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Cost-Benefit Methodology

Effect size

The first step in determining if a program is cost-effective is to estimate the program's future reduction of crime. If an agency has the data and the resources available, they can conduct evaluations of their own programs to determine their impact on recidivism. Evaluations should be rigorous, comparing program participants to a similar sample of non-participants. The groups should be assigned randomly or the characteristics of persons in each group should be controlled statistically to ensure that the groups are equivalent. The difference found between the treatment and the comparison group can be represented with an effect size, which gives an estimate of how effective a certain program is at reducing recidivism. If the data and resources are available, an impact evaluation is a valuable way to estimate an effect size for a program because it takes into account specific aspects of the program's delivery and unique jurisdictional factors. Ongoing evaluations allow agencies to test if their specific programs are effective and if the level of effectiveness changes over time. When local evaluations are available, the estimated percent change in crime from the evaluation is used in the cost-benefit model.

However, it is often difficult or impossible to determine if a specific program is effective at reducing crime. If a program has few participants or has recently been implemented, there will not be enough data to estimate if the program actually reduces future criminal behavior. Some programs may have available data, but agencies may not have the resources available to evaluate the program. New programs need to be implemented for some time to allow initial problems to be worked out before evaluation. For many programs it is not feasible for agencies to conduct their own evaluations. When there are not specific evaluations within a jurisdiction or when it is more desirable to have broader national results, a meta-analysis can be used to estimate the effect of a program on recidivism. A meta-analysis examines the results of numerous studies to summarize the results of a given set of research. For example, a meta-analysis of drug courts would incorporate all of the rigorous studies available on adult drug courts and see if, on average, they are effective at reducing future crime of drug court participants. Statistical techniques are used to determine if, on average, a certain type of program is effective at achieving a measurable goal.

The Washington State Institute for Public Policy (WSIPP) conducted a meta-analysis of hundreds of evaluations of adult correctional programs to determine what works to reduce crime.[1] Their meta-analysis only included rigorous evaluations that had a well matched business-as-usual comparison group. They also discounted some of the effect sizes depending on the research methodology.

In their meta-analysis, WSIPP categorized these studies into program categories that they believed had enough research to estimate an effect size. The meta-analysis provides an average effect size based on the available research. Using the meta-analysis already done by WSIPP, estimates can be made on how effective programs are in a jurisdiction at reducing the crime of participants. The cost-benefit model is designed to use WSIPP's effect sizes, though jurisdictions may use their own evaluations instead of WSIPP's effect sizes.

[1] See their website for a list of program areas with cost-benefit and meta-analytic results. http://www.wsipp.wa.gov/BenefitCost?topicId=2.

Effect size to avoided crime

The meta-analysis described above provides estimates on how effective a program is at reducing crime, but it does not report how much crime is actually avoided. In order to estimate avoided crime, the recidivism patterns of offenders must be estimated. Assumptions must also be made on how long the effect of the program will last and whether that effect fades out over time. For this model, we assume that effect sizes do not fade out and that they are applied equally across crime categories. The equation for transforming an effect size to a percent change in recidivism, *%RecidChange*, is show below in equation 1.

$$(1) \quad \%RecidChange = \left(\frac{(e^{ES \times 1.65} \times BaseRecid)}{(1 - BaseRecid + BaseRecid \times e^{(ES \times 1.65)}) \times BaseRecid} \right) - 1$$

In equation 1, $e^{ESx1.65}$ is the exponentiation of the effect size, *ES*, multiplied by 1.65. *BaseRecid* is assumed to be 50%.[2]

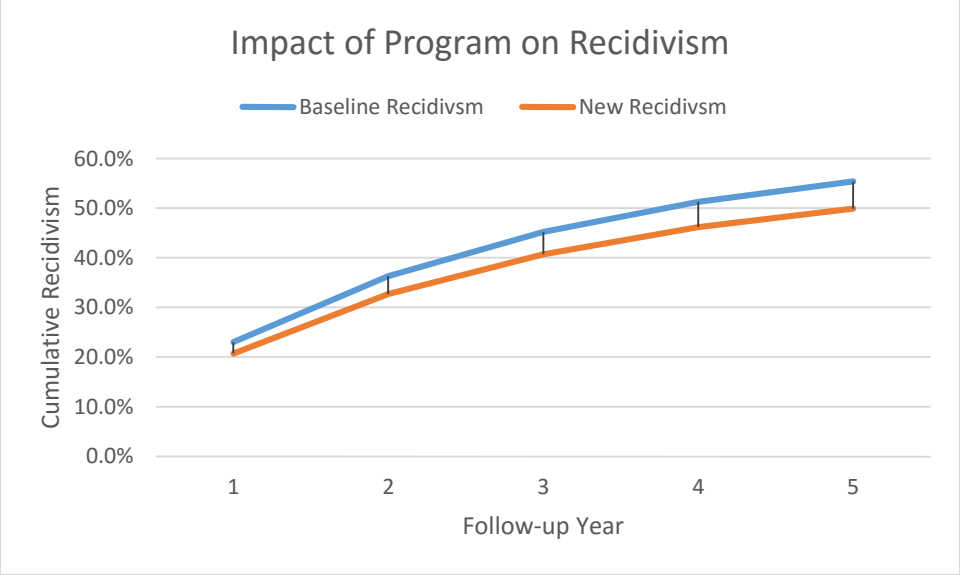
The national recidivism base rate is modeled with data from the Bureau of Justice Statistics (BJS) on prisoners released in 30 states in 2005 followed through 2010.[3] This means the model estimates recidivism reduction and benefits for five years into the future. The model assumes that the recidivism patterns are generalizable to any jurisdiction using the model. If the user believes that their actual recidivism rate is different than the national average, the model allows adjustments of -20%, -10%, 10% and 20% to the national recidivism rate. The five-year conviction based recidivism rate, estimated by the BJS, is 55.4%. This includes both in state and out of state convictions. Recidivism is broken out by misdemeanors and felonies based on the percentage of a jurisdiction's convictions that are misdemeanors. The recidivism measure for the model also includes all conviction events, meaning that if an offender recidivates multiple times in the follow up period all of the recidivating events are counted. The reason for this is that the costs are much different for an offender who recidivates once for a misdemeanor and an offender who recidivates multiple times for serious violent felonies. For the national recidivism rate the estimated number of convictions per recidivist is 2.6. This was calculated using data from the BJS report and the assumption was made that 50% of arrests end in a conviction. The model uses the 2.6 value to estimate taxpayer impacts but takes a conservative approach for victimization costs and only assumes one victim per conviction.

The model also allows a jurisdiction to enter up to two of their own local baseline recidivism rates. The user must enter two measures of recidivism: the number of offenders who recidivate in each year of the follow up period and the total number of recidivating events by year in the follow up period. This information is used to create the baseline recidivism rate and to estimate the total number of recidivating events per recidivist. The local recidivism rate should be measured as a conviction for a new crime over a five to ten year follow up period.

[2] By using a 50% baseline rate the percent change in crime is constant across cohorts for a given program.

[3] Cooper, A. D., Durose, M. R., and Snyder, H. N. *Recidivism of Prisoners Released in 30 States in 2005: Patterns from 2005 to 2010*. NCJ 244205. Bureau of Justice Statistics, April 22, 2014. http://www.bjs.gov/index.cfm?ty=pbdetail&iid=4986 accessed 8/10/2015.

The model uses the baseline recidivism rate and applies the percentage crime reduction derived from the effect sizes (see equation 1) to estimate the number of convictions avoided from a particular program. Graph 1 shows how the model applies the calculation from equation 1 to the baseline recidivism rate. The overall estimated conviction reduction from the program will depend on the baseline recidivism rate and how effective the program is at reducing recidivism. The model uses the effect size and historical recidivism rates to predict recidivism reductions into the future. Once the effect size and baseline recidivism rates have been used to estimate the overall reduction in convictions, the next step is to monetize the impact of those avoided convictions. The monetary benefits are calculated by taking the difference in offending patterns between the original baseline recidivism rate and the reduced recidivism rate from the impact of the program. The process of computing benefits is described in the next section.



Graph 1

Costs of crime

The first step in estimating the benefits of avoiding a recidivist is to estimate the cost of an offender going through the criminal justice system. The system costs and victimization costs of an avoided conviction become the benefits to taxpayers and society as a whole. Any program that reduces crime provides benefits to taxpayers, victims and society. Taxpayers benefit from avoiding criminal justice system expenses and society benefits from avoiding harm, lost property and money, and related intangible damage from crime victimization. The methods used to calculate the costs of a recidivist or the benefits of reducing an offender going through the system are described below.

There are a number of costs that are incurred when an offender commits a crime and moves through the system. These include the cost to crime victims, the cost of an arrest, conviction, incarceration, probation, and post-prison supervision. Conceptually, these costs are easy to understand, however not all of these are easy to estimate. The modeled criminal justice system costs are police (per arrest), courts (judiciary, prosecutors, and public defenders per conviction), jail (per year), probation (per year), prison (per year), and post-release probation or parole (per year). These per-unit costs will also vary

depending on the type of crime that is committed. The model captures these differences by breaking down these costs between felonies and misdemeanors.

When estimating system costs, it is important to estimate the marginal or incremental change in costs, not the average costs. Average costs include fixed costs such as utilities, administrative staff, and capital costs. The average cost will overstate the true costs of small changes in the caseloads. For example, a small change in the number of jail inmates may result in reduced costs for health care, food, and possibly frontline staffing (marginal costs), but would not change costs for utilities, the warden's office, and other fixed administrative functions. These fixed costs only change if facilities are closed or units are shut down. For each part of the criminal justice system, it is important to estimate marginal costs.[4]

Taxpayer costs are not the only costs incurred from crime. Victimization costs are also substantial and in some cases they are much larger than taxpayer costs. Victimization costs include lost property, lost productivity, mental health care, social services, medical care, and reduced quality of life. Two prominent national studies have estimated these costs.[5] The estimates from these two studies were averaged together and used in this model. The McCollister, French and Fang study estimates victimization costs by two categories, monetary and quality of life. Monetary costs include medical, mental health care, lost property, and reduction in future earnings of crime victims. Quality of life costs place a dollar value on pain and suffering of crime victims using jury awards for pain and suffering and lost quality of life.

Use of criminal justice resources

Once the costs of each portion of the criminal justice system have been calculated, it is necessary to estimate the likelihood and the amount of each resource being used. For example, if a felony conviction is avoided how many jail bed, probation, prison, and post-prison supervision days are expected to be avoided? Sentencing data is used to estimate these likelihoods along with the actual length stay for each portion of the system. This data along with the costs data described above is used to estimate the overall costs of an offender moving through the system.

Benefit calculation

With estimates for the costs of each resource used and how much of that resource each offender uses, it is possible to estimate the monetary benefits to taxpayers and victims of programs that reduce recidivism. This is estimated for both misdemeanors and felonies and it is calculated using the estimated victimization and criminal justice system costs and data on how offenders move through the criminal justice system. For example, it may cost the same amount for a misdemeanor offender and a felony offender to spend one day in jail, but the felony offender is more likely to spend time in jail and to stay longer, so the overall cost to the jail for one felony conviction is much higher than the cost for a misdemeanor conviction.

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[4] For a more detailed description of marginal costs see Henrichson, C. and Galgano, S. *A Guide to Calculating Justice-System Marginal Costs.* Washington, DC: Bureau of Justice Assistance, 2013. http://cbkb.org/wp-content/uploads/2013/05/A-Guide-to-Calculating-Justice-System-Marginal-Costs-050213.pdf

[5] McCollister, K. E., French, M. T., & Fang, H. The Cost of Crime to Society: New Crime-Specific Estimates for Policy and Program Evaluation. *Drug and Alcohol Dependence, 108(1), 98-109*, 2010

Cohen, M. A. & Piquero, A. R. (2009). New evidence on the monetary value of saving a high risk youth. *Journal of Quantitative Criminology,* 25, 25-49.

The final step in calculating the benefit of an avoided conviction is to calculate the present value of benefits. The costs of an offender moving through the system or the benefit of avoiding a recidivist, are not all measured in the same time period. Some of the avoided costs occur immediately and some do not happen until years in the future. When an offense is avoided in the first year, the victimization cost is avoided immediately. However, if the offender is ultimately convicted and serves a prison sentence, the costs of incarceration and post-prison supervision occur in future years. An example of this is if a felony is avoided, the benefit of avoiding a victimization and an arrest would likely happen immediately. A conviction will take longer, but is more likely be close to the crime. However, if a prison sentence is avoided, many of those benefits would not happen until years in the future. For the most serious felonies, prison stays can last for decades. In this case, many of the taxpayer benefits are not realized until years into the future. The standard economic technique to put future benefits in terms of today's dollars is to calculate the present value. The present value of benefits can be calculated using equation 2.

$$(2)\quad PVBen_{ro} = \sum_{t=1}^{N_{ro}} \frac{Ben_{ro}}{(1+Dis)^{t-1}}$$

Where,

$PVBen_{ro}$ is the present value benefit or avoided cost for resource *r* for offender type *o* for time periods 1 to the number of periods for resource *r* and offense *o*.[6]

Ben_{ro} is the benefit or avoided cost of resource, *r*, for offense, *o*, measured in 2014 inflation adjusted dollars. For 2015 and beyond, inflation is expected to grow at 2.16% based on the annualized inflation rate of the past 10 years.[7]

Dis is the discount rate. It is used to discount future benefits into the current time period. For this analysis, it is assumed to be 0.035.[8]

N_{ro} is the time period associated with the resource and offense. For this model it is five years.

Putting all of these steps together provides an estimate for the benefits of programs that reduce crime. The final step is to estimate the cost of the programs in order to estimate benefits relative to the costs of investing in the program.

Costs of programs

Any cost-benefit analysis must have estimates of the costs of the program. Sometimes the costs of a program are straight forward. When programs are administered by one agency, the overall operating costs of the program divided by the number of participant days will provide a program cost per day. However, this is much more difficult to estimate with a program like drug courts. Drug courts can receive some state money, some federal money, and some local money. The state money can go through multiple agencies and is often given to local service providers. Those providers do not

[6] For example *r* could represent an arrests and *o* could be a felony.

[7] All costs are converted to 2014 dollars using the consumer price index (http://www.bls.gov/cpi/cpid1507.pdf).

[8] This is a standard discount rate that is used in many cost-benefit analysis, including the Washington State Institute for Public Policy.

consistently report back to the state or county agency on which specific programs were funded with that money, making it difficult to estimate a cost per participant. When budget data is unavailable or difficult to obtain, it may be easier to estimate the time that goes into a program and multiply that time by the wages and benefits of employees administering the program. For more information about how to estimate program costs, see Henrichson, C. and Galgano, S. *A Guide to Calculating Justice-System Marginal Costs*.

Once the per participant program costs are estimated, they are combined with the estimated benefits of the program to yield a benefit to cost ratio. This estimates the return of investing one dollar in a program in terms of the benefits of avoiding victimization and taxpayer costs.

Sensitivity Analysis

The cost-benefit model also allows the user to test the sensitivity of the model to assumptions of how much criminal justice system costs, program costs, and costs to crime victims vary. The model also allows for different effect size values based on using the lower and upper 95% confidence intervals derived from the effect size and its standard error. Finally, low (2.0%), average (3.5%), and high (5.0%) values of the discount rate can be used for the sensitivity analysis to show a range of possible benefits.

The user can choose three different options for the sensitivity analysis: low, average, or high. A low value will choose the high values of program costs, low criminal justice costs, and low crime victim costs based on the user-defined cost variance for each of those cost components. A low value will also include a small effect size based on the lower bound of the 95% confidence interval derived from the effect size. The low value will also use a discount rate of 5%. This will show the lower bound of the results based on the user defined cost variance assumptions, the lower bound of the 95% confidence interval for the effect size, and the high estimated discount rate of 5%. Choosing modal will use the actual estimates entered in the model for all costs, effect size, and a discount rate of 3.5%. Modal is the default setting for the model.

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