

# **Cost-Benefit Analysis of Staff Training in Juvenile Correctional Facilities**

**Prepared for PbS Learning Institute, Inc.**

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## **Executive Summary**

At the request of PbS Learning Institute, Inc. (PbS), we analyzed the costs and benefits of providing additional training for staff in juvenile correctional facilities. We used Cognitive-Behavioral Therapy (CBT) training for correctional officers as our specification of additional staff training to provide a program-focused analysis. We developed a Monte Carlo simulation to estimate the average net benefits for three benefit scopes: direct, short-term, and long-term. Our calculations show additional staff training in CBT provides direct net benefits of \$2,600, benefits to society of \$600,700 in the short-term, and benefits to society of \$3,144,700 in the long-term.

Implementing additional staff training in CBT at a juvenile correctional facility involves direct training costs and the opportunity cost of the replacement staff time during training. Investing in training staff has been shown to have many benefits, including increasing employees' job satisfaction and reducing the likelihood of staff turnover. Additionally, by teaching youth new skills to restructure thought processes and help increase their positive behavior, CBT reduces adolescents' levels of aggression, risk of re-arrest, rate of abuse of drugs or alcohol, and increases their likelihood of graduating high school.

To account for variation in our estimates, we did a simulation in which each estimated benefit and cost value was randomly pulled from a range of likely values. Out of 10,000 trials, our simulation generated positive net benefits 47 percent of the time for direct benefits to facilities, but nearly 100 percent of the time for both short-term and long-term benefits to society. We therefore recommend juvenile correctional facilities invest in additional staff training. We also recommend future data collection includes efforts to capture current staff training programs in juvenile correctional facilities in more detail. Doing so will provide the

capacity to build a more robust dataset and to contribute to future assessments of benefits associated with investing in additional staff training.

## Introduction

Rising juvenile correctional populations made juvenile justice a growing concern of the Federal government in the 1980s and 1990s. According to a report by the Office of Juvenile Justice and Delinquency Prevention (OJJDP) in 1994, admissions to juvenile facilities were on the rise in the late 1980s and had reached all-time highs in the 1990s.<sup>1</sup> Concurrently, challenges traditionally associated with adult facilities, such as overcrowding, increased costs, and litigation over conditions of confinement, were increasing in juvenile facilities.

The OJJDP report highlighted three major findings. First, there was a widespread problem with the conditions of confinement at these facilities, including quality of living space, health care, and security. Second, the level of compliance with federal standards was not strongly correlated with an improvement in the conditions of confinement, because these standards had few specified outcomes. Third, these deficiencies were ubiquitous across the system, so an effort to close some of the worst facilities would have little impact. The report recommended that, in order to improve conditions of confinement, performance-based standards be implemented at a national level, particularly in the areas of security, health care, education, mental health services, and treatment programming. This recommendation and the overall findings of this report sparked the creation of our client organization, PbS Learning Institute, Inc. (PbS), by the US Department of Justice, Office of Justice Programs, and the OJJDP in 1995.

Incorporated in 2004, PbS continues its work as a “data-driven improvement model” that provides support for its member facilities in the following areas: setting goals and policies, implementing policies to meet those goals and standards, generating outcome reports and data summaries, constructing improvement plans, tapping into the juvenile justice resource network,

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<sup>1</sup> For citations, please refer to the Appendices.



and providing training, technical assistance, coaching, research, and resources. All of its work is rooted in the belief that “youth-serving agencies should be challenged to deliver effective and safe rehabilitation and reentry services.”<sup>2</sup>

PbS requested that our group perform a cost-benefit analysis of improving and increasing staff training in juvenile correctional facilities. The goal of this analysis is not only to evaluate the value of investing in evidence-based training models, but also to create a framework for PbS to use in cost-benefit analyses in the future.

We begin by presenting an overview of the demographics of juvenile offenders within correctional facilities and current practices for training correctional staff. We then describe the process of cost-benefit analysis and the specific model of additional staff training we analyze: training correctional officers in Cognitive-Behavioral Therapy (CBT). Next, we describe the costs and benefits associated with training staff in CBT and our methods for estimating a monetary value for each cost and benefit. Based on these costs and benefits, we then calculate the net benefits of training staff in CBT and conduct sensitivity analysis to account for uncertainty in our estimates. Finally, based on our results, we present recommendations for juvenile correctional facilities and PbS.

## Overview of Staff Training

Because there are no national training standards, the basic training received by juvenile correctional officers varies widely from state to state. However, most states operate correctional training academies with training curricula based on guidelines established by the American Correctional Association. These correctional training academies, which are anywhere from 3 to 20 weeks long, incorporate physical, classroom, and hands-on training on a variety of subjects,

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<sup>2</sup> Performance-based Standards, (2016), 1.

including self-defense, institutional policies, regulations, operations, and custody and security procedures. After graduating from these academies, correctional officers typically receive several weeks or months of on-the-job training at their facility.

In 2010, OJJDP conducted a national training needs assessment that identified gaps in available training for juvenile justice professionals. One of the top two categories of interest among the 1,660 juvenile justice professionals surveyed was “effectively working with youth,” with subcategories such as “evidence-based practices for working with mentally ill youth,” “evidence-based practices for working with substance using or abusing youth,” and “violent offenders.” Based on the results of the assessment, it is clear that many juvenile justice professionals believe that more training on working effectively with certain sub-populations of juvenile offenders is desirable.

## Profile of Juvenile Offenders

The rate of juvenile arrests tends to steadily increase with age, with the highest rates of arrest occurring between 16 to 18 years of age. The average age of a juvenile offender in residential placement is 16 with the largest proportion of male residents being 17 years old. Juvenile offenders are highly likely to be male, with males comprising 86 percent of offenders in residential placement, compared to 14 percent for females. Minority youth are arrested at a disproportionate rate to their representation within the population, with African American youth representing the highest rate of offense and residential placement. Of the juvenile offenders in residential placement in 2010, 32 percent were white, 41 percent were African American, 22 percent were Latino or Hispanic, and the remaining 5 percent were American Indian, Asian, or members of one or more of these groups. Juveniles account for roughly 18 percent of all arrests, 17 percent of all violent crimes, and 33 percent of all property crimes committed in the United

States. The most common crimes for juvenile offenders to be arrested for are arson, vandalism, motor vehicle theft, burglary, and disorderly conduct. Fewer than 0.5 percent of all youth ages 10 to 17, however, are arrested for a violent crime in a given year. (For more information on juvenile offender demographics, see Appendix B: Demographics of Offenders.)

## **Cost-Benefit Analysis Overview**

A cost-benefit analysis is “a policy assessment method that quantifies in monetary terms the value of all consequences of a policy to all members of a society.”<sup>3</sup> In this analysis, we evaluate the costs and benefits of a “policy” of additional staff training in CBT. The difference between aggregate costs and benefits, social benefits less social costs, gives the net social benefit, otherwise referred to as net benefits. The magnitude of the net benefits indicates which policy is most efficient.

The process of cost-benefit analysis begins by specifying a policy alternative. After evaluating various options, we decided to focus our cost-benefit analysis on cognitive-behavioral therapy (CBT). CBT is a treatment program that aims to change both dysfunctional thinking and behaviors by helping clients to develop new skills and ways of thinking. We chose to focus on CBT as our staff training program for several reasons. First, cost-benefit analysis requires the availability of studies that provide quantitative assessments of program impacts. As a well-established therapeutic method, there is a large body of research that assesses CBT. Second, mental health has been identified as an area in the juvenile justice field in which there is a gap between professional training needs and the training available. Thus, it is important to demonstrate the value of mental health training that is available. Finally, CBT provides a

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<sup>3</sup> Boardman et al., (2010), 2.

program-focused analysis that can serve as a model for future analyses by PbS or other organizations.

In conducting our cost-benefit analysis, we compare a hypothetical facility that is implementing additional training in CBT to a standard facility whose direct service staff has normal training but does not have training in CBT. We worked with our client, PbS, along with facility and demographic data from Office of Juvenile Justice and Delinquency Prevention (OJJDP), to establish this standard facility as a 60-bed, all male, public, juvenile correctional facility. (For more details on how this type of facility relates to overall national facilities, see Appendix A: Facility Background.) Additionally, through OJJDP data, we estimate that a 60-bed correctional facility will serve 147 committed male residents per year. (See Appendix C: Residents per Year in a 60-Bed Facility for a detailed description of the calculation of residents.)

The second step in cost-benefit analysis is to identify “standing” or, more simply, whose costs and benefits count. In this case, we first focus on the costs to juvenile correctional facilities of conducting trainings and the resulting direct benefits to the facility. We then include the resulting benefits to the youth in the facility as well as general societal benefit such as a reduction in crime. The inclusion of these broader costs and benefits yields the net benefits from society's perspective.

The next steps include identifying the costs and benefits of impacts related to additional staff training in CBT, predicting these impacts, and then monetizing them by attributing dollar values to units of impact. These steps have been summarized below and are fully explained in the attached appendices. As some of these benefits happen in the future, for example education and lifetime impacts, they are discounted back to today's value. However, most of our impacts are valued within one year, so most values are already in present values and therefore do not

need to be discounted.

Finally, we perform a sensitivity analysis to determine how the predicted net benefits change over plausible ranges of predicted impacts. This provides an overall view of net social benefits and the probability of a positive net benefit directly to the facility, short term societal benefit, and long term societal benefit.

## **Cognitive Behavioral Therapy**

Cognitive-Behavioral Therapy (CBT) is “a problem-focused approach to helping people identify and change the dysfunctional beliefs, thoughts, and patterns of behavior that contribute to their problems.”<sup>4</sup> CBT aims to change both dysfunctional thinking and behaviors by helping participants to develop new skills and ways of thinking. It is the most evidence-based form of psychotherapy and the most widely used approach to treatment in criminal justice today.

CBT programs for offenders focus on skill development in three areas: intrapersonal (safe regulation of thoughts, feelings, and impulses); interpersonal (adaptive communication, negotiation, and boundary setting); and community responsibility (empathy and adherence to community norms, morals, and ethical standards). Four brand name CBT programs are widely used in the juvenile justice system: Aggression Replacement Training (ART), Moral Reconditioning Therapy (MRT), Reasoning and Rehabilitation (R&R), and Thinking for a Change (T4C). (See Appendix D: Cognitive-Behavioral Therapy Overview for a more detailed description of CBT and its brand name programs.)

Each program has different requirements for becoming a facilitator, but none necessitate the facilitator to be a trained clinical professional. Indeed, adequate training of both clinical and

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<sup>4</sup> Development Services Group, Inc., (2010), 1.

non-clinical staff is a critical element to the success of cognitive behavioral programs. When cognitive behavioral program facilitators are not adequately trained, studies show that programs are less effective and can even lead to dysfunctional outcome behaviors. Consistent behavior modeling by all staff both during and outside of treatment sessions is also a crucial factor for the success of a cognitive behavioral program. Correctional officers tend to interact with juvenile offenders much more frequently than clinical staff and can assist with observations and monitoring of offenders as part of a multidisciplinary treatment team. Additionally, engaging all staff to participate in facility-wide principles and practices makes staff “less likely to burnout, lose job satisfaction, or use authority inappropriately.”<sup>5</sup>

## **Program Costs and Benefits**

In this section, we describe our process for monetizing the cost and benefits associated with training staff in CBT. The main costs of implementing additional staff training in CBT at a juvenile correctional facility are the costs of the training itself and the opportunity cost of staff time while being trained. Investing in training staff has been shown to have many benefits, including increasing employees’ job satisfaction and reducing the likelihood of staff turnover. Additionally, by teaching youth new skills to restructure thought processes and increase their positive behavior and positive decision-making, CBT reduces adolescents’ level of aggression, risk of re-arrest, and rate of abuse of drugs or alcohol, as well as increasing their likelihood of graduating high school.

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<sup>5</sup> Gornik, Mark, (2002), 11.

## Training Costs

Implementing staff training in CBT at a juvenile correctional facility requires either an on- or off-site training workshop or seminar for staff. Depending on which CBT model a facility subscribes to, these training costs can include the cost of the training itself, the cost of curriculum, and the cost of trainers. Costs vary widely from model to model, and a breakdown of the costs for each model is provided in Appendix E, Table E.1: Point Estimates of Total Costs per Training Model.

In addition, the cost of additional staff to replace the staff that are being trained must be factored into overall cost. We calculated this by multiplying the number of hours spent in training for each model by the average hourly compensation of juvenile correctional security staff. Taking both of these costs into account, we found that implementing CBT training for 40 security staff at a 60-bed facility would cost \$88,000, \$89,000, \$99,250, and \$56,000 respectively for the ART, MRT, R&R, and T4C training models, with an average cost of \$83,050 across all four models. (See Appendix E: Training Costs for a detailed description of the calculation of training costs.)

## Direct Benefits

Direct benefits include benefits that result from costs juvenile correctional facilities avoid. These benefits include cost savings due to reduced staff turnover, reduced juvenile offender injuries, and reduced staff injuries.

### *Reduced Staff Turnover*

Turnover is costly for correctional institutions. The direct financial costs of turnover include the recruitment and training of new hires, potential overtime costs to cover vacated positions, and administrative staff time to coordinate new schedules and to obtain approval for

hiring new staff. Indirect costs of turnover can include decreased morale, loss of social networks, and lower productivity due to inexperienced or tired replacement staff. In addition, high levels of turnover can trigger more turnover among remaining employees if remaining employees have to cover more shifts or have lower morale. Turnover at correctional facilities is also higher than in other industries, climbing as high as 40 percent in some state corrections departments.

We calculated savings due to reduced turnover by multiplying the reduction in turnover due to CBT training by the cost of turnover from one employee departure. We predicted the impact of CBT training using studies that relate the effect of additional job training to satisfaction with job training, overall job satisfaction, and employees' intentions to leave their current job. We found that adding CBT training to staff training will save a 60-bed facility with 40 employees between \$39,000 and \$97,400 annually, with a point estimate of \$63,300 in savings (2016 dollars). (See Appendix F: Benefit of Reduced Turnover for a detailed description of the calculation of reduced staff turnover due to CBT.)

#### *Reduced Juvenile Offender Injuries*

Health care spending makes up a significant portion of correctional expenditures—almost 20 percent of overall prison expenditures in fiscal year (FY) 2011. Youth assaults contribute to in-facility injuries and health expenditures, with 29 percent of incarcerated youth who reported being assaulted saying they were injured by that assault. In order to predict the benefit of reduced youth injury due to assaults, we link CBT's impact on assault to its impact on anger. Anger is undoubtedly linked to violent aggression and assault, and there is broad support for CBT's capacity to reduce anger. In a meta-analysis of 50 studies regarding the effect of CBT on anger, Beck and Fernandez (1998) found that CBT has a robust impact on anger management for a wide variety of participants, including prison inmates and children displaying aggressive behavior.



Absent better estimates of the relationship between anger and assault, we take the improvement in anger management from CBT found in the above meta-analysis (anger management improvement over 76 percent of untreated subjects) as the upper bound for the reduction in assaults in facilities and allow our estimate to range between that bound and zero, or no effect. In doing so, we assume that having staff trained in CBT will not result in increased youth assaults, but may reduce assaults in exact proportion to the degree to which it reduces anger. We then use this estimate and the percent of youth who reported being assaulted in the 2003 Survey of Youth in Residential Placement to estimate numbers of youth assaults before and after full staff training in CBT.

To monetize this impact, we multiply the difference in assaults before and after staff training by per-assault medical costs. We use Miller, Fisher, and Cohen's (2001) estimate of the average medical costs for juvenile victims of juvenile assault, adjusted to 2016 dollars. Doing so results in an estimated benefit from reduction in youth injury of \$17,400 per year. (See Appendix G: Benefit of Reduced Injury for a more detailed description of the calculation of the benefit of reduced incarcerated youth injury.)

#### *Reduced Staff Injuries*

According to the most recent data from the Bureau of Labor Statistics (2016), state correctional officers and jailers were one of five state and local government occupations with over 10,000 nonfatal occupational injuries and illnesses resulting in days away from work. If, as we assume, CBT has the potential to reduce youth violence in facilities, then training staff in CBT could help improve staff safety and decrease costs due to medical payments and injury time away from work. We estimate a reduction in staff injuries by taking the difference between a baseline rate of correctional staff injury due to violence and an estimated rate after full CBT

training, once again using Beck and Fernandez's (2001) estimate of CBT's potential to reduce anger.

We monetize this reduction first by multiplying it by an estimate of time away from work derived from the median time away due to injury for state correctional officers over the last five years. We then multiply the result by eight to account for full-time hours worked, and multiply that result by average hourly compensation to arrive at the cost of staff time saved due to injury reductions. We then calculate changes in medical costs due to staff injury reductions by using Miller, Fisher, and Cohen's (2001) estimate of average per-victim medical cost for adult victims of juvenile assault, adjusted to 2016 dollars. By adding the value of staff time saved and the avoided medical cost due to injury, we arrive at an estimate of cost savings from staff injury of \$5,000. (See Appendix G: Benefit of Reduced Injury for a more detailed description of the calculation of the benefit of reduced staff injury.)

## Short-Term Benefits

Short-term benefits are those that accrue within one year after juvenile offenders' participation in CBT. These benefits include cost savings due to reduced recidivism, suicide rate, and substance abuse.

### *Reduced Rate of Recidivism*

The average juvenile offender commits one to four criminal offenses each year from ages 14 to 17. Policy makers and the public are increasingly interested in interventions in crime prevention, both to reduce the number of crimes committed by new offenders and to reduce offenders' re-offense or re-arrest rates. Some states use these re-offense rates to measure and report recidivism while others report re-arrest rates. Due to this and other inconsistencies in measurement, there is no national recidivism rate for juvenile offenders. A meta-analysis by

Landenberger and Lipsey (2005) suggest a base juvenile recidivism rate of 0.40, defined as a re-arrest rate 12 months after intervention.

To value the impact of CBT on juvenile offenders' recidivism rate, we first find the impact of CBT on recidivism using Landenberger and Lipsey's (2005) estimate of a mean recidivism rate of 0.30 for CBT participants. To monetize this impact, we estimate the cost of crime (\$15,900) including victim costs, criminal justice costs (police, courts, and prisons), and lost productivity of offenders who are incarcerated. Multiplying this cost of crime by the number of residents and the difference between control and treatment group recidivism rates provides a resulting estimated benefit of CBT. We estimate a savings of \$234,000 due to CBT's effect of reducing juvenile offenders' recidivism rate. (See Appendix H: Benefit of Reduced Recidivism for a detailed description of the calculation of the benefit of reduced recidivism.)

#### *Reduced Suicide Rate*

Suicide is the leading cause of death in juvenile correctional facilities. Between 2002 and 2005, suicide accounted for 48.8 percent of the total deaths in state juvenile correctional facilities. Studies suggest that the prevalence rate of completed suicide for juvenile offenders is two to four times that of youth in the general population. Tarrier et al. (2008) found that adolescents who participated in a CBT program have a decreased risk of suicide, with a combined Hedge's  $g$  effect size of -0.260, corresponding to an odds ratio of 0.62. This analysis quantifies the cost of suicide using estimates of the value of a statistical life (VSL) of \$9 million. Combining these estimates, we calculate CBT's impact of reducing suicide among juvenile offenders as a cost savings of \$190,000. (See Appendix I: Benefit of Reduced Suicide for a detailed description of the calculation of benefits from reduced suicide.)

### *Reduced Substance Abuse*

Substance abuse is costly to both society and individual abusers. According to Young et al. (2007), 77 percent of juvenile offenders abuse alcohol. In this evaluation, we use alcohol abuse as a proxy for all substance abuse as it has been the most common focus of the effect of CBT on substance abuse. The U.S. Department of Health and Human Services Substance Abuse and Mental Health Services Administration (SAMHSA) defines heavy drinking as drinking five or more drinks on the same occasion on each of five or more days in the past 30 days. Tanner-Smith et al. (2013) found that treatment, of which CBT was one of the best forms, reduced substance abuse in abusers by 70 percent.

To measure the effect of CBT on substance abuse in a 60-bed correctional facility, we first restrict our population to only those with substance abuse by multiplying residents per year (147) by the proportion of youth in facilities who are substance abusers (.77). We then assess the change in rate of substance abuse by multiplying the CBT reduction in substance abuse (.7) by the number of days of alcohol abuse (5/30) and by the rate of reduction in substance consumption, for example days of heavy drinking. We then monetize this reduction by multiplying by Cohen and Piquero's estimate of the cost of substance abuse per person with a point estimate of \$13,200. Combining these estimates, we calculate CBT's impact of reducing substance abuse among juvenile offenders as a cost savings of \$174,000. (See Appendix J: Benefit of Reduced Substance Abuse for a detailed description of the calculation of benefits from reduced substance abuse.)

### **Long-Term Benefits**

Long-term benefits are those that accrue over a youth's lifetime. This includes benefits associated with CBT participants' increased likelihood of earning a high school degree.

### *Increased Educational Attainment*

A National Center of Education Studies (NCES) survey published in 2015 found that 64.60 percent institutionalized youth stay in school through their senior year. Furthermore, Quinn et al. (2015) found that 33 percent of all youth in correctional facilities have a disability ranging from ADHD to a behavioral disability, making that population even more susceptible to dropping out of school. A meta-analysis across twelve studies by Cobb et al. (2006) found cognitive-behavioral interventions, such as CBT, had a positive effect (.55 Hedges  $g$ ) on the rate of staying in school for youth with disabilities. We know staying in school is a strong predictor of high school “completion,” defined as high school graduation or receiving a GED. In turn, we know completing high school has a significant positive impact on lifetime earnings. That is, a high school graduate will have a greater income and other benefits than someone who has not completed high school. Over time, this accumulates into a significant difference in labor market earnings.

To assess the impact of CBT on high school completion rate and thereby labor market earnings for youth with disabilities in a 60-bed all male correctional facility, we estimate the number of the youth with disabilities in the facility by multiplying the fraction of disabilities in the hypothetical correctional facility (.334) by our residents per year (147). We then find the impact of CBT on high school completion for this population by taking the difference between the calculated CBT-influenced high school completion rate (74 percent, confidence interval: 69 percent to 79 percent) and the estimated high school completion rate (55 percent). This difference is multiplied by the number of residents per year with disabilities to find the change in high school completion for that population. This change is multiplied by the difference in labor market earnings and spillover to society between not completing high school and high school completion (\$271,300, with a range of \$228,000 to \$319,000). The resulting estimated benefit of

CBT on lifetime earnings of juvenile offenders with disabilities is a point estimate of \$2,544,000. (See Appendix K: Benefit of Increased Education for a more detailed description of our calculations of education benefits. See Appendix L: Shadow Price of Lifetime Earnings for a detailed description of the calculation of increased labor market earnings.)

## Unquantifiable Benefits

We are unable to quantify or monetize some additional benefits that may result from CBT training. These unquantifiable benefits include reduced sexual assault, reduced use of restraint and isolation, increased staff productivity, and improved juvenile offender reintegration into their communities. The following section describes these benefits and our reasons for assessing them as unquantifiable.

### *Reduced Sexual Assault*

Sexual victimization in correctional facilities is a serious concern, and the number of alleged and substantiated assaults in state juvenile facilities has increased dramatically in the last decade. The U.S. Bureau of Justice Statistics reports that a staff member is the perpetrator in 45 percent of reported cases of sexual victimization. We were unable to find research that quantified the effect of staff training on sexual victimization. However, researchers who surveyed correctional facility residents and staff found that residents reported feeling safer from assault in facilities where staff reported higher job satisfaction. Additionally, our research showed that increased job training, potentially including CBT training for staff, increased staff job satisfaction. It is possible future research will find a more definitive link between training and reduced sexual victimization, but at this time we are unable to quantify this effect.

### *Reduced Use of Restraints/Isolation*

There is a growing movement in the juvenile justice and other mental health fields to reduce the use of restraints and isolation in residential facilities. But although Martin et al. (2008) find a link between the implementation of CBT and a reduction in the use of restraints and isolation, there is only anecdotal evidence that connects the reduction of restraints and isolation and a reduction in either youth or staff injury — often, studies only report the pre- and post-reduction injury rates. Some of this benefit may be captured in our calculations of benefits due to reduced youth and staff injury. Further research that uses thorough statistical methodology to analyze the connection between the reduction of use of restraints and isolation and its impact on staff and youth injury rates is needed.

### *Increased Productivity*

Researchers have found that increased job satisfaction can increase employee productivity. When employees are dissatisfied or considering leaving their positions, they can become less productive through absenteeism and lower levels of engagement. Higher job satisfaction is linked to positive behaviors such as support for rehabilitation and better performance. Because our research on turnover has linked additional training to higher job satisfaction, it is possible that CBT training will have positive effects on employee productivity, but these effects cannot yet be quantified.

### *Improved Reintegration*

OJJDP (2010) defines aftercare as reintegrative services that prepare out-of-home placed juveniles for reentry into the community. Comprehensive aftercare programs begin after sentencing, throughout incarceration, and for a period of time after release back into the community. As CBT seeks to change individual behavior and prevent further delinquency, it can be classified as an aftercare intervention strategy during incarceration. We expect CBT to help

better prepare youth to reintegrate into the community upon release. Some of this reintegration effect may be captured in the reduced impact but monetizing any additional improvement in reintegration is impractical with available information.

## Results

We calculate a point estimate of net benefits for each of our three benefit scopes: direct, short-term, and long-term. These numbers represent our best estimate of the likely net benefits in each scope, without accounting for any uncertainty or variation in our estimates. The values in Table 1 reveal a slightly positive net direct benefit to facilities for training staff in CBT and significant positive net benefit for both short-term and long-term scopes.

**Table 1: Net Benefits Point Estimate**

	Point Estimate
Direct	\$2,600
Short-Term	\$600,700
Long-Term	\$3,144,700

## Sensitivity Analysis

Sensitivity analysis is required to determine how sensitive our predicted net benefits are to uncertainty of the estimate parameters used to calculate those net benefits. To complete our sensitivity analysis, we conducted a Monte Carlo simulation to assess the plausible range of our net benefit estimates. In a Monte Carlo simulation, each variable affecting potential costs and benefits is assigned a range of likely values. Researchers then create a computer program that recalculates the net benefits equation many times, using values of the variable drawn from each



variable range according to an assumed distribution. The resulting distribution of potential net benefits provides insight into likely outcomes of the program. Therefore, the Monte Carlo simulation provides an estimate of uncertainty in the net benefit measures resulting from uncertainty in the variables used to produce them. (See Appendix M: Monte Carlo Equations and Estimates for a summary of the equations and estimates used in the Monte Carlo simulation.)

For our Monte Carlo analysis, we draw 10,000 observations for each of our random variables. This creates a simulation in which we may see the net benefits to our hypothetical facility in 10,000 alternate realities, each with a different combination of variable estimates. (Appendix N: Stata Code for Monte Carlo Analysis lists the code used to implement the Monte Carlo simulation in Stata.)

**Figure 1: Distribution of Direct Facility Present Value of Net Benefits**

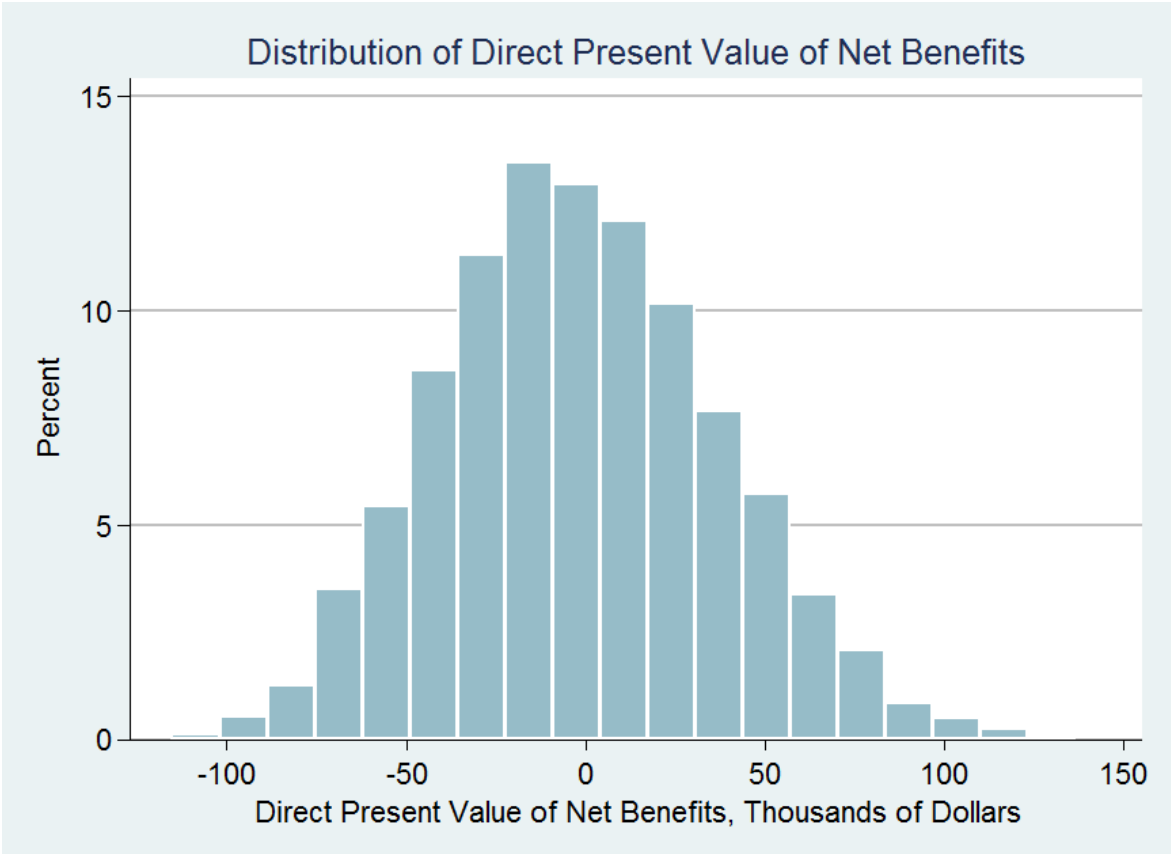


Figure 1 shows the distribution of direct net benefits across the 10,000 observations generated by our simulation. The benefits cluster around a small negative value (mean = -\$1,500) but range from -\$115,000 to \$137,000. Overall, the direct benefits are positive 47 percent of the time.

**Figure 2: Distribution of Direct and Short-Term Present Value of Net Benefits**

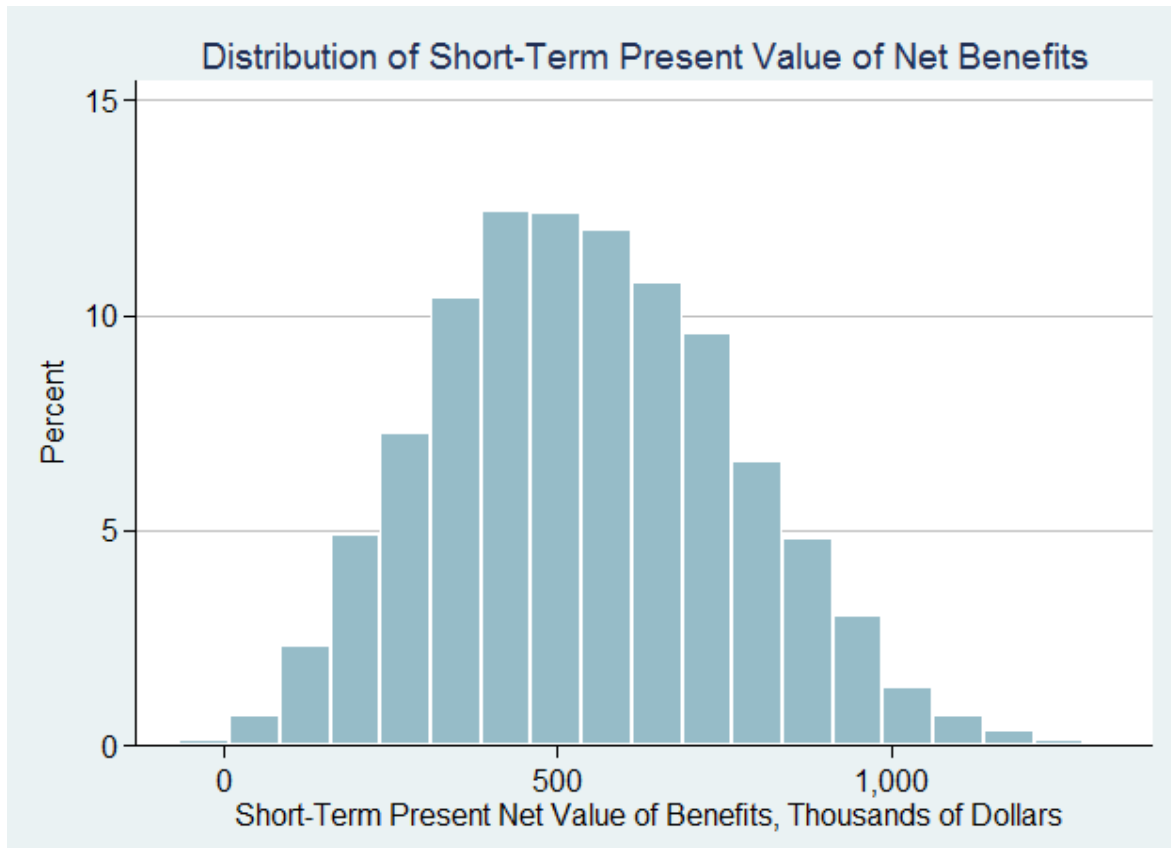


Figure 2 shows the distribution of short-term net benefits, which include benefits accruing directly to the facility, as well as benefits from reductions in suicides, recidivism, and substance abuse, across the 10,000 observations generated by our simulation. The benefits cluster around a robust positive value (mean = \$543,000) but range from -\$65,000 to \$1,362,000. Though the distribution dips below zero on the left tail, negative short-term benefits are exceedingly unlikely in our simulation, as we see positive benefits over 99.9 percent of the time.

**Figure 3: Distribution of Present Value of Net Benefits**

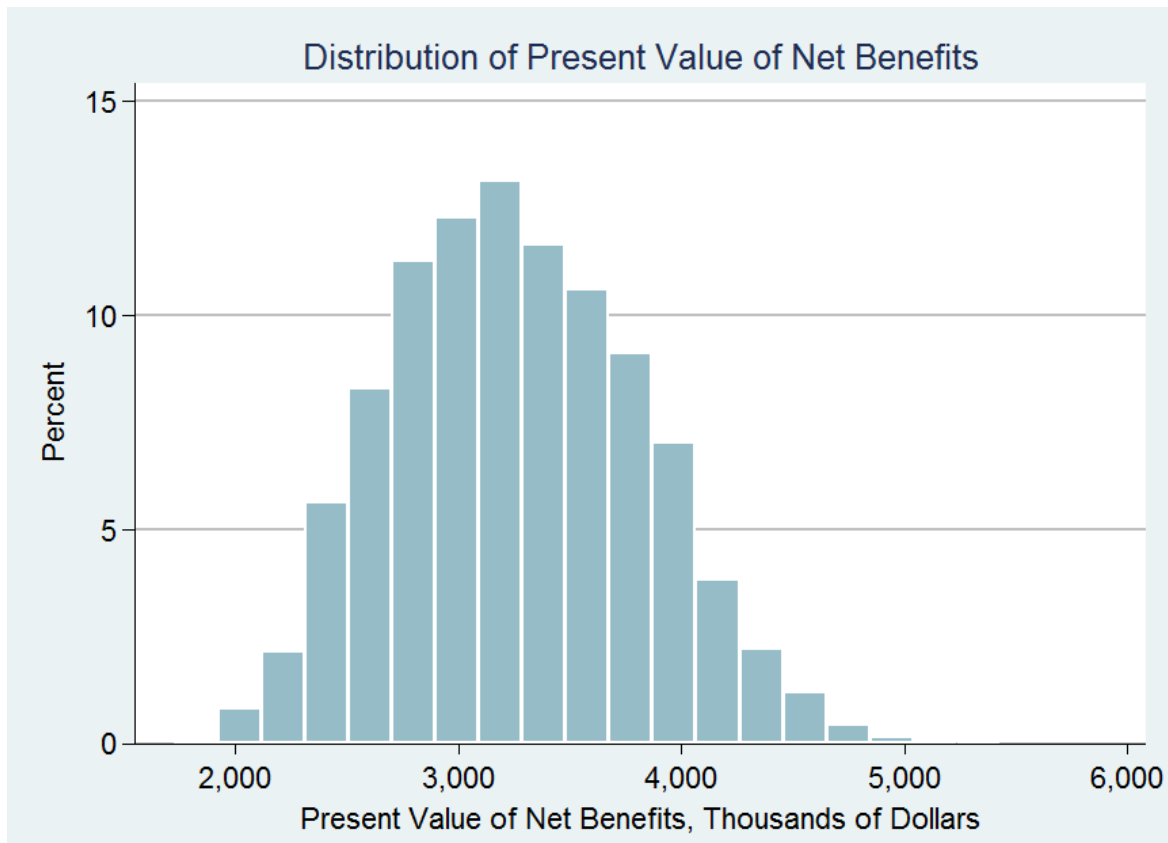


Figure 3 shows the distribution of the total present value of long-term net benefits, which includes direct benefits to the facility, short-term benefits, as well as benefits from increased educational attainment of incarcerated juveniles, across the 10,000 observations generated by our simulation. The benefits are consistently positive (mean = \$3,261,000) and range from \$1,732,000 to \$5,432,000.

Table 2 summarizes the Monte Carlo simulation estimates for each of the three benefit scopes. Descriptive statistics for each benefit scope are shown, as well as breakdowns of the components of each benefit scope. From this we can see to what extent each benefit category impacted the calculation of net benefits for each scope. At the direct level, for example, turnover appears to contribute the most to net benefits, having both the largest mean and the widest range

of any other benefit category. For short-term benefits, all three benefit categories have wide ranges with high upper bounds, which sweeps the net benefit estimation up and results in the simulation yielding positive net benefits in almost every trial. The inclusion of the benefit of education, a benefit accumulated over the lifetime of incarcerated youth who are able to complete high school, in the long-term scope sharply increases our estimation of net benefits and makes it so that the simulation never produces negative benefits.

**Table 2: Summary of Monte Carlo Estimates for Benefit Scopes**

	Mean Net Benefits (\$)	Percent of Trials with Positive Net Benefits	Minimum Estimated Net Benefits (\$)	Maximum Estimated Net Benefits (\$)
<b>Direct</b>	<b>-1,500</b>	<b>46.7</b>	<b>-115,000</b>	<b>137,000</b>
Youth Injury	19,200		200	53,300
Staff Injury	1,800		10	7,400
Turnover	67,800		-9,950	176,000
Training Cost	-90,300		-137,000	-33,800
<b>Short-Term</b>	<b>543,000</b>	<b>99.9</b>	<b>-65,000</b>	<b>1,362,000</b>
Direct	-1,500		-115,000	137,000
Recidivism	282,000		27,500	568,000
Suicide	149,000		-249,000	795,000
Substance Abuse	113,000		46,300	202,000
<b>Long-Term</b>	<b>3,260,000</b>	<b>100</b>	<b>1,732,000</b>	<b>5,432,000</b>
Short-Term	543,000		-65,000	1,360,000
Education	2,720,000		1,575,000	4,270,000

## Limitations

One limitation of our cost-benefit analysis is that our analysis is performed for a hypothetical 60-bed state correctional facility rather than for an actual facility. It is important to remember that our analysis assumes that no security staff in this facility have received prior training in CBT. In addition, because standards, regulations, and funding of state facilities are done at the state level, it is difficult to construct an “average” profile of a facility. Aspects such as staffing, training, and programming vary widely from state to state and facility to facility.

Additionally, there is a dearth of research on the effects of staff training on conditions in juvenile facilities. For example, because of ethical concerns, there are few randomized control trials that examine juvenile justice programs, forcing researchers to rely on observational data. Furthermore, because we found little data from juvenile corrections, for many estimates we relied on research from adult corrections or even other fields. Some of our estimates, including the effects of education and number of assaults, include both male and female residents, and in several cases the best studies we found were from the 1990s or 2000s; conditions in facilities may have changed since these studies were conducted. Finally, in cases where the exact effects we needed to estimate had not been directly researched, we relied on long chains of logic to determine effects.

Another limitation of our analysis is that we calculate benefits and costs only for a one-year period. As a facility hires new staff, it will have to train these staff in order to maintain predicted benefits over time. Similarly, the direct benefits we predict from CBA, such as reduced turnover and reduced use of restraints, will presumably continue into future years. However, because we lack data on the effects of CBT training over time, we were unable to reliably estimate the benefits of CBT in future years.

By far the largest limitation of our analysis is that there is little available research on how direct staff training in CBT, or even training in general, impacts our benefit categories. Consequently, most of the research we used estimates the impact of juvenile offenders participating in CBT groups, not the impact of staff receiving training in CBT. Therefore, our valuation of those benefits which we were able to quantify is likely an overestimation of the true impact of training staff in CBT. It is important to note, however, that better information on the impact of CBT training would have allowed us to estimate more benefits, such as those due to

reduced sexual assault or increased productivity. Likewise, were better information available, we could have broadened the scope of the impacts that we did estimate, such as predicting education benefits for all residents, not only those with disabilities. It is therefore difficult to determine the net effect of information limitations on our calculation of benefits, as we would expect benefit magnitudes to decline with better information while the number of benefit categories would increase.

## **Recommendations**

We recommend facilities invest in additional staff training in CBT. Though we found a likelihood of positive direct net benefits of 47 percent for our hypothetical facility, the likelihood of positive short- and long-term net benefits is nearly 100 percent. Therefore, from the perspective of society, the state, and the juvenile correctional residents, staff training in CBT appears well worth the investment.

As stated previously, we found our efforts to estimate net benefits of additional staff training limited by a lack of data. We therefore recommend that PbS amend its bi-annual survey to collect data about the type of trainings facility staff receive, how much training they receive, and which staff receive the training. Collecting this information will build a much more robust dataset that could benefit cost-benefit analyses in the future.

In addition, cost-benefit analysis generates the most useful information when it is applied to a specific program. A CBA of a specific facility, using data from that facility, would be more accurate and useful than a general examination of a hypothetical facility using national averages. We therefore recommend that future cost-benefit analyses narrow their focus to look at the impact of specific training programs in particular facilities.

Finally, we caution that while cost-benefit analysis is a useful tool, a cost-benefit analysis assesses only the economic impacts of a policy or program. It does not take into account important impact categories such as equity. We recommend that PbS and other stakeholders use this cost-benefit analysis as one factor when deciding whether to provide additional training to staff, but also consider other impact categories as well.

## **Appendix A: Facility Background**

To conduct this cost-benefit analysis, we began with a baseline facility to compare to an alternative facility with additionally trained staff. Based on client suggestions, client estimates of average facility type, and OJJDP information on a standard facility, our baseline facility is a 60-bed, all-male state juvenile correctional facility. Below, we review a national snapshot of five major facility characteristics: type of facility, facility size, public or private ownership, and gender make-up. Facility staff ratios and overall staffing are addressed in Appendix E: Training Costs.

We began by selecting a facility type. Out-of-home placements create the greatest burden on both youth and the juvenile justice system. Out-of-home placements usually are to either detention centers or correctional facilities. Detention centers are more short-term holding facilities, while correctional facilities are typically long-term residential facilities. According to the OJJDP Statistical Briefing Book (2015), more than one-third (35 percent) of committed juveniles, but just 7 percent of detained juveniles, remained in placement six months after admission. In the latest OJJDP data, among juveniles in a correctional facility, 83 percent had been in the facility at least 30 days, 71 percent for at least 60 days, 60 percent at least 90 days, and 12 percent for a full year. In addition, our client, PbS, asked us to specifically look at corrections facilities, as they make up a substantial portion of their membership.

Size was another major consideration, as facilities can range from very small (0-11 beds) to large (200 plus beds). In 2015, 56 percent of facilities were small (20 or fewer residents) but held only 17 percent of juvenile offenders, while 38 percent of facilities were medium (21-100 residents) and held 54 percent of juvenile offenders. Only 5 percent of facilities were large (holding 100-200 or more residents), but they held 29 percent of juvenile offenders. As medium-



sized facilities are the most common, this is the size we decided to focus on. In particular, PbS suggested that we focus on a facility with 60 beds.

Another factor to consider is whether the facility is public or private. In 2015, 54 percent of facilities were public, while 46 percent of facilities were private. However, 71 percent of juvenile offenders were held in public facilities and only 29 percent in private facilities. Furthermore, our client PbS primarily works with public facilities, so we decided to use public facilities as our model.

We further narrowed our focus down to male-only facilities. According to OJJDP data, nationally, females accounted for 14 percent of juvenile offenders in residential placement in 2013. That being said, only 38 percent of public facilities are male-only. 57 percent of public facilities have both male and female offenders, so focusing on male-only facilities will be a limitation in our analysis.<sup>6</sup>

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<sup>6</sup> OJJDP, (2015).

## Appendix B: Demographics of Offenders

The information collected and presented on the state of juvenile correctional facilities primarily comes from three data sources collected by the OJJDP. The first two, the Census of Juveniles in Residential Placement (CJRP) and the Juvenile Residential Facility Census (JRFC), are snapshots of facilities surveyed on one day during the year, administered every other year. Both surveys are administered to all secure and non-secure residential placement facilities in the United States that house juvenile offenders. For these purposes, juvenile offenders are defined as “persons younger than 21 who are held in a residential setting as a result of some contact with the justice system (they are charged with or adjudicated for an offense).”<sup>7</sup> This includes both status offenders and delinquent offenders, and includes juveniles who are temporarily detained by a court or committed to a facility after adjudication for an offense.

The CJRP primarily collects individual-level information, including gender, age, race, placement authority, charged offense, admission data, and security status. The JRFC, in addition to similar snapshot data as the CJRP, includes some past-month and past-year questions on how the facilities operate and the types of services provided. This includes questions on security, capacity, crowding, injuries, and deaths. The third information source is the Survey of Youth in Residential Placement (SYRP). The SYRP collects a wide range of self-reported information through interviews with individual juveniles in placement, such as placement experience, past offense histories, education, and other experiential questions.<sup>8</sup> It is through these three components that the OJJDP presents its demographic information of the national juvenile justice system.

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<sup>7</sup> NCJJ, (2014), 186.

<sup>8</sup> Ibid.

Of all the 79,166 total residents in placement facilities in 2010, 89 percent were juvenile offenders. 86 percent of all residents (70,793 total) were being held for delinquency offenses, which consist of behaviors that would be criminal law violations for adults. Another 4 percent (3,016 total) were being held for status offenses, which are offenses that would not be law violations for adults, such as running away and truancy.<sup>9</sup> This pattern has remained constant, but the overall number of residents in juvenile facilities has been declining over the past decades, from 116,701 residents in 1997 down to 79,166 in 2010.<sup>10</sup> The overall number of delinquents peaked in 1999 and has decreased by 34 percent since then to 2010. Over the period from 2001 to 2010, overall juvenile arrests decreased by 21 percent.<sup>11</sup>

**Table B.1: Profile of Juvenile Offenders in Residential Placement**

	Number			Percent of Total		
	1997	2003	2010	1997	2003	2010
All Residents	116,701	109,094	79,166	100	100	100
Juvenile Offenders	105,055	96,531	70,793	90	88	89
Delinquency	98,813	92,022	67,776	85	84	86
Status Offenders	6,242	4,509	3,016	5	5	4
Other	11,646	12,563	8,373	10	12	11

Source: NCJJ 2014, page 187

Juvenile justice facilities are nearly evenly split between public and private ownership. In 2010, of the 2,259 total facilities, 1,156 were under private control, slightly more than the 1,103 public facilities. But public facilities hold the overwhelming majority of all juvenile offenders. Of the 70,793 juvenile offenders being held, 49,112 (69 percent) were in public facilities with the remaining 21,681 (31 percent) being held in private facilities. Both facility types have seen declines in numbers over the past decades, with a slightly larger decline in public facilities than private ones (35 percent versus 26 percent) between 1997 and 2010. Over this same time period,

<sup>9</sup> NCJJ, (2014).

<sup>10</sup> Ibid.

<sup>11</sup> Ibid.

however, the number of private facilities has declined from 1,736 in 1997 to 1,156 in 2010, a 33 percent decline. The number of public facilities has remained nearly the same over the same time period. Private facilities are comprised of a larger proportion of committed offenders to those simply detained (89 percent detained, 9 percent committed) than public facilities (60 percent detained, 38 percent committed).<sup>12</sup>

**Table B.2: Percentage of Juvenile Facilities by Sector**

	1997	2003	2010
Total Facilities	2,842	2,852	2,259
Percent Public	39.9	41.0	48.8
Percent Private	68.1	59.0	51.2

Source: NCJJ 2014, page 187

**Table B.3: Percentage of Juvenile Offenders in Facilities by Sector**

	1997	2003	2010
Total Offenders	105,055	96,531	70,793
Percent in Public Facilities	72.0	68.6	69.4
Percent in Private Facilities	28.0	31.4	30.6

Source: NCJJ 2014 page 187

Of the 70,793 juvenile offenders in residential placement, 96 percent are held for delinquency offenses, while the remaining 4 percent are held for status offenses. Delinquency offenses are categorized as either person crimes, property crimes, drug crimes, public order violations, or technical violations. Person crimes, including homicide, sexual assault, robbery, and assault, represent 37 percent of total offenses. Property crimes, such as burglary, theft, auto theft, and arson are another 24 percent of offenses. Drug crimes are another 7 percent, public order violations represent 11 percent, and technical violations represent the remaining 16 percent.<sup>13</sup> See Table B.4: Profile of Juvenile Offense Type.

<sup>12</sup> NCJJ, (2014).

<sup>13</sup> Ibid.

**Table B.4: Juvenile Offenses by Offense Type**

Offense Type	Number of Offenses	Percent of Total
Delinquency	67,776	96
Person	26,010	37
Property	17,037	24
Drug	4,986	7
Public Order	8,139	11
Status Offense	3,016	4
Total	70,792	100

Source: NCJJ 2014, page 188

In 2010, 225 juvenile offenders were in residential facilities for every 100,000 American juveniles.<sup>14</sup> Males account for 86 percent of the total juvenile facility population while females comprise the remaining 14 percent.<sup>15</sup> Roughly two-thirds of females are held in public facilities. The proportion of females in residential placement are more likely than males to be detained for status offenses (11 percent for females versus 4 percent for males), while males are more likely than females to be detained for delinquency offenses (89 percent for females versus 96 percent for males). The majority of juvenile detainees are either 16 or 17 years of age (28 percent each). For males, the highest proportion are 17 years old (29 percent) and, for females, the highest proportion are 16 years old (29 percent).<sup>16</sup> (See Table B.5: Age Profile of Detained Residents.)

Of the 70,793 juvenile offenders in placement, 32 percent were identified as white (22,947), 41 percent were black (28,976), 22 percent were Hispanic (15,590), and the remaining 5 percent were either American Indian, Asian, or members of two or more of these categories. Minorities make up a smaller share of the female population than males.<sup>17</sup> Of the overall juvenile population for each race, however, minorities' rates of residential placement are much higher than that of white juveniles. For every 100,000 white juveniles, 128 are in residential placement.

<sup>14</sup> NCJJ, (2014).

<sup>15</sup> OJJDP, (2013).

<sup>16</sup> NCJJ, (2014).

<sup>17</sup> Ibid.

For black juveniles, the rate is 606 per 100,000. For Hispanic youth, 228 per 100,000, and for American Indians, 369 juveniles are detained per 100,000. Asian juveniles, however, are in residential placement at a rate of only 47 per 100,000.<sup>18</sup>

**Table B.5: Age Profile of Detained Residents**

Age	Percent of Total Population
12 and Under	1
13	3
14	8
15	18
16	28
17	28
18 and Over	14

Source: NCJJ 2014, page 195

Male juveniles tend to stay in facilities longer than females during the 2010 survey year, and detained juveniles remain in placement for much less time on average than committed juveniles. For detained juveniles: after 30 days, 25 percent of females and 37 percent of males remain in placement and after 60 days, 11 percent of females and 20 percent of males remain. For committed offenders: after 180 days, 28 percent of females and 34 percent of males remain in placement and after 1 year, 8 percent of females and 12 percent of males remain. Committed white and minority youths remain in placement in similar proportions, whereas 28 percent of detained white juvenile offenders remained in placement after 30 days compared to 38 percent of minority juveniles.<sup>19</sup>

<sup>18</sup> NCJJ, (2014).

<sup>19</sup> Ibid.

## **Appendix C: Residents per Year in a 60-Bed Facility**

Data from the OJJDP for 2013 gives the percent of residents remaining in placement in ten day increments until 365 (one at 360 and then at 365).<sup>20</sup> To find the average number of days per committed male resident, we took the percentage of committed males of each ten-day increment (Day 10 = .928) and multiplied this by the ten days of the increment ( $92.8/100$  residents remain =  $.928$  residents remain \*  $10$  days =  $9.28$  days/kid). We did this for all ten day increments and multiplied the last 360-365 by five days. The sum of these gives us the average number of days spent in placement per male resident = 149 days per committed male resident. This is compared to the median of 125 days per committed male resident.

To find the average number of residents in a 60-bed all male correctional facility in a year, first we divide 365 days by the average number of days spent in placement per male resident ( $365/149 = 2.44884$ ). Then multiply this by 60-beds ( $2.44884 * 60 = 146.93$  residents, rounded to the nearest whole person, 147). Therefore, our analysis will assume that a 60-bed correctional facility will serve 147 committed male residents per year.

We acknowledge that because we do not have day-to-day increments the average has a bias, or underestimate, as residents are not released only on ten day increments. This downward bias is created because we are not counting the extra days a resident would stay after the increments. For example, a resident may stay until day 76 but they are only counted as having stayed until 70, leaving six days unaccounted for and therefore undercounting. We also don't know how many residents stay for longer than 365 days. Average is often not used due to potential upward bias from long stay outliers. The OJJDP data caps the longest possible stay included in the average at 365.

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<sup>20</sup> OJJDP, (2013).

This underestimation of days in corrections facilities per resident may alleviate another potential problem in that we do not know the amount of time that it takes to replace a resident in a facility. There is a possible over counting of residents served by a facility due to lack of resident replacement information, that is how many days it will take for a vacated bed to be filled.

For our Monte Carlo simulation, we also use a calculation of residents per year utilizing the median number of days spent in a correctional facility for a male youth, 125, to account for variance.<sup>21</sup> Using the same technique as we did in the previous paragraph ( $365/125 = 2.92$ )  $2.92 \times 60\text{-beds} = 175.2$  and rounding to the nearest person results in 175 committed male residents per year using the median number of days in facility.

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<sup>21</sup> OJJDP, (2013).



## Appendix D: Cognitive-Behavioral Therapy Overview

Cognitive-Behavioral Treatment (CBT) is “a problem-focused approach to helping people identify and change the dysfunctional beliefs, thoughts, and patterns of behavior that contribute to their problems.”<sup>22</sup> CBT combines two fields of theory: cognitive theory and behavioral theory. Cognitive theory emphasizes thoughts, assumptions, and beliefs while behavioral theory emphasizes external behaviors and actions. Merging these two theories, CBT is based on the principle that thoughts affect emotions, which then control external behaviors. CBT aims to change both dysfunctional thinking and behaviors by helping clients to develop new skills and ways of thinking. Clients are taught positive behaviors and learn to restructure their thought processes to assist in positive decision-making.<sup>23</sup> For example, CBT programs teach skills related to interpreting social cues, monitoring one’s own thought processes, reasoning about right and wrong behavior, and generating alternative solutions.<sup>24</sup>

CBT programs for offenders focus on skill development in three areas: intrapersonal (safe regulation of thoughts, feelings, and impulses); interpersonal (adaptive communication, negotiation, and boundary setting); and community responsibility (empathy and adherence to community norms, morals, and ethical standards).<sup>25</sup> Most CBT programs for criminal offenders tend to focus on cognitive deficits and distortions.<sup>26</sup>

Four brand name CBT programs are widely used in the juvenile justice system: Aggression Replacement Training (ART), Moral Reconciliation Therapy (MRT), Reasoning and Rehabilitation (R&R), and Thinking for a Change (T4C). While each program has different

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<sup>22</sup>Development Services Group, Inc., (2010), 1.

<sup>23</sup> Milkman and Wanberg, (2007).

<sup>24</sup> Landenberger and Lipsey, (2005).

<sup>25</sup> Milkman and Wanberg, (2007).

<sup>26</sup> Ibid.

requirements for becoming a facilitator, none necessitate the facilitator to be a trained clinical professional. Indeed, adequate training of both clinical and non-clinical staff is a critical element to the success of cognitive behavioral programs. When cognitive behavioral program facilitators are not adequately trained, studies show that programs are less effective.<sup>27</sup> Consistent behavior modeling by all staff both during and outside of treatment sessions is also a crucial factor for the success of a cognitive behavioral program.<sup>28</sup> Correctional officers tend to interact with juvenile offenders much more frequently than clinical staff and can assist with observations and monitoring of offenders as part of a multidisciplinary treatment team.<sup>29</sup> Additionally, engaging all staff to participate in facility-wide principles and practices makes staff “less likely to burnout, lose job satisfaction, or use authority inappropriately.”<sup>30</sup> (For a summary of brand name CBT trainings, see Table D.1: Summary of CBT Trainings.)

**Table D.1: Summary of CBT Trainings**

Program	Number of Participants per Group	Program Duration
Aggression Replacement Training (ART)	8-12	30 hours over 10 weeks
Moral Reconciliation Therapy (MRT)	5-20 or more	Open-ended
Reasoning & Rehabilitation (R&R)	6-8	35 sessions over 8-12 weeks
Thinking for a Change (T4C)	8-12	30 sessions over 10-30 weeks

*Aggression Replacement Training (ART)*

Aggression Replacement Training (ART) “seeks to provide youngsters with prosocial skills to use in antisocial situations as well as skills to manage anger impulses that lead to

<sup>27</sup> Landenberger and Lipsey, (2005).

<sup>28</sup> Gornik, Mark, (2002).

<sup>29</sup> Appelbaum, Hickey, and Packer, (2001).

<sup>30</sup> Gornik, Mark, (2002), 11.

aggressive and violent actions”.<sup>31</sup> ART includes social skills training, anger control training, and moral reasoning. Social skills training teaches youth interpersonal skills to use to deal with situations that produce anger (i.e. making a compliment, responding to failure, understanding other’s feelings). Anger control training teaches youth to identify what factors create their anger and teaches them self-control techniques. Moral reasoning aims to teach youth to consider others’ perspectives and increase their level of justice and fairness.

Sessions last for one hour each week for a total of ten weeks. Three levels of facilitator training are offered, including:

- Group Facilitator: 36- to 40-hour didactic seminar.
- Booster training: One-day workshop
- Trainer of Group Facilitator: minimum 4- or 5-day, 32- to 40 hour seminar that may include up to 280 hours of additional study once the group facilitators have implemented the program three times with their clients under supervision.
- Master Trainer: individualized program for those with at least 5 years’ experience delivering the program and at least 3 years as a trainer of group trainers

### *Moral Reconciliation Therapy (MRT)*

Moral Reconciliation Therapy (MRT) was originally designed for criminal justice-based drug treatment, but has been expanded to a variety of uses including addressing general antisocial thinking among juvenile offenders. The name refers to the program’s aim of teaching the process of correct, prosocial decision-making (moral) through a reevaluation of decisions (reconciliation). It aims to improve offenders’ self-centered reasoning to a concern for the welfare of others and for societal rules to reduce their criminal behavior.

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<sup>31</sup> Milkman and Wanberg, (2007), 16.

MRT offers three levels of training, including:<sup>32</sup>

- Basic Training: Four-day, 32 hour course where facilitators guide participants toward completion of MRT's 16 steps from demonstrating honesty and trust, to setting goals, to reassessing relationships.
- Review training: One-day, 8 hour workshop
- Advanced training: Two-day, 16 hour workshop

### *Reasoning and Rehabilitation (R&R)*

Reasoning and Rehabilitation (R&R) focuses on enhancing self-control, interpersonal problem-solving, social perspectives, and prosocial attitudes. It teaches participants to think before acting, consider consequences of actions, manage emotions, be open-minded, and respond to others' feelings. R&R consists of 35 two-hour sessions held over 8-12 weeks with a group of 6-8 participants.

R&R was designed for any level of staff to facilitate the program. Training offerings are as follows:<sup>33</sup>

- Initial training: Three-day workshop
- Follow up training: Two-day small group sessions

### *Thinking for a Change (T4C)*

Thinking for a Change (T4C) combines cognitive restructuring, social skills, and problem solving to increase offenders' awareness of themselves and others. The program is used for adults and juveniles, probationers, prison and jail inmates, and parolees. The curriculum is

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<sup>32</sup> Correctional Counseling, Inc., (2016).

<sup>33</sup> Cognitive Centre of Canada, (2016).

divided into 25 lessons which last 1 to 2 hours. Groups of 8 to 12 participants ideally meet twice per week but not more than three times per week for a total of 30 sessions. Facilitator training includes a 2-day, 40-hour training program.<sup>34</sup>

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<sup>34</sup> National Institute of Corrections, (2016).

## Appendix E: Training Costs

The main costs of providing CBT training for security staff at a correctional facility are the costs associated with implementing the training. Depending on which CBT model a facility subscribes to, these training costs can include the cost of the training itself, the cost of curriculum, and the cost of trainers. There are two uncertain variables included in the calculation of each model's cost: hourly compensation and the total number of staff trained. Because the hourly wage of correctional officers varies widely from state to state, we included hourly wage as a range from \$13.38 (bottom 10 percent) to \$35.13 (top 10 percent).<sup>35</sup> We then multiplied that wage by 1.58 in order to account for fringe benefits as a component of the value of staff time. We chose 1.58 based on the ratio of total compensation to total benefit costs for state and local government workers provided by the Bureau of Labor statistics.<sup>36</sup> As for total number of staff trained, because the total number of security staff employed at state correctional facilities varies from facility to facility, we estimated that the total number of security staff for a 60-bed state facility would be 40.<sup>37</sup> The breakdown of how costs were calculated for each model is as follows:

### *Compensation*

Compensation was included into the training cost table to take into account replacement staff that would be needed while staff was being trained in CBT. Compensation was calculated as followed:

$$1.58 * \textit{hourly\_wage} * \textit{training\_hours} * \textit{staff}$$

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<sup>35</sup> Bureau of Labor Statistics, (2016a).

<sup>36</sup> Bureau of Labor Statistics, (2016b).

<sup>37</sup> Estimate based on the staff to resident ratios mandated in Prison Rape Elimination Act of 2003.

Where 1.58 is the ratio of full compensation—including fringe benefits—to hourly wage, *hourly\_wage* is wage per hour, *training\_hours* is the number of hours spent in training for each model, and *staff* is the total number of staff trained.

#### *Training cost*

Training costs include reported cost of both on-site training and facilitators of each of the four most popular CBT Models. Training costs were calculated as follows:

$$trainings * cost + trainers * trainer\_cost * trainings$$

where *trainings* is the number of trainings required for each model, *cost* is the cost per training for each model, *trainers* is the number of trainers required for each model, and *trainer\_cost* is the cost per trainer for each model.

#### *Curriculum cost*

Curriculum cost includes the cost of required materials for the trainings. Curriculum cost was calculated as followed:

$$curriculum\_cost * staff$$

where *curriculum cost* is the cost of curriculum materials per staff member, and *staff* is the total number of staff trained.

The entire equation for the cost of each CBT training model is as follows:

$$\begin{aligned} & training\_cost \\ & = (hourly\_wage * training\_hours * staff) + (trainings * cost + trainers \\ & * trainer\_cost * trainings) + (curriculum\_cost * staff) \end{aligned}$$

For the point estimates of total cost for each model using the average wage for state correctional officers reported by the Bureau of Labor Statistics (\$22.06), refer to Table E.1: Point Estimates

of Total Cost per Model. For a complete list of the valuation of cost variables for each program, refer to Table E.2: Variables for Cost of Implementing Training.

**Table E.1: Point Estimates of Total Cost per Training Model**

Model	Point Estimate (\$)
ART	88,000
MRT	89,000
R&R	99,250
T4C	56,000
Average	83,050



**Table E.2: Variables Included in Estimate of Training Cost**

Model	Staff Hourly Compensation (\$)	Number of Staff	Total Hours of Training	Trainings	Training Cost (\$)	Number of Trainers	Trainer Cost (\$)	Curriculum Cost (\$)	Source
ART	21 – 56	40	48	2	9,500	2	2,500	45.95	EPISCenter
MRT	21 – 56	40	40	1	32,100	1	0	25	Correctional Counseling
R&R	21 – 56	40	40	3	7,200	1	323.52	517	Cognitive Center of Canada
T4C	21 – 56	40	40	1	0	1	0	0	National Institute of Corrections

## Appendix F: Benefit of Reduced Turnover

Turnover is costly for correctional institutions. The direct financial costs of turnover include the recruitment and training of new hires, potential overtime costs to cover vacated positions, and administrative staff time to coordinate new schedules and to obtain approval for hiring new staff. Indirect costs of turnover can include decreased morale, loss of social networks, and lower productivity due to substituting inexperienced or tired staff.<sup>38</sup> In addition, high levels of turnover can trigger more turnover among remaining employees if remaining employees have to cover more shifts or have lower morale.<sup>39</sup> Turnover at correctional facilities is also higher than in other industries, climbing as high as 40 percent in some state corrections departments.<sup>40</sup>

We calculated savings due to reduced turnover by multiplying the cost of turnover from one employee departure by the difference between predicted annual turnover at a 60-bed facility with 40 employees without training and predicted annual turnover at a similar-sized facility with CBT training. We predicted the impact of CBT training using studies that relate the effect of additional job training to satisfaction with job training, overall job satisfaction, and employees' intentions to leave their current job. We use the equation:

$$\begin{aligned} \text{Annual turnover savings} \\ &= \text{annual turnover cost} \\ &* (\text{annual turnover}_{\text{without CBT}} - \text{predicted annual turnover}_{\text{with CBT}}) \end{aligned}$$

We calculate the annual turnover without CBT by multiplying the annual turnover rate by the rate of turnover that is voluntary. We then multiply this amount by the number of employees at the facility. To calculate the predicted annual turnover rate with CBT, we use the following logic chain:

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<sup>38</sup> Lambert and Hogan, (2009).

<sup>39</sup> Cawsey and Wedley (1979); Byrd et al., (2000).

<sup>40</sup> Lambert and Hogan, (2009).

Days of job training *increases* employees' rating of job training satisfaction which *increases* employees' rating of overall job satisfaction which *decreases* employees' rating of their turnover intentions which *decreases* actual turnover rate.

We multiply these factors together and then divide by 100 to convert this number into a proportion to find a reduction in turnover rate due to training. We multiply this rate by the number of employees and subtract the result from the annual turnover rate without CBT.

Therefore, we use the following equation:

$$b\_turnover = turnover\_cost * ((staff * turnover * vol\_turnover\_rate) - ((training\_days * training\_satis * job\_satis * turnover\_decrease * turnover\_predict)/100 * employees)$$

where *turnover\_cost* is the cost of replacing one employee, *staff* is the number of correctional officers, *turnover* is the proportion of employees who leave annually, *vol\_turnover\_rate* is the proportion of leaving employees who leave voluntarily, *training\_satis* is the increase in job satisfaction for each additional day of training, *job\_satis* is the increase in overall job satisfaction, *turnover\_decrease* is the decrease in turnover intent, *turnover\_predict* is the proportion of cases in which intent predicts actual turnover, and *training\_days* is the number of work days of CBT training.

Using this equation, we predict additional CBT training will save a 60-bed facility with 40 employees between \$39,000 and \$97,400 annually, with a point estimate of \$63,300 in savings (all dollar amounts in 2016 dollars). The variables of this equation are explained in more detail below.

### *Turnover Cost*

The predicted direct cost of correctional employee turnover is \$17,700 to \$35,500. This figure comes from McShane et al.'s (1991) calculation of \$10,000 to \$20,000, converted to 2016 dollars. We use these dollar amounts to frame our estimate, and the mean value of \$26,600 as our point estimate of employee turnover. Note that this number includes only recruitment and hiring costs, training costs, and wages and benefits for replacement staff while the position is unfilled. This estimate does not include any indirect costs from turnover.

### *Annual Turnover<sub>without CBT</sub>*

We estimated the turnover rate at a facility by multiplying the number of employees by the corrections turnover rate and the proportion of turnovers that are voluntary. We estimate a 60-bed facility will have 40 employees. For detailed information on how we came to this estimate, refer to Appendix E: Training Costs.

Minor et al. (2011) followed juvenile corrections workers for one year and found that 23.4 percent of employees were no longer working at the same facility twelve months later. Although the authors concentrated on workers who had just graduated from training and were beginning their careers, their estimate is solidly within the 15 to 25 percent turnover rate for corrections estimated by Lambert and Hogan (2009). Some researchers (for example Tipton, 2002) argue that working with a younger, more difficult population increases turnover for juvenile corrections staff so that their turnover rate is higher than the general turnover rate for corrections; therefore, we are comfortable using Minor et al.'s slightly higher estimate.

Of employees who leave jobs at correctional facilities for any reason, Blakely and Bumphus (2004) found that at public facilities 63 percent of employees leave voluntarily, while

at private prisons 71 percent leave voluntarily. Because we are estimating effects of training on public facilities, we use their 63 percent as our estimate, and 58 to 68 percent as our range for estimating low and high impacts of training on voluntary staff turnover. We multiply the turnover rate by this number to find a voluntary turnover rate.

#### *Predicted Annual Turnover<sub>with CBT</sub>*

We first found the impact of additional training on job satisfaction. Schmidt (2007) asked customer service and technical workers to rate their satisfaction with job training on a survey with 43 questions, answering each question with a scale of one (“disagree very much”) to six (“agree very much”). The score range for the surveys, then, is 43 to 258, with a higher score meaning that workers are more satisfied. Schmidt then used the survey responses to predict the effect of one more day of job training on respondents’ satisfaction with their job training. He found that, on average, one additional day of training increased respondents’ satisfaction with job training by 9.7 points, with a standard error of 0.004.

To simplify the effect of training on job training satisfaction, we converted Schmidt’s scale of 43 to 258 to 0 to 100. A score of 43, then, would be equal to 0, while a score of 258 would be equal to 100. On this scale, Schmidt’s finding that one additional day of training increased scores by 9.7 points is equivalent to increasing a score by 4.5, with a standard error of .00186.<sup>41</sup> (For a full listing of estimates converted to 0-100 scales, see Table F.2: Original and Re-Calculated Numbers Converted from Various Scales to 0-100 Scale.)

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<sup>41</sup> To convert Schmidt’s scale, we calculated the difference between a perfect score and the lowest possible score (258-43=215). We then divided the difference between a perfect score on our new scale and the lowest possible score on the new scale (100-0=100) by the difference on Schmidt’s scale (100/215=0.465). An increase in one point on Schmidt’s scale, then, is equivalent to an increase of 0.465 on a scale of 0-100. We multiplied this number by the increase and standard error on Schmidt’s scale to find an increase of 4.496 and a standard error of .00186.

Next, we found the impact of job training satisfaction on overall job satisfaction, also using Schmidt (2007) and the same survey used for the previous step. Schmidt finds that a one-point increase in job training satisfaction on the 43 to 258 scale increases job satisfaction by 0.70 points, with a standard error of 0.04. Converting this information to a 0 to 100 scale, we find that increasing job satisfaction by one point on Schmidt's original scale is equivalent to increasing job satisfaction on a 0 to 100 scale by 0.47 points. Therefore, we estimate that an increase of one point in job training satisfaction predicts an increase in overall job satisfaction of 0.33 points on a 0 to 100 scale, with a standard error of .0186.

We then examined the effect of job satisfaction on employee's intent to leave their job, a measure called turnover intent. Lambert and Hogan (2009) use a survey of correctional employees at a Midwestern private maximum security prison to predict the effects of job satisfaction on turnover intent. The survey contained four questions that asked staff about their intent to leave their current job, with potential scores ranging from 3 (not likely to leave) to 17 (likely to leave). The survey also contained five questions about job satisfaction with possible scores ranging from 5 (very unsatisfied) to 25 (very satisfied). The authors found that a one-point increase in job satisfaction decreased turnover intent scores by .24 points.

We standardized both scales used by Lambert and Hogan using the same process we used to convert Schmidt's scales. A one-point increase in job satisfaction on Lambert and Hogan's scale is equivalent to a five-point increase in job satisfaction on our standardized scale. We also converted the turnover intent scale to a 0 to 100 scale with 0 being most likely to consider leaving and 100 being least likely to consider leaving, which means that a one-point *increase* in Lambert and Hogan's turnover intent (that is, a person becoming *more* likely to consider leaving their job) is equivalent to a 7.14 point *decrease* in our 0 to 100 scale. Using our converted scale, we found

that a one-point increase in job satisfaction predicts a 1.71 point decrease in likelihood to consider leaving.

Finally, we found the extent to which turnover intent predicts turnover behavior. Many studies have determined that intention to leave a job is the most accurate predictor of actual turnover (see, for example, Steel and Ovalle, 1984, Alley and Gould, 1975, and van Brueklen et al., 2004). Turnover intent is a more accurate predictor of turnover than job satisfaction, demographic characteristics, work environment, or organizational loyalty. However, turnover intent still predicts actual turnover imperfectly. In a meta-analysis of 155 studies, Tett and Meyer found that turnover intentions accurately predicted turnover behavior in 45 percent of cases (1993). They found a low standard error, so we use a range of turnover intentions predicting turnover behavior in 44 to 46 percent of cases.

We multiplied these values together to find the effect of one additional day of training on turnover behavior. We found that one day of training reduces turnover (behavior) by 1.12 points on a 0 to 100 scale, or 1.12 percent. Multiplying this number by 5.5 estimated training days, we find that one course of CBT training reduces turnover by 6.18 points on a 0-100 scale. We divide this percent by 100 to convert this number into a proportion.

To estimate the turnover effect for a 60-bed facility, we multiply the proportion obtained above by the number of employees.

### *Limitations*

Our analysis is limited by several factors. First, limited research on turnover in juvenile justice facilities led to our use of research from adult corrections and in some cases from fields outside corrections. Most notably, we were unable to find research on how job training affects

job satisfaction for juvenile justice staff; we therefore substituted Schmidt’s estimates of the impact of training on job satisfaction for customer and technical service workers. There are obvious differences between the duties of customer service representatives and correctional officers, so our analysis may not accurately predict the effects of training for juvenile corrections employees. We were also unable to find predictions how CBT training affects job satisfaction; we instead used Schmidt’s research on general employee training.

**Table F.1: Variables Estimating Effect of Training on Turnover Costs**

Variable	Point Estimate	Variable Range	Reference
<i>b_turnover</i>	\$63,300	\$39,000-\$97,400	Author calculations
<i>turnover_cost</i>	\$26,600	\$17,700-\$35,500	McShane et al. (1991), in 2016 dollars
<i>turnover</i>	0.234	0.15-0.25	Minor et al. (2011), Lambert and Hogan (2009)*
<i>vol_turnover_rate</i>	0.63	0.58-0.68	Blakely and Bumphus (2004)
<i>staff</i>	40	-	Author calculations (see Appendix E)
<i>training_satis</i>	4.495	4.493-4.497	Schmidt (2007)
<i>job_satis</i>	0.325	0.31-0.344	Schmidt (2007)
<i>turnover_decrease</i>	1.71	1.045-2.375	Lambert and Hogan (2009)
<i>turnover_predict</i>	0.45	0.44-0.46	Tett and Meyer (1993)
<i>training_days</i>	5.5	5.0-6.0	Author calculations (see Appendix E)

*\*Lambert and Hogan did not report a standard error, but did report a p-value  $\leq 0.01$ . Using this information, we estimated the value of the standard error as the effect estimate on the original scale (-0.24) divided by the z-value of one half the p-value (-0.24/2.576). This gave us a standard error of -0.0932, which we converted to a 0-100 scale for a standardized standard error of -0.665. We used this standard error to determine the minimum and maximum range of values for the effect of job satisfaction on turnover intent.*

Second, our analysis predicts only the direct effects of training on turnover. We do not predict the potential indirect effects of increased job satisfaction from training, such as higher productivity and higher employee morale. Similarly, we predict only the direct costs of turnover, and do not include additional potential costs from decreased morale due to departures, loss of institutional knowledge, and the possibility that the departure of one employee might move other



employees to quit. Therefore, our analysis probably underestimates some of the cost of employee turnover.

Third, our analysis assumes that the effect of training is linear. That is, we assume that the first day of training has the same impact on job satisfaction as second, or the tenth, or the twentieth. In reality, employee training probably has diminishing marginal returns, in which case our model overestimates the cost savings due to training. To more accurately estimate the effect of CBT on turnover, more research is needed on how a course of CBT training affects job satisfaction.

**Table F.2: Values Converted from Various Scales to 0-100 Scale**

	Original Scale	Estimate of Impact (Original Scale)	Standard Error (Original Scale)	Estimate of Impact (0-100 Scale)	Standard Error (0-100 Scale)	N	R	P-value	Reference
Effect of job satisfaction on turnover intent	Job satisfaction: 5-25 (low = unsatisfied) Turnover intent: 3-17 (high = likely to leave)	-0.24	-0.0932	1.71	0.665	160	.61	≤.01	Lambert and Hogan (2009)
Predicted increase in overall job satisfaction for each one-point increase in job training satisfaction	43-258 (low = very unsatisfied)	.699	.04	0.325	.0186	301	.55	<.05	Schmidt (2007)
Predicted increase in job training satisfaction rating for each additional day of training	43-258 (low = very unsatisfied)	9.667	.004	4.495	.00186	185	.13	<.05	Schmidt (2007)

Note: N = number of subjects included in survey. R = amount of variation in data explained by the regression model; as R approaches one the model becomes better fitted to the data. P = the p-value, or the probability of obtaining a result equal to or more extreme than what was actually observed if the null hypothesis (that the independent and dependent variable are unrelated) is true.

## **Appendix G: Benefit of Reduced Injury**

Our estimate of the impact of CBT on in-facility injuries draws a causal chain connecting CBT's impact on anger, anger's role in motivating assault, and the rate of injury from assaults for staff and youth. Because they have different baseline rates of assault, injury, and costs, we estimate the impact of CBT on youth and staff injury separately.

We estimate the impact of CBT on injuries within the facility based on CBT's capacity to reduce anger and aggression for two reasons. First, in a meta-analysis of 50 studies of the effect of CBT on anger, Beck and Fernandez found that CBT has a mean weighted effect size of .7, which the authors indicated meant that the average CBT recipient had better anger reduction outcomes than 76 percent of untreated subjects.<sup>42</sup> Second, we believe the most direct and plausible mechanism by which CBT could affect in-facility injury is through reducing incidences of violence and assault, for which we believe anger is an appropriate mediator.

As we were unable to find a reliable and quantifiable link between anger and assaults, we take the estimate of CBT's impact on anger as the upper bound of its potential impact on assaults and zero as the lower bound. In this way, we are able to randomly draw from a range that assumes on the low end that anger plays no motivating role in assault and on the high end that there is a 1:1 relationship between anger and assault. Because both extremes seem equally unlikely, we draw from a symmetrical triangular distribution over this range to give more weight to draws from the middle of this range.

### *Youth Injury*

We estimate the impact on youth injury using following formula:

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<sup>42</sup> Beck and Fernandez, (1998).

$$b\_youth\_ari = (youth\_assault\_base - youth\_assault\_cbt) * youth\_med\_cost$$

where *youth\_assault\_base* is the baseline number of youth assaults, *youth\_assault\_cbt* is the number of youth assaults after CBT training, and *youth\_med\_cost* is the average youth medical cost per assault.

**Table G.1: Variables Estimating Effect of Training on Youth Injury**

Variable	Calculation	Point Estimate	Range	Reference
<i>cbt_ari</i>	= 1 - 0.76 * (draw from a uniform distribution + draw from a uniform distribution) * 0.5	0.620	0.25-1.00	Beck and Fernandez (1998)
<i>youth_assault_base</i>	= Youth per year (147) * percent who say they have been assaulted or threatened with assault while in facility (.29)	43	43-51	Sedlak et al. (2013)
<i>youth_assault_cbt</i>	= <i>youth_assault_base</i> * <i>cbt_ari</i>	26	11-49	Beck and Fernandez (1998)
<i>youth_med_cost</i>	Miller et al.'s estimate of medical costs to juvenile victims of juvenile assault in urban and rural settings, converted to 2016 dollars using a combination of inflation-adjusted health spending growth rates and CPI	\$1,100	\$640-\$1500	Miller, Fisher, and Cohen (2001)

The baseline youth assault-related injury amount was derived by using youth responses to the Survey of Youth in Residential Placement from 2003, the last year the survey was given. In the survey, 29 percent of youth reported being assaulted or threatened with assault in their time in facility. Because this percentage includes threats of assault, it may be a slight overestimate of actual assaults, but as a nationally representative survey with over 7,000 respondents, this

estimate is still likely the best available.<sup>43</sup> Moreover, the survey response treats assault as a binary condition—respondents either are assaulted or not. This does not allow for the possibility of re-victimization, which would result in an underestimate of total number of assaults.

We calculate *youth\_assault\_base* by multiplying the number of residents by the ratio of youth reporting being assaulted discussed above (.29). We then calculate *youth\_assault\_cbt* by multiplying *youth\_assault\_base* by CBT's impact on anger reduction, *cbt\_ari*.

In order to monetize these reduced youth injuries, we use Miller et al.'s estimate of average per-victim medical cost for juvenile victims of juvenile assault, which include payments for a broad range of health services and medical devices.<sup>44</sup> This estimate ranged from \$277 in urban contexts to \$655 in rural contexts in 1993 dollars.<sup>45</sup> We then applied Catlin and Cowan's inflation-adjusted growth rates for National Health Expenditure from 1993-2002 (4.7 percent) and 2003-2013 (3.2 percent) to convert these costs to 2013 dollars.<sup>46</sup> We adjusted the 2013 costs for inflation to convert them to 2016 dollars. Because health care costs grow faster than inflation, this final adjustment is likely to make our estimates of per-assault medical costs a slight underestimate. Likewise, these costs do not include intangible costs to youth affected by assault and injury, and so are only partial estimates of the full cost of youth injury.

We ultimately arrive at a point estimate for *b\_youth\_ari* of \$17,400.

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<sup>43</sup> OJJDP, (2013).

<sup>44</sup> Miller, Fisher, and Cohen, (2001).

<sup>45</sup> Ibid.

<sup>46</sup> Catlin and Cowan, (2015).

## *Staff Injury*

We use the same impact of CBT on anger reduction to predict impact on staff injuries, as mediated by staff injuries from youth violence and assault. We estimate the impact on staff injury using the model below:

$$b\_staff\_ari = (staff\_ari\_base - staff\_ari\_cvt) * medtimeoff * (1.58 * hourly\_wage) + (staff\_ari\_base - staff\_ari\_cvt) * staff\_med\_cost$$

where *staff\_ari\_base* is the baseline number of staff assault-related injury, *staff\_ari\_cvt* is the number of staff assaults after training, *medtimeoff* is the median time taken off by staff due to injury, 1.58 is the ratio of full compensation to hourly wage, *hourly\_wage* is the average hourly wage for state correctional employees, and *staff\_med\_cost* is the average staff medical cost per assault.

We used data from the Bureau of Labor Statistics to determine the rate of staff injury due to violence and the median days taken off by state correctional staff due to illness and injury. We used the 2015 data for point estimates of *staff\_ari\_base* and *medtimeoff*. To estimate ranges of these values, we used the minimum and maximum values for both violent injury rates and median days away from work for state correctional staff from the past five years (94 to 239 per 10,000 and 14 to 24 days, respectively).<sup>47</sup> We created these ranges to mitigate error that might stem from the latest year of data, 2015, being unusual.

In order to monetize the impact of CBT on staff injuries, we added the cost of lost employee time due to injury to the medical cost due to juvenile assault. We calculate the cost of lost employee time by multiplying the estimated change in injuries, median hours away from work, and hourly compensation (multiplied by 1.58, to account for the value of employee

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<sup>47</sup> Bureau of Labor Statistics, (2011-2016).

benefits as in the calculation of training costs). We calculate the medical cost due to juvenile assault by multiplying the estimated change in injuries due to assault by Miller et al.'s estimate of average per-victim medical cost for adult victims of juvenile assault, adjusted to 2016 dollars in the same way as the cost estimates for juvenile victims explained above. Because we use the incidence rate of injury rather than assault and the medical cost estimates are per assault, we expect that we underestimate the total value of reductions in assaults on staff. Furthermore, as with youth assault, we do not consider intangible impacts of assault on staff.

We ultimately arrive at a point estimate for *b\_staff\_ari* of \$5,000.

**Table G.2: Variables Estimating the Effect of Training on Staff Injury**

Variable	Calculation	Point Estimate	Range	Reference
<i>staff_ari_base</i>	= full time staff (40) * rate of injury due to violence for state correctional workers (.01475)	1 assaults	0.376-1.02 assaults	Bureau of Labor Statistics (2016); Konda et al. (2013)
<i>staff_ari_cbt</i>	= <i>staff_ari_base</i> * <i>cbt_ari</i>	0 assaults	0.097-0.988 assaults	Beck and Fernandez (1998)
<i>medtimeoff</i>	= median days away from work due to injury for state correctional workers * 8 hours	112 hours	112-192 hours	Bureau of Labor Statistics (2016)
<i>hourly_wage</i>	-	\$22.06/hour	\$13.38- \$35.13/hour	Bureau of Labor Statistics (2016)
<i>staff_med_cost</i>	Estimate of medical costs to adult victims of juvenile assault in 2016 \$ using inflation-adjusted health spending growth rates and CPI.	\$1100	\$660-\$1,500	Miller, Fisher, and Cohen (2001)



## Appendix H: Benefit of Reduced Recidivism

In a meta-analysis by Landenberger and Lipsey (2005) of 58 studies of the effects of CBT programs, three factors were found to be independently related to larger recidivism (re-arrest) reductions: treatment of high risk offenders, high quality treatment implementation, and a CBT program that included anger control and interpersonal problem solving.<sup>48</sup> Controlling for these factors revealed no difference in the effectiveness of different brand name or generic forms of CBT programs. Landenberger and Lipsey found a mean recidivism rate of 0.30 for the treatment groups, a 25 percent decrease from the 0.40 mean recidivism rate of the control group. They suggest a ‘best practice’ CBT program can achieve a 0.19 rate of recidivism, a 52 percent decrease from the 0.40 rate of recidivism of the average control group.

According to OJJDP’s Juvenile Offenders and Victims: 2014 National Report, there is no national recidivism rate for juveniles.<sup>49</sup> Therefore, we use Landenberger and Lipsey’s (2005) reported control recidivism rate of 0.40 in our estimates.

The cost of crime includes victim costs, criminal justice costs (police, courts, and prisons), and lost productivity of offenders who are incarcerated. A “bottom up” approach attempts to piece together each of these cost components to estimate a total cost of crime. In contrast, the willingness-to-pay (WTP) approach estimates the costs of crime by asking individuals to assess their value of reduced crime. The WTP approach is sometimes believed to be more comprehensive as it can capture the monetary value of some intangible impacts of reduced crime such as reduced fear or social degradation. However, we do not expect staff training to affect these intangible components and thus opt to use the “bottom up” estimates to value the costs of crime.

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<sup>48</sup> Landenberger and Lipsey, (2005).

<sup>49</sup> OJJDP, (2014).

To estimate the costs of crime, we first found the distribution of juvenile arrests for each crime type using data from OJJDP on the national arrests of juveniles.<sup>50</sup> We then multiplied the distribution of the types of crimes by the costs of those types of crimes using cost estimates primarily from McCollister et al. (2010) and Cohen (2007). These cost estimates were summed to estimate the total cost of crime (*NPV\_crime*) committed by juveniles (\$15,900).

**Table H.1: Types of Crime Committed by Juveniles**

Type of Crime	Percent of Arrests	Cost of Crime (\$)	Cost Multiplied by Distribution (\$)
Murder and non-negligent manslaughter	0.05	10,085,457	5,502
Forcible rape	0.19	270,329	518
Robbery (armed and basic)	1.63	47,503	774
Aggravated assault	2.75	120,155	3,305
Other assaults	13.12	12,824	1,682
Burglary	4.08	7,255	295
Motor vehicle theft	0.99	12,094	120
Larceny-theft	16.99	3,966	673
Arson	0.33	23,693	79
Vandalism	4.54	5,457	248
Fraud	0.36	5,650	20
stolen property	0.98	8,953	88
Other	33.03	583	193
Forgery and counterfeiting	0.11	5,911	6
Embezzlement	0.03	6,153	2
Drug abuse violations	10.61	22,734	2,412
Total	89.78	-	15,918

We were not able to find cost estimates for every type of crime and grouped several crime categories into an “other” category. Therefore, our cost estimates may be an underestimate. We estimate that nearly 90 percent of juvenile crimes are accounted for in our cost estimate.

<sup>50</sup> OJJDP, (2012).

Then, to estimate the benefits of reduced crime, we used the following model:

$$b\_recid = NPV\_Crime * residents * (recid\_con - recid\_cbt)$$

where, *NPV\_crime* is the net present value of the cost of crime, *residents* is the number of residents, *recid\_con* is the base juvenile offender recidivism rate, and *recid\_cbt* is the recidivism rate with CBT intervention.

We come to the following point estimate calculation of benefits:

$$b\_recid = NPV\_crime * residents * (recid\_con - recid\_cbt)$$

$$b\_recid = 15,900 * 147 * (0.40 - 0.30)$$

$$b\_recid = \$234,000$$

**Table H.2: Variables Estimating the Effect of Training on Recidivism**

Variable	Point Estimate	Range	Source
<i>residents</i>	147	147-175	See Appendix C
<i>recid_con</i>	0.40	-	Landenberger, Lipsey (2005)
<i>recid_cbt</i>	0.30	0.19-0.39	Landenberger, Lipsey (2005)
<i>NPV_crime</i>	\$15,900	-	McCollister et al (2010), Cohen (2007)

## Appendix I: Benefit of Reduced Suicide

Suicide is the leading cause of death in juvenile correctional facilities. In 2002-2005, suicide accounted for 48.8 percent of the total deaths in state juvenile correctional facilities.<sup>51</sup> Juvenile offenders' rates of suicidal ideation and attempts vary widely among studies and many experts believe the numbers to be under-reported.<sup>52</sup> However, studies do suggest that the prevalence rate of completed suicide for juvenile offenders is two to four times that of youth in the general population.<sup>53</sup> For this analysis we use the Centers for Disease Control and Prevention's most recently reported suicide rate for youth in the general population of 12.6 per 100,000.<sup>54</sup> Because the prevalence of suicide is higher for juvenile offenders, we multiply this number to create a suicide rate range of 25.2 per 100,000 to 50.4 per 100,000.

A meta-analysis conducted by Tarrrier et al. (2008) found that adolescents who participated in a CBT program have a decreased risk of suicide up to three months post-treatment, with a combined Hedge's  $g$  effect size of -0.260. Hasselblad and Hedges (1995) show how to convert this standard mean difference effect size into an odds ratio using the formula  $OR = e^{\pi ES/\sqrt{3}}$ , where  $OR$  = odds ratio,  $ES$  = standard mean difference effect size. Therefore, we calculate an odds ratio of 0.62.<sup>55</sup>

Estimates for the long-term effect in reduction of suicide behavior tend to decrease over time, but the rate at which that effect size decreases remains unknown.<sup>56</sup> Tarrrier et al. report a 95 percent confidence interval of 0.32 to 1.23 for the effect size of CBT on suicide up to three months post-treatment. Because this range is so large, we expect that it captures the diminishing

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<sup>51</sup> Bureau of Justice Statistics, (2005).

<sup>52</sup> National Action Alliance for Suicide Prevention, (2013).

<sup>53</sup> OJJDP, (2013b).

<sup>54</sup> Center for Disease Control and Prevention, (2015).

<sup>55</sup> Hasselblad and Hedges, (1995).

<sup>56</sup> Tarrrier, Taylor, and Gooding, (2008).

return that would be seen within one year. Therefore, we use 0.32 to 1.23 to estimate the effect size of CBT on suicide for one year.

This analysis quantifies the cost of suicide using estimates of the value of a statistical life (VSL). VSL does not actually refer to the value of a life. Rather, VSL describes an individual’s willingness to pay for small reductions in mortality risks.<sup>57</sup> We use Robinson & Hammitt’s (2015) VSL of \$7.904 million – \$14.248 million in 2016 dollars.<sup>58</sup>

We use the following model to calculate the benefits of reduced suicide due to CBT:

$$b\_suicide = residents * (suicide\_con - suicide\_cbt * (suicide\_con)) * VSL$$

where *residents* is the number of residents, *suicide\_con* is the baseline suicide rate, *suicide\_cbt* is the suicide rate after CBT treatment, and *VSL* is the value of a statistical life.

**Table I.1: Variables Estimating the Effect on Suicide Rate**

Variable	Point Estimate	Variable Range	Source
<i>residents</i>	147	147 – 175	See Appendix C
<i>suicide_con</i>	0.000378	0.000252 -0.000504	OJJDP (2014)
<i>suicide_cbt</i>	0.62	0.32 - 1.23	Tarrier et al. (2008)
<i>VSL</i>	\$9 million	\$7.904-\$14.248 million	Robinson, Hammitt (2015)

We therefore find the following point estimate of benefits due to reduced suicide:

$$b\_suicide = residents * (suicide\_con - suicide\_cbt * (suicide\_con)) * VSL$$

$$b\_suicide = 147 * (0.62 - .000378 * 0.62) * 9000000$$

$$b\_suicide = \$190,000$$

<sup>57</sup> Robinson and Hammitt, (2015).

<sup>58</sup> Ibid.

## **Appendix J: Benefit of Reduced Substance Abuse**

Substance abuse is costly to both society and individual abusers. According to Young et al. (2007), 77 percent of juvenile offenders abuse alcohol. In this evaluation, we use alcohol abuse as a proxy for all substance abuse as CBT research most extensively considers alcohol abuse. The U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration (SAMHSA) defines heavy drinking as drinking five or more drinks on the same occasion on each of five or more days in the past 30 days. We believe that this provides a good, conservative proxy for overall substance abuse among juvenile offenders. Tanner-Smith et al. (2013) found that treatment, of which CBT was one of the best, reduced substance abuse in abusers by 70 percent. We came to this number by using the results of reducing alcohol consumption, post-treatment from 2 days to 0.6 days of alcohol use. Because this data is specific to general treatment programs it could be an overestimate of the benefits of reduced substance abuse, nonetheless the same study found CBT is an effective treatment program to reduce substance abuse.

To measure the effect of CBT on substance abuse in a 60-bed correctional facility, we first restrict our population to only those with substance abuse by multiplying residents per year (147), by the proportion of youth in facilities who are substance abusers (.77). We then assess the change in rate of substance abuse by multiplying the CBT reduction in substance abuse (.7) by the number of days of alcohol abuse (5/30). This provides us with the reduction in the number of days of substance abuse.

We then monetize this reduction by multiplying by Cohen and Piquero's estimation of cost of substance abuse, a point estimate of \$13,193, with a lower bound range to \$10,425. To arrive at this estimate, we included the most relevant costs for one year after treatment, costs

associated with resources devoted to drug market, drug treatment, reduced productivity, and medical costs. This is due to the findings that CBT only has a reliable impact on substance abuse for roughly one year. (See Table J.1: Annual Costs of Substance Abuse for details.) We then found an annual amount for each of the included cost categories by utilizing a ratio to convert the lifetime present value numbers to annual cost numbers. We then used the Consumer Price Index (CPI) to convert these 2009 dollars to 2016 dollars. These benefits are effectively cost savings to society from reduced substance abuse.

**Table J.1: Annual Costs of Substance Abuse**

	2007 Annual (\$)	Lower Bound (\$)	CPI Adjuster	2016 Annual (\$)	Lower Bound (\$)
Resources	4,750	2,375	1.165847	\$5,537	2,768
Treatment	1,300	-	1.165847	\$1,515	-
Productivity	3,750	-	1.165847	\$4,371	-
Medical	1,517	-	1.165847	\$1,768	-
Total	-	-	-	\$13,193	10,425

We use the following model to calculate benefits from reduced substance abuse:

$$b_{subabuse} = (residents * prevalence_{subabuse}) * (rate_{reduc} * days_{abuse} * abuse_{cost})$$

where *residents* is the number of residents, *prevalence\_subabuse* is the percent of substance abuse users in juvenile corrections, *rate\_reduc* is the reduction in the days of substance use due to treatment, *days\_abuse* is the minimum days per month of substance abuse, *abuse\_cost* is the cost of substance abuse per person.

We come to the following point estimate calculation of benefits due to reduced substance abuse:

$$b_{subabuse} = (residents * prevalence_{subabuse}) * (rate_{reduc} * days_{abuse} * abuse_{cost})$$

$$b_{subabuse} = (147 * .77) * (.7 * .1667 * \$13,193)$$

$$b_{subabuse} = \$174,000$$

**Table J.2: Variables Estimating the Effect of CBT on Substance Abuse**

Variable	Point Estimate	Variable Range	Source
<i>Residents</i>	147	-	Appendix C
<i>prevalence_subabuse</i>	0.77	-	Young, Dembo, Henderson (2006).
<i>rate_reduc</i>	0.70	-	Tanner-Smith et al. (2013).
<i>days_abuse</i>	0.1667	-	SAMHSA
<i>abuse_cost</i>	\$13,200	\$10,425 - \$13,194	Cohen and Piquero (2009).



## Appendix K: Benefit of Increased Education

A 2006 meta-analysis across twelve studies by Cobb et al., found that cognitive behavioral interventions (CBT) had a positive effect on the rate of staying in school for youth with disabilities.<sup>59</sup> A National Center of Education Studies (NCES) survey published in 2015 found that just 64.6 percent of institutionalized youth stay in school through their senior year.<sup>60</sup> Furthermore, 33.4 percent of all youth in correctional facilities have an educationally relevant disability, making that population even more susceptible to dropping out of school.<sup>61</sup>

First, we found the approximate number of youth with disabilities in a 60-bed all male correctional facility. To do so, we used the residents per year (147) calculated in Appendix C: Residents per Year in a 60-Bed Facility multiplied by the rate of disabilities within juvenile correctional facilities (.334) to predict that 49 youth with a disability pass through a 60-bed correctional facility in a year.

Second, we found the baseline rates of staying in school and high school completion for institutionalized male youth with disabilities (55 percent) using ratios and National Center for Education Statistics.<sup>62</sup> These estimates are in line with Aizer and Doyle (2015), who found that those incarcerated as a juvenile are 39 percentage points less likely to graduate than an average student.<sup>63</sup>

Next, we found the estimated completion rate for institutionalized youth with disabilities who have received CBT treatment. A 2006 meta-analysis across twelve studies by Cobb et al., found that cognitive behavioral interventions (CBT) had an estimated .55 Cohen's d effect size

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<sup>59</sup> Cobb et al., (2006).

<sup>60</sup> Stark and Noel, (2015).

<sup>61</sup> Quinn et al., (2005).

<sup>62</sup> Stark and Noel, (2015).

<sup>63</sup> Aizer and Doyle, (2015).

and a confidence interval of .36 to .74 on youth with disabilities likelihood to stay in high school or to not drop out. Hasselblad and Hedges (1995) show how to convert this standard mean difference effect size into an odds ratio using the formula  $OR = e^{(\pi ES/\sqrt{3})}$ , where OR = odds ratio, ES = standard mean difference effect size. Therefore, we calculate an odds ratio of 2.712. Due to the large size of the odds ratio, we converted the odds ratio to a risk ratio.<sup>64</sup> We then multiply the risk ratio by the control rate for institutionalized youth with disabilities found in.<sup>65</sup> This results in the probability of staying in school for institutionalized youth with disabilities who receive CBT treatment is 0.79.

The rate at which students stay in school is not the same rate at which they complete their degree whether by high school graduation or GED.<sup>66</sup> Completion of high school is defined by the National Center for Education Statistics as graduating high school or finishing the GED. This is also the measure that the Washington State Institute for Public Policy (WSIPP) uses in their valuation of additional labor market earnings from high school degree.<sup>67</sup> Using ratios between similar data from NCES, we found the point estimate for the probability of completing high school for institutionalized youth with disabilities who are treated with CBT is 74 percent. Table K.1: Conversion of Cohen's d Effect Size to Completion Rate with CBT Treatment illustrates all equations used to calculate the final CBT effect on high school completion rate for juvenile males with educationally-relevant disabilities.

Furthermore, we know that a high school completion has a significant positive impact on labor market earnings due to an increase in productivity, see Appendix L: Shadow Price of

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<sup>64</sup> Zhang and Yu (1998).

<sup>65</sup> Ibid.

<sup>66</sup> Stark and Noel (2015).

<sup>67</sup> Washington State Institute of Public Policy, (2015), 157.

Lifetime Earnings for the shadow price of education benefits on labor market earnings.<sup>68</sup> The following process monetizes the effect of CBT on the high school completion rate of a standard youth population with disabilities in a 60-bed facility by multiplying by the change in labor market earnings from high school graduation.<sup>69</sup>

**Table K.1: Conversion of Cohen’s d Effect Size to Completion Rate with CBT Treatment**

Step	Equation	Low Estimate	Point Estimate	High Estimate
Effect Size (ES) in Cohen's d	-	0.36	0.55	0.74
Odds Ratio (OR)	$e^{((ES*\pi))/\sqrt{3}}$	1.92	2.71	3.82
Risk Ratio (RR)	$OR/((1-Po)+ (Po*OR))$	1.24	1.35	1.43
Effect Probability	$P1=RR*Po$	0.73	0.79	0.84
CBT Completion Rate Conversion	$CR_{CBT} = (CR_{InMwithD}/ NDO_{InMwithD}) *P1$	0.69	0.74	0.79

To estimate the benefits of CBT on the high school completion rate in this population, we use the following model:

$$b\_edu = residents * p\_disability * (cr\_cbt - cr\_con) * npv\_ddegree$$

where *residents* is the number of residents, *p\_disability* is the percentage of youth in corrections with a disability, *cr\_cbt* is the high school completion rate for incarcerated male youth with disabilities with CBT treatment, *cr\_con* is the high school completion rate for incarcerated male youth with disabilities control group, and *npv\_ddegree* is the net present value of a high school degree less the net present value of no high school degree impacts on labor market earnings plus total society impacts.<sup>70</sup>

<sup>68</sup> WSIPP, (2015), 157.

<sup>69</sup> Standard residents per year estimated at 147 youth. See Appendix C.

<sup>70</sup> See Appendix L for details.

**Table K.2: Variables Estimating the Effect of CBT on Education and Labor Market Earnings**

Variable	Point Estimate	Variable Range	Reference
<i>Residents</i>	147	147-175	Appendix C
<i>p_disability</i>	.334	-	Quinn et al. (2005)
<i>cr_cbt</i>	.74	.69 - .79	Cobb et al. (2016)
<i>cr_con</i>	.55	-	Stark and Noel (2015)
<i>npv_ddegree</i>	\$271,300	\$228,000 to \$319,000	WSIPP (2015)

According to our model and the shadow price of lifetime earnings from high school graduation (271,300) explained in Appendix L: Shadow Price of Lifetime Earnings, the point estimate for the total benefit per year of CBT treatment on education and lifetime earnings on institutionalized youth with disabilities in a 60-bed all male facility is \$2,544,000.

## Appendix L: Shadow Price of Lifetime Earnings

As stated in Appendix K: Benefit of Increased Education, we know that a high school graduate will be more productive and have a greater income and other benefits than someone who has not completed high school.<sup>71</sup> Over time, this accumulates into a significant difference in labor market earnings and spillover effects to society. According to the 2015 Benefit-cost Technical Documentation, the Washington State Institute of Public Policy (WSIPP) estimated the difference in labor market earnings plus spillover of an 18-year-old who has graduated high school and an 18-year-old who has dropped out to be \$270,500 in 2011 dollars.<sup>72</sup> Using the consumer price index (CPI), we converted these estimates to 2016 dollars (\$290,700).

In 2013, OJJDP reported an average age of 16 for juveniles in residential facilities.<sup>73</sup> Most youth are between the ages of 14 and 18.<sup>74</sup> Therefore, we discounted the WSIPP labor market earnings to 16 years of age for our point estimate (\$271,300) but also discounted to 14 to create a range of uncertainty between 14 and 18 years of age. Because more male juveniles in facilities tend to be between 16 and 18 years of age, this could create a slight over-discounting and thereby an underestimate.<sup>75</sup> However, given the magnitude of these effects, this is a negligible difference. We used WSIPP's discount rate of 3.5 percent.<sup>76</sup> We then created a greater range of uncertainty by creating a lower bound, the 14-year-old estimate minus 10 percent, and an upper bound, the 18-year-old estimate plus 10 percent. Thus, we create a range of possible labor market earnings plus spillover from \$228,000 to \$320,000 per youth ranging from 14 to 18 years of age.

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<sup>71</sup> WSIPP, (2015), 157.

<sup>72</sup> Ibid.

<sup>73</sup> OJJDP. 2013.

<sup>74</sup> Ibid.

<sup>75</sup> NCJJ, (2014).

<sup>76</sup> WSIPP, (2015), 157.

These estimates are a comparison only between labor market earnings from high school graduation and that of no graduation, so these may be underestimates by not accounting for the benefits from possible advanced degrees. However, as these are estimates for a general population they may also have possible overestimates as some youth with a disability or youth with correctional history may make less over a lifetime.

## **Appendix M: Monte Carlo Equations and Estimates**

To complete our sensitivity analysis, we conducted a Monte Carlo simulation to assess the plausible range of our net benefit estimates. In a Monte Carlo simulation, each variable affecting potential costs and benefits is assigned a range of likely values.<sup>77</sup> Researchers then create a computer program that re-calculates the net benefits equation many times, using values of the variable randomly drawn from each variable range according to an assumed distribution. The resulting distribution of potential net benefits provides insight into likely outcomes of the program. Therefore, the Monte Carlo simulation provides an estimate of uncertainty in the net benefit measures resulting from uncertainty in the variables used to produce them.

For most benefit categories, we believe any randomly generated value within the range is equally as likely to occur as another and therefore use uniform distributions. However, for recidivism and injury effect sizes, we use triangular distributions because we believe the median impact estimate is more likely than those at the upper and lower bounds.

The rest of this appendix summarizes the estimates and equations used in the Monte Carlo simulation.

### **Training Cost**

As described in Appendix E: Training Costs, the four CBT brand name programs have different costs due to variation in each program's curriculum cost, number of training hours, and cost of the training. There is also a range in correctional officers' wage rate which contributes additional uncertainty in the calculation of training costs.

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<sup>77</sup> Boardman et al., (2011).

We have no data that indicates how likely one training type would be used over another and need to create a random distribution of training costs to be used in our Monte Carlo calculations. First, we calculate the cost for each of the four CBT program trainings using the following model:

*training\_cost*

$$= (\text{hourly\_wage} * (1.58) * \text{training\_hours} * \text{staff}) + (\text{trainings} * \text{cost} + \text{trainers} * \text{trainer\_cost} * \text{trainings}) + (\text{curriculum\_cost} * \text{staff})$$

where *hourly\_wage* is a value in the range of \$13.38 to \$35.13, *training\_hours* is the number of hours spent in training for each model, *staff* is the total number of staff trained, *trainings* is the number of trainings required for each model, *cost* is the cost per training for each model, *trainers* is the number of trainers required for each model, *trainer\_cost* is the cost per trainer for each model, and *curriculum cost* is the cost of curriculum materials per staff member.

Second, we create a 10,000 observation data set for each of the four trainings and concatenated them to create a 40,000 observation data set. Next, we draw a random sample of 10,000 observations from this 40,000 data set to create a random distribution of training costs. This random sample has the following characteristics:

**Table M.1: Estimates of Training Costs**

	Number of Observations	Mean (\$)	Minimum (\$)	Maximum (\$)	Standard Deviation (\$)
<i>Training Cost</i>	10,000	66,800	21,400	98,300	19,400

Finally, we merge these 10,000 observations with our final Monte Carlo data set to attach a random training cost to each observation.



## Benefits

The following sections provide the equations and estimates used to calculate our benefit categories. Each of the equations below have been presented in earlier appendices. We create three benefit scopes: direct, short-term, and long-term. Direct benefits include benefits that result from savings juvenile correctional facilities accrue due to reduced expenditures on payments. These benefits include cost savings due to reduced staff turnover, reduced juvenile offender injuries, and reduced staff injuries. Short-term benefits include direct benefits plus benefits that accrue within one year after juvenile offenders' participation in CBT. These additional benefits include cost savings due to a reduced rate of recidivism, reduced suicide rate, and reduced substance abuse. Long-term benefits include direct benefits and short-term benefits plus benefits that accrue over a youth's lifetime. This includes benefits associated with CBT participants' increased likelihood of earning a high school degree.

### Direct Benefits

Below is a summary of the variables included in the direct benefit scope.

#### *Turnover*

We use the following equation to estimate savings from reductions in staff turnover:

$$b\_turnover = turnover\_cost * ((staff * turnover * vol\_turnover) - ((training\_days * training\_satis * job\_satis * turnover\_decrease * turnover\_predict)/100) * staff$$

where *turnover\_cost* is the cost of replacing one employee, *staff* is the number of correctional officers, *turnover* is the proportion of employees who leave annually, *vol\_turnover\_rate* is the proportion of leaving employees who leave voluntarily, *training\_satis* is the increase in job satisfaction for each additional day of training, *job\_satis* is the increase in overall job

satisfaction, *turnover\_decrease* is the decrease in turnover intent, *turnover\_predict* is the proportion of cases in which intent predicts actual turnover, and *training\_days* is the number of work days of CBT training.

For the point estimates and ranges we used in our Monte Carlo, refer to Table M.2:

Estimates for Turnover Variables.

**Table M.2: Estimates of Turnover Variables**

Variable	Point Estimate	Minimum Estimate	Maximum Estimate
<i>training_satis</i>	4.495	4.493	4.497
<i>job_satis</i>	0.325	0.31	0.344
<i>turnover_decrease</i>	1.71	1.045	2.375
<i>turnover_predict</i>	.45	.44	.46
<i>turnover</i>	.234	.15	.25
<i>vol_turnover</i>	.63	.58	.68
<i>training_days</i>	5.5	5	6
<i>staff</i>	40	40	40
<i>turnover_cost</i>	\$26,600	\$17,700	\$35,500

### Staff Injury

We use the following equation to estimate savings from reductions in staff injury:

$$b\_staff\_ari = (staff\_ari\_base - staff\_ari\_cvt) * medtimeoff * (1.58 * hourly\_wage) + (staff\_ari\_base - staff\_ari\_cvt) * staff\_med\_cost$$

where, *staff\_ari\_base* is the baseline number of staff assault-related injury, *staff\_ari\_cvt* is the number of staff assaults after training, *medtimeoff* is the median time taken off by staff due to injury, *hourly\_wage* is the average hourly wage for state correctional employees, and *staff\_med\_cost* is the average staff medical cost per assault.

For the point estimates and ranges we used in our Monte Carlo, refer to Table M.3:

Estimates for Staff Injury Variables.

### *Youth Injury*

We use the following equation to estimate savings from reductions in youth injury:

$$b_{youth\_ari} = (youth\_assault\_base - youth\_assault\_cbt) * youth\_med\_cost$$

where *youth\_assault\_base* is the baseline number of youth assaults, *youth\_assault\_cbt* is the number of youth assaults after CBT training, and *youth\_med\_cost* is the average youth medical cost per assault.

For the point estimates and ranges we used in our Monte Carlo, refer to Table M.4:

Estimates for Youth Injury Variables.

**Table M.3: Estimates for Staff Injury Variables**

Variable	Point Estimate	Minimum Estimate	Maximum Estimate
<i>cbt_ari</i>	0.24	0	0.24
<i>staff_ari</i>	0.020075	0.01475	0.0254
<i>medtimeoff</i>	112	-	-
<i>staff_ari_base</i>	0.8015814	0.5900173	1.015993
<i>staff_ari_cbt</i>	0.4966129	0.144379	1.011505
<i>staff_med_cost</i>	\$1,100	\$660	\$1,500

**Table M.4: Estimates for Youth Injury Variables**

Variable	Point Estimate	Minimum Estimate	Maximum Estimate
<i>youth_ari</i>	0.0841	-	-
<i>youth_ari_base</i>	13.54648	12.36283	14.71718
<i>youth_ari_cbt</i>	8.386499	2.979963	14.6476
<i>youth_med_cost</i>	\$1,100	\$640	\$1,500

### *Present Value Net Benefits: Direct*

We use the following equation to estimate the total present value of net benefits that accrue directly to the facility:

$$facil\_pvnb = (b_{turnover} + b_{youth\_ari} + b_{staff\_ari}) - training\_cost$$

## Short-Term Benefits

Below is our explanation of the additional variables and equations added to direct benefits to estimate short-term benefits.

### *Recidivism*

We use the following equation to estimate savings from reductions in recidivism:

$$b\_recid = NPV\_crime * residents * (recid\_con - recid\_cbt)$$

where *NPV\_crime* is the net present value of the cost of crime, *residents* is the number of residents, *recid\_con* is the base juvenile offender recidivism rate, and *recid\_cbt* is the recidivism rate with CBT intervention.

For the point estimates and ranges we used in our Monte Carlo, refer to Table M.5:

Estimates for Recidivism Variables.

**Table M.5: Estimates for Recidivism Variables**

Variable	Point Estimate	Minimum	Maximum
<i>residents</i>	147	147	175
<i>recid_con</i>	0.40	-	-
<i>Recid_cbt</i>	0.30	0.19	0.39
<i>NPV_crime</i>	\$15,900	-	-

### *Suicide Rate*

We use the following equation to estimate savings from reductions in the suicide rate of institutionalized juveniles:

$$b\_suicide = residents * (suicide\_con - suicide\_cbt * (suicide\_con)) * VSL$$

where *residents* is the number of residents, *suicide\_con* is the baseline suicide rate, *suicide\_cbt* is the suicide rate after CBT treatment, and *VSL* is the value of a statistical life.

For the point estimates and ranges we used in our Monte Carlo, refer to Table M.6:

Estimates for Suicide Rate Variables.

**Table M.6: Estimates for Suicide Rate Variables**

Variable	Point Estimate	Minimum	Maximum
<i>residents</i>	147	147	175
<i>suicide_con</i>	.000126	-	-
<i>suicide_cbt</i>	0.62	0.32	1.23
<i>VSL</i>	\$9 million	\$7.904 million	\$14.248 million

*Substance Abuse*

We use the following equation to estimate savings from reductions in substance abuse:

$$b\_subabuse = (residents * prevalence\_subabuse) * (rate\_reduc * days\_abuse * abuse\_cost)$$

where *residents* is the number of residents, *prevalence\_subabuse* is the percent of substance abuse users in juvenile corrections, *rate\_reduc* is the reduction in the days of substance use due to treatment, *days\_abuse* is the minimum days per month of substance abuse, *abuse\_cost* is the cost of substance abuse per person.

For the point estimates and ranges we used in our Monte Carlo, refer to Table M.7:

Estimates for Substance Abuse Variables.

**Table M.7: Estimates for Substance Abuse Variables**

Variable	Point Estimate	Minimum	Maximum
<i>Residents</i>	147	147	175
<i>prevalence_subabuse</i>	0.77	-	-
<i>rate_reduc</i>	0.70	0.229	0.70
<i>days_abuse</i>	0.1667	-	-
<i>abuse_cost</i>	\$13,200	\$10,400	\$13,200

### *Present Value Net Benefits: Short-Term*

We use the following equation to estimate the total present value of net benefits in the short term:

$$\begin{aligned} \text{short\_term\_pvnb} \\ = (b\_turnover + b\_youth\_ari + b\_staff\_ari + b\_recid + b\_suicide \\ + b\_subabuse) - training\_cost \end{aligned}$$

### Long-Term Benefits

Below is our explanation of the additional variables added to direct and short-term benefits to generate the long-term benefits.

#### *Education*

We use the following equation to estimate savings from increased education:

$$b\_edu = residents * p\_disability * (cr\_cbt - cr\_con) * npv\_ddegree$$

where *residents* is the number of residents, *p\_disability* is the percentage of youth in corrections with a disability, *cr\_cbt* is the high school completion rate for incarcerated male youth with disabilities with CBT treatment, *cr\_con* is the high school completion rate for incarcerated male youth with disabilities control group, and *npv\_ddegree* is the net present value of a high school degree less the net present value of no high school degree plus total society impacts. For the point estimates and ranges we used in our Monte Carlo, refer to Table M.8: Estimates for Education Variables.

**Table M.8: Estimates for Education Variables**

Variable	Point Estimate	Minimum	Maximum
<i>residents</i>	147	147	175
<i>p_disability</i>	.35	-	-
<i>cr_cbt</i>	0.74	0.69	0.79
<i>cr_con</i>	.55	-	-
<i>npv_ddegree</i>	\$271,300	\$228,000	\$320,000

*Present Value Net Benefits: Long-Term*

We use the following equation to estimate the total present value of net benefits in the long term:

$$\begin{aligned} \textit{long\_term\_pvnb} &= (\textit{b\_turnover} + \textit{b\_youth\_ari} + \textit{b\_staff\_ari} + \textit{b\_recid} + \textit{b\_suicide} \\ &+ \textit{b\_subabuse} + \textit{b\_edu}) - \textit{training\_cost} \end{aligned}$$

## Appendix N: Stata Code for Monte Carlo Analysis

### *Monte Carlo Simulation*

```
set more off // ensures code runs straight through without stopping

set obs 10000 // sets the number of observations we want to analyze - essentially the number of
iterations of our model that we want to run
set seed 788963291 // Sets an arbitrary number as the basis on which to draw subsequent random
numbers. Allows for replication of our simulation while maintaining assumption of random
draws.

gen id=_n

/*generate variables for cost*/
generate hourly_wage=13.38
replace hourly_wage=13.38+21.75*uniform()

gen staff=40

/*generate variables to be used in benefit models*/

/*Initialize base case parameters*/

generate residents=147

/*Replace base parameters with random variables over ranges*/
replace residents=147+28*uniform()

// Recidivism

/*generate variables for recidivism benefit*/
generate npv_crime=15917.98
generate recid_con=0.40
generate recid_cbt=0.19

// replace recidivism variables with random variables over ranges
replace recid_cbt=.19+.2*(uniform()+uniform()*.5

// Education

/*generate variables for education benefit*/
generate p_disability=0.334
generate cr_cbt=0.6860
generate cr_con=0.5518
```



```

generate npv_ddegree=290661.77
replace npv_ddegree=(261595.59+58132.35*uniform())/((1+.035)^(0+4*uniform()))

/*replace education variables with random variables over ranges*/
replace cr_cbt=0.6860+0.1039*uniform()

// Suicide reduction

/*generate variables for suicide reduction*/
generate suicide_con=.000252
generate suicide_cbt=0.32
generate vs1=7904000

/*replace suicide variables with random variables over ranges*/
replace suicide_con=.000252+.000252*uniform()
replace suicide_cbt=0.32+0.91*uniform()
replace vs1=7904000+6344000*uniform()

// Turnover

/*generate variables for turnover*/
generate turnover_cost=17748
generate turnover=0.15
generate vol_turnover=0.58
generate training_days=5
generate training_satis=4.493
generate job_satis=0.31
generate turnover_decrease=1.045
generate turnover_predict=0.44

/*replace turnover variables with random variables over ranges*/
replace turnover_cost=17748+17748*uniform()
replace turnover=0.15+0.1*uniform()
replace vol_turnover=0.58+0.1*uniform()
replace training_days=5+1*uniform()
replace training_satis=4.493+0.004*uniform()
replace job_satis=0.31+.034*uniform()
replace turnover_decrease=1.045+1.33*uniform()
replace turnover_predict=0.44+0.02*uniform()

// Assault related Injury

// generate variable for assault reduction
gen cbt_ari=.24
replace cbt_ari=1-.76*(uniform()+uniform())*.5

```

```

// Staff

// generate variables for staff assault related injury
gen staff_ari=(147.5/10000)
replace staff_ari=((94+159.8*uniform())/10000)
gen med_days_off=14
replace med_days_off=14+10*uniform()
gen medtimeoff=med_days_off*8
gen staff_ari_base=staff_ari*staff
gen staff_ari_cbt=staff_ari*staff*cbt_ari
gen staff_med_cost=1096.32
replace staff_med_cost=657.33+877.98*uniform()

// Youth

// generate variables for youth assault related injury
gen youth_assault_rate=.29
gen youth_assault_base=youth_assault_rate*residents
gen youth_assault_cbt=youth_assault_rate*residents*cbt_ari
gen youth_med_cost=1082.385
replace youth_med_cost=643.39+877.99*uniform()

// Substance abuse

// generating substance abuse variables
gen prevalence_subabuse=0.77
gen rate_reduc=0.229
gen days_abuse=0.1667
gen abuse_cost=10424.4

//replacing substance abuse variables

replace rate_reduc=.229+.471*uniform()
replace abuse_cost=10424.4+2770.35*uniform()

/*benefit models*/

/*recidivism*/
generate b_recid=npv_crime*residents*(recid_con-recid_cbt)

/*education*/
generate b_edu=residents*p_disability*(cr_cbt-cr_con)*npv_ddegree

/*suicide rate*/

```

```

generate b_suicide=residents*(suicide_con-(suicide_cbt*suicide_con))*vsl

/*turnover*/
generate b_turnover=turnover_cost*((staff*turnover*vol_turnover)-
((training_days*training_satis*job_satis*turnover_decrease*turnover_predict)/100)*staff)

// staff assault related injury
gen b_staff_ari=(staff_ari_base-
staff_ari_cbt)*medtimeoff*(1.58*hourly_wage)+(staff_ari_base-staff_ari_cbt)*staff_med_cost

// youth assault related injury
gen b_youth_ari=(youth_assault_base-youth_assault_cbt)*youth_med_cost

//substance abuse

gen b_subabuse=(residents*prevalence_subabuse)*(rate_reduc*days_abuse*abuse_cost)

// adding in training cost bsample

merge 1:1 id using "C:\Users\Max\Documents\La Follette\CBA\final project code\training_cost
dist bsample.dta", nogen

/*calculate PVNB*/
generate facil_pvnb=b_youth_ari+b_staff_ari+b_turnover-training_cost
gen short_term_pvnb=b_youth_ari+b_staff_ari+b_turnover+b_recid+b_suicide+b_subabuse-
training_cost
generate pvnb=(b_recid+b_edu+b_suicide+b_turnover+b_youth_ari+b_staff_ari+b_subabuse)-
training_cost

/*Create Histograms for results*/
summarize
histogram facil_pvnb, bin(19) percent fcolor(ltblue) fintensity(115) lcolor(white) ylabel(,
angle(horizontal) glcolor(gs12)) ymtick(, angle(horizontal)) xtitle(Direct Present Value of Net
Benefits, Thousands of Dollars) xlabel(, format(% 12.0gc)) title("Distribution of Direct Present
Value of Net Benefits", size(medlarge))
histogram short_term_pvnb, bin(19) percent fcolor(ltblue) fintensity(115) lcolor(white) ylabel(,
angle(horizontal) glcolor(gs12)) ymtick(, angle(horizontal)) xtitle(Short-Term Present Net Value
of Benefits, Thousands of Dollars) xlabel(0(500000)1200000, format(% 12.0gc))
title("Distribution of Short-Term Present Value of Net Benefits", size(medlarge))
histogram pvnb, bin(19) percent fcolor(ltblue) fintensity(115) lcolor(white) ylabel(,
angle(horizontal) glcolor(gs12)) ymtick(, angle(horizontal)) xtitle(Present Net Value of Benefits,
Thousands of Dollars) xlabel(, format(% 12.0gc)) title("Distribution of Present Value of Net
Benefits", size(medlarge))

// generating counter variables to determine the percent of times our simulation was positive at
different benefit levels

```

```

gen positive_facil_ben=0
replace positive_facil_ben=1 if facil_pvnb>0

gen positive_short_ben=0
replace positive_short_ben=1 if short_term_pvnb>0

gen positive_pvnb=0
replace positive_pvnb=1 if pvnb>0

save "C:\Users\Max\Documents\La Follette\CBA\final project code\monte carlo dist.dta",
replace

```

```
/*end*/
```

### *Cost of ART*

```
// Stata code generating 10,000 observation data set for cost of ART training
```

```
set more off
```

```
set obs 10000
set seed 788963291
```

```
generate hourly_wage=13.38
replace hourly_wage=13.38+21.75*uniform()
```

```
gen staff=40
gen ART_training_hours=48
gen ART_trainings=2
gen ART_cost=9500
gen ART_trainers=2
gen ART_trainer_cost=2500
gen ART_curriculum_cost=91.90
```

```
gen
training_cost=(1.58*hourly_wage*ART_training_hours*staff)+(ART_trainings*ART_cost)+(A
RT_trainers*ART_trainer_cost*ART_trainings)+(ART_curriculum_cost*(staff/2))
```

```
save "C:\Users\Max\Documents\La Follette\CBA\final project code\ART dist.dta", replace
```

### *Cost of MRT*

```
// Stata code generating 10,000 observation data set for cost of MRT training
```

```

set more off

set obs 10000
set seed 788963291

generate hourly_wage=13.38
replace hourly_wage=13.38+21.75*uniform()

gen staff=40

gen MRT_training_hours=40
gen MRT_trainings=1
gen MRT_cost=32000
gen MRT_trainers=0
gen MRT_trainer_cost=0
gen MRT_curriculum_cost=25

gen
training_cost=(1.58*hourly_wage*MRT_training_hours*staff)+(MRT_trainings*MRT_cost)+(
MRT_trainers*MRT_trainer_cost*MRT_trainings)+(MRT_curriculum_cost*staff)

save "C:\Users\Max\Documents\La Follette\CBA\final project code\MRT dist.dta", replace

```

### *Cost of RR*

// Stata code generating 10,000 observation data set for cost of MRT training

```

set more off

set obs 10000
set seed 788963291

generate hourly_wage=13.38
replace hourly_wage=13.38+21.75*uniform()

gen staff=40

gen MRT_training_hours=40
gen MRT_trainings=1
gen MRT_cost=32000
gen MRT_trainers=0
gen MRT_trainer_cost=0
gen MRT_curriculum_cost=25

```

```
gen
training_cost=(1.58*hourly_wage*MRT_training_hours*staff)+(MRT_trainings*MRT_cost)+(
MRT_trainers*MRT_trainer_cost*MRT_trainings)+(MRT_curriculum_cost*staff)
```

```
save "C:\Users\Max\Documents\La Follette\CBA\final project code\MRT dist.dta", replace
```

*Cost of T4C and Master Training Cost File*

```
// T4C and master training cost
```

```
set more off
```

```
set obs 10000
set seed 788963291
```

```
generate hourly_wage=13.38
replace hourly_wage=13.38+21.75*uniform()
```

```
gen staff=40
```

```
gen T4C_training_hours=40
gen T4C_trainings=1
gen T4C_cost=0
gen T4C_trainers=1
gen T4C_trainer_cost=0
gen T4C_curriculum_cost=0
```

```
gen
training_cost=(1.58*hourly_wage*T4C_training_hours*staff)+(T4C_trainings*T4C_cost+T4C_t
rainers*T4C_trainer_cost*T4C_trainings)+(T4C_curriculum_cost*staff)
```

```
append using "C:\Users\Max\Documents\La Follette\CBA\final project code\ART dist"
```

```
append using "C:\Users\Max\Documents\La Follette\CBA\final project code\RR dist"
```

```
append using "C:\Users\Max\Documents\La Follette\CBA\final project code\MRT dist"
```

```
save "C:\Users\Max\Documents\La Follette\CBA\final project code\training_cost dist.dta",
replace
```

```
bsample 10000
```

```
gen id=_n
```

```
keep training_cost id
```

```
save "C:\Users\Max\Documents\La Follette\CBA\final project code\training_cost dist  
bsample.dta", replace
```

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