relevant background information. The records of these and other pretreatment assessments provided the historical and other data used to determine the equivalence of the treatment and comparison groups. All factors were coded and entered into a database shortly after the youth was admitted to MJTC.

To match the treatment youth with comparison youth, we coded a broad set of demographic, behavioral, and clinical variables that are related to juvenile offending. The full sample was 43 percent African American, 46 percent White, 9 percent Hispanic and 2 percent Native American male juveniles. The average age when released was 17 years 1 month ($SD = 13$ months). Demographic and offense-history variables were coded from Juvenile Corrections records at the time of admission to MJTC. Other variables included the number of prior charged offenses in the juvenile record, the number of prior charged violent offenses in the juvenile record, the weekly rate of institutional rule infractions in the 3 months prior to transfer to MJTC, race, age of first arrest, age of first recorded behavioral problems, age the juvenile reported first engaging in criminal behavior, history of violent felony charges, any institutional violence, the worst victim injury, the number of days of secured custody before transfer to MJTC, and the age at admission to MJTC. The history of any violent felony and institutional violence variables were coded dichotomously. The worst victim-injury variable was coded on a five-point scale (0 = *no injury*, 1 = *minor injury, no medical attention*, 2 = *medically treated without hospital admission*, 3 = *admitted to hospital*, 4 = *death*).

Investment in academic achievement has been associated with the onset and persistence of delinquent behavior (Gottfredson 2001; McCord and Tremblay 1992; Thornberry et al. 1991; Wolford and Koebel 1995). To aid us

in matching groups on this factor, we coded grade achievement level from academic achievement scores obtained on admission for the purpose of school-grade placement.

Similarly, neurological difficulties have been associated with persistent offending in juveniles (Moffitt et al. 2002). We used the Wechsler Intelligence Scale for Children–Revised (Wechsler 1991) Full Scale Intelligence Quotient to control for the youths intellectual abilities. Youth that did not have intelligence testing recorded in their records were administered intelligence testing as part of their admission assessment.

As part of the admission procedure, clinical staff completed a Conduct Disorder Symptom Checklist based on the 15 symptoms of Conduct Disorder listed in the Diagnostic and Statistical Manual of the American Psychiatric Association, 4th Edition (American Psychiatric Association 1994). Seven of the symptoms involve violent behavior. Both the total number of symptoms and the number of violent symptoms were coded for each youth.

A Psychopathy Checklist: Youth Version (PCL:YV; Forth, Kosson, and Hare 2003), was completed on the basis of a review of the available records and notes of diagnostic interviews. The PCL:YV consists of 20 items, each of which are rated for their degree of match to the youth (from 0 to 2). Forth and Burke (1998) reported reasonably good interrater reliability and moderate predictive utility for violence for the PCL:YV and acceptable levels of internal consistency ($M r = .83$). Similarly, in their review, Edens et al. (2001) found the PCL:YV was moderately predictive of future violence. More recently, Forth et al. (2003) have shown further support for the reliability and validity of the PCL:YV. Forth et al. (2003) noted that specific cut scores to identify psychopathy have not been established with the PCL:YV. In 11 samples of institutionalized adolescents, they found a mean PCL:YV scores 20.73 to 26.48. In an investigation of the relationship between PCL:YV scores and recidivism in adolescent offenders, Gretton, Hare, and Catchpole (2004) utilized a cut score of 30 and above to identify a subgroup of youth with high levels of the underlying latent trait. Over a 10-year follow-up, they found that high scorers had significantly higher rates of violent recidivism, and shorter survival times to violent failure, when compared to low (PCL:YV total 0 to 17) or medium (PCL:YV total 18 to 29) scorers.

Scores for the PCL:YV were compiled at the time of admission to MJTC on the basis of a clinical interview and review of file records. Raters consisted of a licensed psychologist trained in the PCL system and two bachelor's-level counselors. Two raters scored each participant, discussed any differences in scores, and generated a consensus final score. Independent ratings of a subgroup of 37 offenders manifested acceptable rates of interrater reli-

ability for PCL:YV (total score = .89). Internal consistency also was acceptable for PCL:YV Total (Cronbach's alpha = .85).

Outcome Variables

The number of days of MJTC and usual JCI treatment were coded from a database maintained by the Wisconsin Department of Corrections that is used to track the location of inmates held in secured custody. Criminal offense and prison outcome data was collected from a database of public circuit-court records. The number and type of charged offenses, sentences that included prison time, and entry dates were coded for each participant.

Cost Calculations

We took a conservative approach to cost calculations, including only direct, tax-supported costs and, whenever possible, calculating actual costs for each individual. To account for the fact that costs and benefits were realized over a span of several years, all figures were adjusted to 2001 costs. Rather than estimate costs over the lifetime of the participants, we calculated only those costs incurred during the 4.5-year follow-up period. For individuals who were still serving prison sentences at the end of the study period, only the actual costs of confinement paid during the follow-up period were included. We took this approach to minimize the number of assumptions we made in the analysis. We avoided, for example, the assumption that imprisoned participants would continue to serve some future number of years at an estimated cost. We were also primarily interested in determining the relative cost-benefits of the program, compared to treatment as usual.

For each participant, the cost of treatment in MJTC and the usual juvenile institution was calculated by multiplying the per diem cost by the number of days the youth resided in each setting. Likewise, prison costs were calculated from Wisconsin Department of Corrections figures for the bed costs for each state prison and correctional center. For each participant who was imprisoned following an adult conviction, we multiplied the daily bed cost for each institution by the number of days the participant resided in that institution up to the end of the follow up. After generating juvenile corrections and adult prison costs for each individual, a mean for each treatment condition was calculated and used in the final cost-benefits calculation. All follow-up costs were calculated from the day of release to the community to the end of the study period (August 1, 2003). The follow-up time ranged from 24 to 79 months ($M = 54$ months).

Costs for criminal-justice processing, including the cost of arrest, prosecution, and defense were calculated from updated estimates from the work of

Table 1
Tax-Related Costs for Crime Categories in 2001 Dollars

Crime Category	Tax Costs (\$)
Murder	12,231.93
Rape	4,297.61
Robbery	2,476.73
Assault	2,476.73
Motor vehicle theft	1,838.60
Larceny	649.60
Other felony	6,867.08
Other misdemeanor	1,475.00

Cohen (Cohen 1998; Cohen et al. 1994) and reflect estimates from a national sample. In line with Cohen (1998), cost figures were adjusted to 2001 dollars, the midpoint of the study (see Table 1). In keeping with our focus on state tax costs, costs for local and municipal adjudication (i.e., traffic fines, municipal citations, etc.) were not included in the analysis. Re-arrests were coded into one of eight categories (murder, rape, robbery, assault, larceny, motor-vehicle theft, other felonies, and other misdemeanors).

For each participant, the number of charged offenses in each crime category was multiplied by the criminal-justice processing cost for that category and summed for the total criminal-justice processing costs for that individual. Mean costs for each treatment condition were then calculated and compared for the final cost-benefit calculation.

Data Analytic Strategy

We first analyzed the data to determine if the treatment program had produced a significant reduction in the incidence of offending in the treated participants. Because the costs of recidivism are a function of the number and type of offenses that each participant committed, we calculated the difference in the two groups on the basis of the incidence of offending. To insure an adequate number of observations, we first analyzed the impact of treatment on total offending. Because more serious offenses generally involve more criminal justice and prison costs than misdemeanors, we analyzed the impact of treatment on the number of violent, the number of felony, and the prevalence of violent felony offenses separately. This was done to examine the effects of incidence of offending and severity of offending separately. This allows us to determine if differences in the costs of outcomes is due to a lower overall incidence of offending, or to offenders committing less costly offenses.

Because more severe felony violence tends to involve fewer individual offenses, we analyzed the differences between the two treatment conditions for the prevalence (rather than the incidence) of violent felony offending. To control for the opportunity, the individual had to offend during the follow-up period we calculated the time each individual was at risk in the community. We did this by first calculating the number of days between the dates the individual was released from secured custody and the end of the follow-up period and subtracting the number of days the individual was incarcerated in a secured setting. Next, we entered this time at risk in the first step of a regression analysis in which treatment group was entered at the second step to predict each outcome variable.

For each youth, the costs of juvenile institutional care and treatment, of criminal-justice processing for subsequent offending, and prison were summed. We then calculated the mean cost per participant in each of these categories. In this way, the benefits of the treatment effect in the form of avoided criminal justice and prison costs were assigned a monetary value. The mean costs per participant were then compared to generate a cost-benefit ratio.

Results

Developing Propensity Scores

Reviews of the effectiveness of treatment for juvenile delinquents often cite the problem of determining the effect of treatment in studies that lack random assignment (Lipsey, Wilson, and Cothorn 2000; Tate, Rippucci, and Mulvey 1995). In studies that lack random assignment, groups with different levels of treatment can systematically differ in important ways. Because these differences may interact with the outcome variable in complex ways, the effects of treatment may be difficult to determine. It is to address the issue of nonrandom assignment in a variety of situations that the propensity score analysis method is widely applied (see Rosenbaum and Rubin 1983).

The propensity score is defined as the conditional probability of assignment to the treatment group given a set of observed pretreatment variables (Dehejia and Wahba 1999, 2002). Multivariate adjustment methods based on the propensity score can effectively reduce the bias that frequently arises in observational studies. Several studies (Dehejia and Wahba 1999; Drake 1993; Gu and Rosenbaum 1993; Imai, 2002) have found that the propensity score method produces estimates of casual effects that are more reliable than other commonly used methods. The propensity score matching estimator (Dehejia and Wahba 1999, 2002) attempts to control for differences

Table 2
Comparison of Demographic, History, and Institutional Variables
for the Treatment and Comparison Group

	Treatment Group (<i>SD</i>)	Comparison Group (<i>SD</i>)
Percentage African American	39	47
Age at first arrest	10.7 (2.4)	11.1 (2.5)
Previous formal charges	11.5 (9.1)	11.0 (8.2)
Charged crimes versus persons	4.6 (6.7)	4.5 (5.2)
Percent adjudicated for a violent felony	50	51
Age on admission to MJTC, years and/or months	16/1	15/11
Total days of incarceration†	586 (282)	764 (375)
Days of MJTC treatment†	354 (204)	160 (115)
Follow-up months	52.6 (18.6)	53.4 (19.9)
Days at risk in the community	1533 (591)	1359 (682)

Note: MJTC = Mendota Juvenile Treatment Center.

† $p < .0005$.

between treatment groups when treatment-group assignment is nonrandom by matching treated participants with comparison cases on the basis of their propensity scores.

We developed propensity scores by entering 21 demographic, clinical, and behavioral variables coded at the time of admission to MJTC into a forward conditional logistic regression equation to predict treatment group assignment. Seven variables entered the equation (days of incarceration in the JCI before transfer to MJTC, race, PCL:YV total score, age of onset of Conduct Disorder symptoms, age of first arrest, number of prior charges, and number of prior charged crimes against persons). The resulting propensity scores predicted treatment group membership with 86 percent accuracy. Receiver Operating Characteristics (ROC) analysis also indicated that the propensity scores predicted group membership quite well (Area Under the Curve = .88).

Each treatment participant was then matched to a comparison group member based on propensity score using a nearest-neighbor matching approach (Dehejia and Wahba 2002). For each participant pair, propensity scores were matched within 5 percent. The resulting final sample contained 101 treatment youth matched to 101 comparison youth. An added benefit of using propensity scores rather than individual covariates is that propensity scores can be used to determine if there is sufficient overlap in the covariates to support a valid comparison. To examine this, we divided the full sample into five strata of equal numbers based on propensity scores. A cross-tabula-

Table 3
Comparison of Clinical Characteristics
of Treatment and Comparison Groups

	Treatment Group (SD)	Comparison Group (SD)
Grade achievement level	6.1 (3.0)	6.5 (2.4)
WISC-R Full Scale IQ	84.8 (12.5)	85.0 (12.3)
Age at onset of conduct disorder symptoms	7.1 (2.3)	7.0 (2.4)
Number of conduct disorder symptoms	10.4 (2.8)	10.4 (2.9)
PCL:YV total	32.8 (5.1)	32.6 (4.7)

Note: PCL:YV = Psychopathy Checklist: Youth Version.
 For all comparisons *p* values were not significant.

tion of treatment-group status by strata revealed that treatment-group members made up 12 percent of the “lowest treatment probability” strata and comparison-group members made up 15.4 percent of the “highest treatment probability” strata, indicating that there was sufficient overlap to make valid comparisons.

Next, we examined the demographic, clinical, and behavioral characteristics of the final sample. Table 2 compares the two groups on a number of these variables. As expected, the treatment group spent significantly more days in the MJTC program. Because the MJTC program was more effective at improving the institutional adjustment of youth, treatment youth tended to lose fewer days to security interventions. This kept treatment youth engaged in treatment, and therefore they progressed faster on MJTC than in the usual services. As a result, the treatment group’s total time incarcerated was significantly shorter. Table 3 contains a representative sampling of the clinical characteristics of the comparison and treatment groups. The two groups were closely matched on all available clinical variables relevant to persistent offending.

Impact of Treatment on Offending

It is possible that a program could demonstrate a significant cost-effectiveness without demonstrating a significant reduction in offending. A program could theoretically reduce the severity, but not the incidence, of offending, or could possibly improve institutional adjustment, reducing the costs of confinement while having no impact on recidivism. Consequently, we attempted to assess whether cost differences were due to decreased incidence of offending, decreased severity of offending, or lowered institutional costs.

Table 4
Regression Models for Matched Treatment Group Status
After Controlling for Time at Risk

	R^2	df, n	F Change	Significance of F Change ($p =$)
All offenses	.08	2, 200	4.0	.047
Felony offenses	.21	2, 200	6.0	.015
Violent offenses	.32	2, 200	18.33	<.0005

Table 5
Mean Incidence of Offending for Comparison ($n = 101$)
and Treatment ($n = 101$)

	Any offense*	Felony*	Violent**
Comparison	2.49	0.89	0.85
Treatment	1.09	0.48	0.25

* $p < .05$. ** $p < .001$.

To determine if differences in the costs of criminal-justice processing and incarceration could reasonably be attributed to MJTC treatment, we analyzed the impact of treatment on three outcome variables: all offenses, felony offenses, and violent offenses. For each outcome variable, we entered the time at risk in the first step of a hierarchical regression followed by the treatment group assignment. Table 4 shows the results of these analyses for the final step of the model after controlling for time at risk. The models show that treatment status significantly predicted all offenses, felony offenses, and violent offenses, after controlling for nonrandom group assignment and time at risk. The standardized coefficient for the treatment variable was significant for all crimes, (Beta = $-.14$, $p < .05$), for felony offenses (Beta = $-.174$, $p < .05$), and for violent offenses (Beta = $-.29$, $p < .0005$). Table 5 shows the mean number of offenses per participant in each of the three categories. The mean differences were significant in all three categories. Youth in the matched comparison group averaged more than twice the number of charged offenses in the follow-up period (2.49 versus 1.09 for the treatment group) and more than three times the number of violent offenses (0.85 v. 0.25 for the treatment group).

Because violent felony arrests and convictions generate disproportionate costs per offense than less serious offenses, we separately analyzed the impact of the program on this category of offending. Because this type of

Table 6
Differences in Mean Costs by Cost Category for Comparison
(*n* = 101) and Treatment (*n* = 101) (\$)

	Juvenile Institution	Criminal Justice	Prison	Net
Comparison	154,917.79	14,103.24	47,366.97	216,388.00
Treatment	161,932.23	5,927.07	5,152.90	173,012.20
Difference (comparison - treatment)	(7,014.44)	8,176.17***	42,214.07***	43,375.80*

* $p < .05$. *** $p < .005$.

offending is relatively infrequent, we examined the prevalence rather than the incidence of violent felony arrest. In addition, it can be argued that the occurrence of even one violent felony offense should be considered a treatment failure. We first entered the time at risk into a logistic regression equation, followed by the treatment group status to predict the occurrence of violent felony arrest. The prediction equation was significant for treatment group status after controlling for nonrandom group assignment and time at risk, χ^2 change (1, $n = 202$) = 13.15, $p < .001$.

Cost-Benefit Analysis

When a juvenile adjusts poorly to the institution, their confinement is often extended, which increases the costs. The MJTC program treated youth that were making a poor adjustment to the corrections institution. Due to having many more clinical resources, the program had a daily bed cost that was more than double that of the usual JCI program. However, the program was successful at improving the institutional adjustment of the majority youth. As a result, youth that were treated on MJTC for longer periods tended to stabilize and improve more quickly, and consequently had significantly shorter overall periods of confinement.

Table 6 shows the costs of juvenile institutional treatment, criminal justice processing, and adult prison for the two treatment groups. To account for the varying times that costs and benefits were realized, all figures were adjusted to 2001 costs. The cost for juvenile institutional treatment per youth for comparison group youth was \$154,917.79. As a result of improving institutional adjustment and decreasing the length of stay of the treatment group, the mean marginal cost of treating a youth on MJTC was \$7,014.44, an added cost of 4.5 percent over the mean cost for the comparison-group members. Considering the significantly lower rates of offending in the treatment group, it is not surprising that the costs of criminal-justice processing was substan-

tially lower for the treatment group. Taxpayers saved \$8,176.17 per youth in avoided criminal-justice costs. MJTC treated youth-generated criminal justice costs amounting to 42 percent of the total generated by the comparison group youth. Similarly, prison costs for the treatment group amounted to \$42,214 per youth, less than 11 percent of the total for the comparison group. This difference was partly due to a significantly lower rate of prison confinement but was also due to treatment youth tending to be imprisoned for less serious offenses in lower security (and thus less costly) facilities, while comparison-group youth were more apt to be imprisoned in more costly maximum-security facilities.

In total, the mean per-youth cost for the comparison group for the three cost categories included in this analysis was \$216,388.00, whereas the comparable figure for the MJTC treatment group was \$173,012.20. The net treatment group youth costs averaged 20 percent less than the comparison group (\$43,375.80 less in net costs).

The benefits in the form of avoided recidivism cost per youth is compared to the initial added cost of MJTC treatment in excess of the costs incurred by the comparison group youth. Specifically, the added investment of \$7,014 (the mean marginal cost of MJTC treatment) per MJTC-treated youth generated mean marginal benefits (or recidivism costs avoided) of \$50,390 per youth (\$8,176 in avoided criminal-justice processing costs plus \$42,214 in avoided prison costs) over the 4.5-year follow-up period. This represents a cost-benefit ratio of 1 to 7.18, that is, the program produced benefits of \$7.18 for every dollar of cost.

Discussion

Andrews and Bonta (1995) have argued that resources should be allocated in direct proportion to individual risk. In practice, higher risk juvenile offenders are often placed in services that provide fewer treatment resources on the rationale that treatment is unlikely to reach these more difficult offenders (Ogloff and Lyon 1998). In addition, because security costs are higher in programs designed to manage more dangerous youth, programs of this type are costly even without substantial treatment services. This study lends additional support to the treatment model proposed by Andrews and Bonta (1995).

This study overcomes some of the limitations of previous studies by employing a comparison group whose members were matched to the treatment-group members. The propensity-matching strategy is particularly useful in studies of more violent juveniles, because randomized assignment to a "no treatment" condition may be impractical or inappropriate with more vio-

lent juveniles. Although the propensity-matching strategy employed here may be a useful way to control for sampling bias that may arise from a nonrandom group assignment, it relies on identifying factors that may influence this bias. It is possible that some unidentified factors that were not included in this analysis continued to exert an undetected bias in the sample. Nonetheless, for quasi-experimental designs, propensity-score analyses like that used in the present study are among the best available approaches for controlling sampling bias and assessing treatment response.

The juvenile delinquents in the treatment group that were studied here are in a class of the most disruptive and behaviorally disordered youth in the juvenile justice system. They have failed in community-based interventions and have been too disruptive to benefit from the usual secured correctional services. They presented substantial psychopathic personality features and had extensive histories of violent behavior (see Table 2). Recent public policy trends have emphasized incapacitation and punishment for this type of youth, on the assumption that they cannot benefit from any form of treatment. This assumption has not been well-examined empirically. This study contributes to the small body of empirical research that has consistently found a cost-benefit for more treatment-focused services over harsher or more security-focused sanctions for serious and violent youth (Fass and Pi 2002).

Cost-benefit analyses inevitably rest on certain assumptions. In the current study, we avoided assumptions about the costs of confinement, relying instead on known costs. However, calculating the actual cost of each offense and prosecution for every participant was impractical. We relied instead on the best available national estimates for the costs of specific types of crimes. In doing this, we assume that these costs in Wisconsin approximate the national means. We consider this to be a reasonable assumption, and one that is unlikely to have produced significant distortions in the final results because the same figures were used for both the treatment and comparison groups. However, if the difference in actual criminal-justice processing costs, and particularly for violent crimes, is much lower in Wisconsin than in the national estimates, these results may be distorted. This seems unlikely, and in any case there is no workable alternative to using national estimates for these costs.

The cost estimates used here did not include costs that are not directly paid through state tax levies. As such, they are clearly underestimates of the actual full costs that are involved in these offenses. Medical costs, lost wages, property losses, and other victim costs have not been considered and would certainly increase the cost figures. In some studies, adding victim costs to direct tax costs has produced a reversal of the cost-benefit ratio (see Cohen 1988).

For this to have occurred here, the offenses committed by the treatment group, although fewer in number, must generate much greater victim costs, usually by involving more serious and violent offenses. Because the MJTC program tended to reduce more serious and violent offending more than offending in general, excluding victim costs most likely underestimates the full cost-benefits of the MJTC program.

Even with this conservative approach the MJTC program's net return of \$43,375 per participant compares favorably to other programs designed to treat juvenile offenders. In a comprehensive cost-benefit analysis of treatment programs, Aos et al. (2001) found that 14 categories of juvenile offender programs (representing 153 outcome studies) generated a net return to the taxpayer that ranged from a loss of \$6,572 to a gain of \$31,661 per program participant. Adding crime-victim benefits to the programs that showed a positive cost-benefit increased the total benefits on average by a factor of 7.4. Applying this multiplier to the MJTC results would yield a total taxpayer and crime victim benefit of more than \$320,000 per treated juvenile.

Policy Implications

These results have important implications for the management of difficult-to-manage juvenile inmates. Recent trends have emphasized "hard" security, including "supermax" prisons that rely on extremely restrictive security measures, often at the expense of rehabilitative programming (Fass and Pi 2002; Fellner 2000). This approach is often criticized on liberty grounds, but the current study suggests that it may also lack cost-efficiency. An important finding in this study is that most of the added costs of providing intensive treatment was offset through improved institutional adjustment, leading to earlier releases.

This study also illustrates the importance of considering long-term outcomes in assessing the cost of treatment programs. For example, Aos and his colleagues (2001) found that juvenile "boot camp" programs initially saved the taxpayer an average of \$15,424 per participant, but the higher recidivism rates of participants eventually erased the savings and cost taxpayers and crime victims an additional \$3,587 per youth. In this study, the initial per diem bed cost of the MJTC program, although substantial, was offset by the treatment effectiveness of the program, and generated an annual return on the marginal investment in treatment in excess of 130 percent per year over the 4.5 years of the study.

This study contributes to the scarce research on the cost-benefits of treatment services for more serious and violent juvenile delinquents. Although limited, this research has produced consistent findings, that treatment ser-

vices are cost-effective for this difficult population. Not every treatment approach will be effective or produce positive cost-benefits (Aos et al., 2001). These results lend credence to the Risk and/or Needs model proposed by Andrews and Bonta (1995), and to the utility of Aggression Replacement Training (Goldstein et al. 1986) and the Decompression model (Caldwell 1994; Caldwell and Van Rybroek 2001, 2002, in press; Monroe et al. 1988) as applied to disruptive delinquent boys. More study is clearly warranted, but initial results clearly support the notion that the optimal treatment approach is to devote relatively extensive resources to intensive treatment of high-risk offenders.

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Michael F. Caldwell was awarded a Psy.D. in psychology from the University of Denver in 1987. He is currently a Lecturer in the Department of Psychology of the University of Wisconsin–Madison and the Senior Staff Psychologist at the Mendota Juvenile Treatment Center, Madison, Wisconsin.

Michael Vitacco was awarded a Ph.D. in 2002 from University of North Texas. He is currently employed as a staff psychologist at the Mendota Mental Health Institute, Madison, Wisconsin.

Gregory Van Rybroek was awarded a Ph.D. in 1983, and a J.D. in 1990, both from the University of Wisconsin–Madison. He is the director of the Mendota Mental Health Institute in Madison and a lecturer in the Department of Psychology of the University of Wisconsin—Madison.