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Advancing the Quality of Cost-Benefit Analysis for Justice Programs

Carl Matthies
Vera Institute of Justice
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About This Paper

This white paper describes and discusses the main methodological challenges to performing cost-benefit analyses (CBAs) of justice-system investments. It is a product of the Vera Institute of Justice's national Cost-Benefit Knowledge Bank for Criminal Justice project. The paper was shaped with input from the Cost-Benefit Methods Working Group, which Vera convened in 2012 to help advance the use of rigorous CBAs to inform criminal-justice policy decisions. The goals of the working group were to:

- Foster the use of CBA in justice policy by providing information on cost-benefit methods to criminal justice researchers and practitioners;
- Provide guidance on some of the complicated areas of justice-related CBAs, such as measuring social benefits and addressing data limitations;
- Provide advice on increasing the policy relevance of CBA; and
- Investigate areas for further research.

The working group consisted of researchers and policymakers with diverse backgrounds. Some members were drawn from the ranks of academia and possess a deep understanding of CBA methods and concepts, while others have prominent roles in justice planning and administration in state and local government, with firsthand knowledge of the questions policymakers need answered, the available data, and the political and practical dimensions of policy decisions. The working-group members were:

- Mike Clark, chief economist, Kentucky Legislative Research Commission
- Meredith Farrar-Owens, director, Virginia Criminal Sentencing Commission
- Lynn A. Karoly, senior economist, RAND Corporation
- Mike Lawlor, under secretary, Criminal Justice Policy and Planning Division, Office of Policy and Management, State of Connecticut
- Lee Ann Labecki, former director, Office of Research, Evaluation, and Strategic Policy Development, Pennsylvania Commission on Crime and Delinquency
- Kristin Misner, chief of staff, Office of the Deputy Mayor for Health and Human Services, City of New York
- John Roman, senior fellow, Urban Institute
- Diane E. Shoop, manager, Outreach and Policy Support, Pennsylvania Commission on Sentencing
- Ronald Villa, deputy chief operating officer, City of San Diego
- David L. Weimer, Edwin E. Witte Professor of Political Economy, University of Wisconsin–Madison

Table of Contents

Introduction

Cost-benefit analysis is an economic assessment tool that compares the costs and benefits of policies and programs for the time they produce their impacts. The hallmark of CBA is that costs and benefits are both expressed in monetary terms so that they can be directly compared. CBA supplies policymakers with information to weigh the pros and cons of alternative investments and enables them to identify options that are cost-effective and will have the greatest net social benefit. Because benefits are always expressed in dollar terms, CBA also enables decision makers to compare policies and programs that have different purposes and outcomes.

Although CBA is a well-established economic method, it has not been widely used in criminal justice. Promoting knowledge about CBA and addressing methodological issues specific to criminal justice can help increase the quantity and the quality of cost-benefit studies in the field. This report offers guidance on important conceptual and practical issues surrounding the use of CBA to inform justice policymaking.

How This Paper Is Organized

This white paper covers five topics: selecting perspectives to include in justice-related CBAs; predicting and measuring the impacts of justice initiatives; monetizing (that is, placing dollar values on) justice initiatives; dealing with uncertainty; and making cost-benefit studies clearer and more accessible. These are key elements of cost-benefit analysis and can be challenging in the criminal justice context.

Who Should Read This Paper

This paper is intended for anyone who conducts, plans to conduct, or wants to learn how to conduct a cost-benefit study of a justice-related policy or program. Researchers, evaluators, analysts (including legislative, policy, budget, and fiscal analysts), criminologists, and those in similar or related professions may find the paper useful.

Readers who do not intend to get "into the weeds" of doing a CBA but are curious about its methods may find some passages rather technical. For a discussion focused more on the pragmatic aspects of applying CBA to policymaking, please see the 2014 companion paper, *Using Cost-Benefit Analysis for Justice Policymaking*.

This white paper is not intended to be a comprehensive primer on cost-benefit analysis. Much more thorough treatments of the subject are available, covering a broader range of topics in greater depth and exploring the use of CBA in a wide variety of policy arenas. Readers are encouraged to avail themselves of these resources, some of which are listed in the References section. Readers will note that in some instances the paper gives advice or recommendations, while elsewhere it provides information readers may use to weigh decisions and communicate when explaining their work. This is primarily because, as stated earlier, not all issues pertaining to cost-benefit analysis in criminal justice have clear right or wrong answers.

Guiding Principles

This paper is guided by six key principles adapted from the Society for Benefit Cost Analysis and endorsed by the Cost-Benefit Methods Working Group.[1] These principles are enumerated in Figure 1 and discussed below.

Figure 1. Principles for cost-benefit analysis (CBA) and justice policymaking

1. CBA is a decision *tool*, not a decision *rule*.

2. Analysts should strive to quantify all impacts of a policy alternative relative to current policy, and to monetize costs and benefits for all members of society.

3. Transparency in a CBA enhances its value.

4. A CBA should disclose areas of uncertainty and clearly describe how uncertainty has been addressed.

5. The effort required for a CBA should not outweigh the expected value of the resulting information.

6. The pursuit of a perfect analysis should not prevent the completion of a useful one.

1. Cost-benefit analysis is a decision tool, not a decision rule.

CBA can improve the decision-making process by providing a clear, systematic assessment of the decision's effects. CBA is not intended to replace the role of the decision maker or be used in lieu of existing decision-making processes. Rather, consider CBA a tool that adds information about the efficient use of resources to the other sources of information that decision makers rely on.[2]

2. Analysts should strive to quantify all impacts of a policy alternative relative to current policy, and to monetize costs and benefits for all members of society.

All policies generate costs and benefits. To accurately depict future conditions, cost-benefit analysts should attempt to quantify all impacts and monetize the costs and benefits of a proposed policy change relative to the status quo. But not all outcomes can be quantified or monetized. In such cases, analysts should document the qualitative outcomes along with the quantitative results**.** The analysis should also discuss who is affected by the current policy and who would be affected by the policy alternative.

3. Transparency in a CBA enhances its value.

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[1] Richard O. Zerbe, Tyler Blake Davis, Nancy Garland, and Tyler Scott, *Toward Principles and Standards in the Use of*
[2] Matthew J. Kotchen, "Cost-benefit analysis," in *Encyclopedia of Climate and Weather,* second edition, edited by Stephen H. Schneider, Michael Mastrandrea, and Terry L. Root (Oxford, UK: Oxford University Press, 2011).

Transparency makes a CBA replicable and helps foster the reader's trust. Assumptions and calculations should be sufficiently clear and detailed in the analysis to allow technical audiences to replicate it or, at a minimum, understand the steps taken in the analysis. When readers trust a CBA, their focus can shift from the technical details to the decision-making process.[3] Transparency also relates to clarity, that is, presenting the analysis in a way that is understandable and meaningful to policy audiences.

4. A CBA should disclose areas of uncertainty and clearly describe how uncertainty has been addressed.

A cost-benefit study is stronger when its authors address uncertainty. Some uncertainty is inevitable when forecasting policy effects and monetizing costs and benefits. Uncertainty should not paralyze the analysis; rather, analysts should explicitly acknowledge and address it by exploring the sensitivity of net benefits to the assumptions and estimates that they employed. They should document any uncertainty about predictions and valuations, as well as other assumptions that might affect the policy recommendation. They should also discuss the sensitivity techniques they used to address uncertainty.

5. The effort required for a CBA should not outweigh the expected value of the resulting information.

Some key issues can be addressed by using another less time-consuming form of economic analysis, such as cost-effectiveness analysis or fiscal-impact analysis. Before conducting a CBA, decision makers and analysts should consider whether the answer to the question being asked is worth the effort that will be expended to conduct the analysis. Moreover, when conducting a CBA, the analytic effort should focus on the factors most likely to affect the results.

6. The pursuit of a perfect analysis should not prevent the completion of a useful one.

Perfection is an unattainable and therefore unreasonable standard in economic analysis. A CBA that meets basic requirements regarding objectivity and methodology can provide valuable information and contribute to the decision-making process, so long as the study's limitations are explicit.[4]

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[3] Richard O. Zerbe et al., 2010, p. 35.
[4] Ibid., p. 36.

> **A few notes about terminology**
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> Throughout this paper, important terms are italicized in the text and defined in the glossary. The authors assumed a basic understanding of budgeting vocabulary and its usage among readers. (For example, this paper doesn't spell out what it means to use *cost* as a verb, but does explain *micro-costing*.)
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> A note about the word *program* and similar terms: Although *program*, *policy*, *project*, *intervention*, and *initiative* aren't by definition interchangeable, this paper often uses one of those words when another could apply. Justice-related programs, policies, projects, interventions, and initiatives can all be subject to CBA, and all five terms are used in this paper.

Section I: Perspectives

A distinguishing feature of cost-benefit analysis is its comprehensiveness. Whereas other forms of economic analysis, such as fiscal-impact studies, typically adopt the narrow perspective of a single government agency, CBA aims to capture the costs and benefits to all parties affected by the policy under examination. This means including not only the *perspectives* of organized stakeholders, but of all relevant members of society, to provide a complete view of the policy's impact. Parties whose perspectives are included in a CBA are said to have *standing* in the analysis.

In practice, studies may not account for all perspectives, given the many challenges of conducting rigorous CBAs, as well as diverse opinions about which perspectives matter in an analysis. We recommend that:

- Justice CBAs should include at least the taxpayer and crime-victim perspectives.
- CBAs should be explicit about any relevant perspectives that are excluded and the reasons for the exclusion.
- When reporting the results of a CBA, analysts should disaggregate and display the costs, benefits, and net benefits (or other metrics) for each perspective included in the study.

This section of the white paper provides some background on perspectives—including the perspectives typically included in justice-related CBAs—and explains how to select the perspectives to include in a study.

Taxpayers

Whether they introduce new programs, change sentencing laws, or attempt to make the justice system more efficient, justice-related policies affect taxpayers, who fund government operations. Cost-benefit studies therefore routinely include the taxpayer perspective in their calculations.

The taxpayer perspective is synonymous with the government perspective, although these parties don't always agree about how public funds should be spent. Still, it is appropriate to treat the government and taxpayer perspectives as equivalent in CBA. Bear in mind that the taxpayer perspective includes all agencies affected by a program or policy, not just those that directly involve

criminal justice. (See "Taxpayer Costs" on page 19 for more information on how to estimate costs and benefits for this perspective.)

Crime Victims

Because public safety is often the central goal of justice policies, the perspective of crime victims is a critical part of justice-related CBAs. Crime victims may experience financial, psychological, and physical harms. These harms can be expressed in dollars as *tangible costs*, such as medical expenses and lost property, and as *intangible costs*, such as fear of crime or pain and suffering. When victimization is prevented or reduced, the avoided harms are counted as benefits. (See "Victim Costs" on page 21 for information about how to estimate the values of tangible and intangible costs and benefits to victims.)

Offenders

An ongoing debate among analysts is about when to include the perspective of offenders in justice-related CBAs. Although there is no hard-and-fast rule, most in the field agree that offenders should not have standing with respect to their illegal activities, precisely because the activities are prohibited. Otherwise, the CBA would be at odds with the rule of law, a scenario that could lead to the absurd interpretation of stolen property as merely a transfer of goods from the victim to the offender, with no net change in social welfare.[5] Thus, the benefits criminals derive from engaging in illegal activity should not typically be deducted from the total benefits of a crime-reduction program. Studies that analyze the decriminalization of *victimless offenses* are a different story: when evaluating proposals to legalize, tax, and regulate prostitution or marijuana, for example, the anticipated benefits to producers and consumers in these black markets should be taken into account, because under the new law these parties would no longer be engaging in illegitimate activities.

The offender perspective is multifaceted, and just as most economists argue that offenders lack standing with respect to criminal activities and costs incurred from legitimate punishment for those crimes, there is widespread agreement that offenders do have standing as participants in the criminal justice system. The rationale for including the offender perspective is that if CBA is used to decide between two programs with the same impact and benefits to the rest of society, the program that leads to better outcomes for offenders is preferable. Thus, CBAs of justice-related programs—such as reentry services for formerly incarcerated persons or a prison education program—should capture the costs and benefits to program participants.

Consider a program that teaches job skills to people in the last months of their prison sentence. The program may confer future benefits to participants in the form of better job prospects and higher earnings. But the program may impose costs such as fees, transportation expenses, or even lost wages, if participants could have been earning income instead.
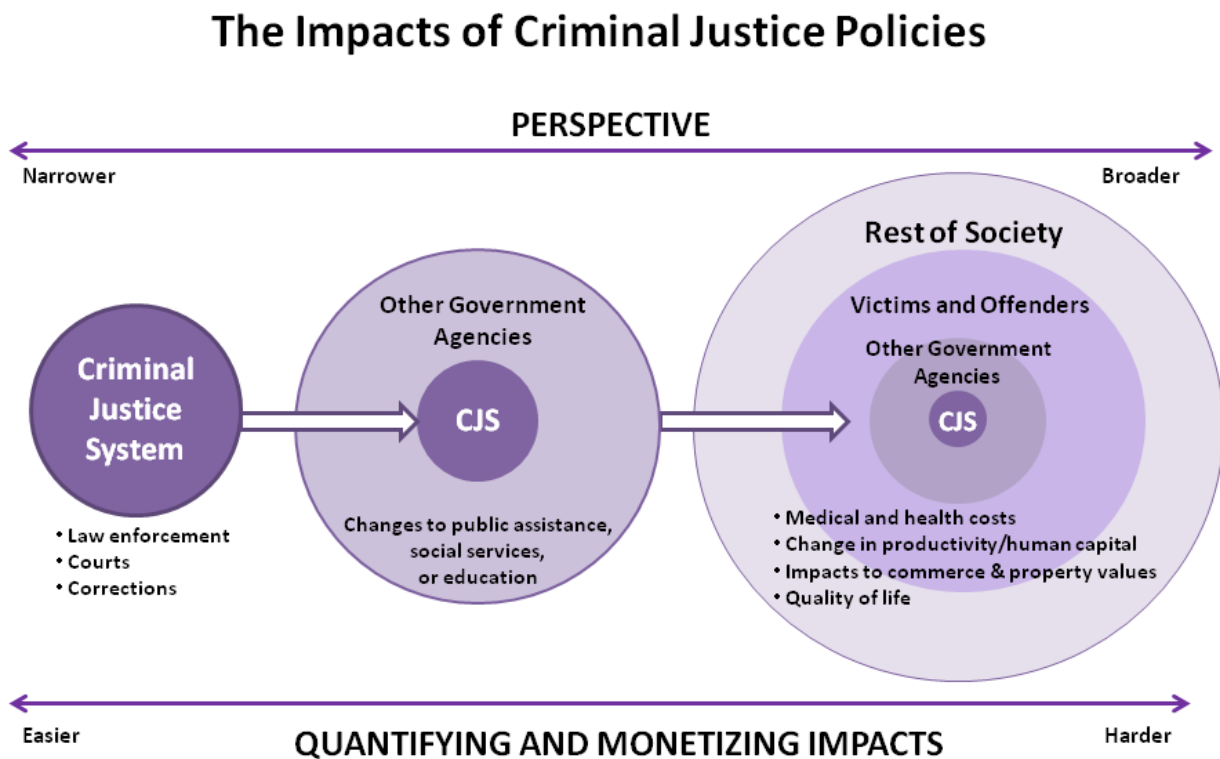
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[5] Andrew S. Rajkumar and Michael T. French, "Drug Use, Crime Costs, and the Economic Benefits of Treatment." *Journal of Quantitative Criminology* 13, no. 3 (1997), 291-323.

The Rest of Society

Taxpayers, crime victims, and offenders are not the only groups affected by criminal justice policies. For instance, reduced crime might benefit communities and businesses through increased property values and commercial activity. Defendants released to pretrial supervision might be able to keep their jobs. Children whose parents complete a drug treatment program might perform better in school. CBAs sometimes refer to parties affected indirectly as "society" or "the societal perspective," even though society includes everyone.

   In some cases, societal costs and benefits may be hard to quantify because of insufficient information to isolate the impacts of a policy on all members of society. At other times the impacts may be difficult to convert into dollar values. (See Section III on page 18 for a description of methods used to measure the value of an outcome or impact in dollars.) Figure 2 illustrates the trade-off between comprehensiveness and analytical effort.

Figure 2. The trade-off between comprehensiveness and analytical effort in cost-benefit analysis

The Impacts of Criminal Justice Policies

PERSPECTIVE

Narrower   Broader

Criminal Justice System

- Law enforcement
- Courts
- Corrections

Other Government Agencies

CJS

Changes to public assistance, social services, or education

Rest of Society

Victims and Offenders

Other Government Agencies

CJS

- Medical and health costs
- Change in productivity/human capital
- Impacts to commerce & property values
- Quality of life

Easier   **QUANTIFYING AND MONETIZING IMPACTS**   Harder

Source: Adapted from Alex Cowell, *Approach for Conducting Cost, Cost-Effectiveness, and Benefit-Cost Analyses of SVORI program*s. Research Triangle Park, NC: RTI International, 2006. http://www.rti.org/pubs/rria_economic_analysis.pdf (accessed January 16, 2014).

The societal perspective also comes into play when justice policies or programs have broad economic repercussions, known as *general equilibrium effects*. For instance, draconian drug laws could spur enough growth in incarceration to trigger new prison construction and affect the price of concrete and other building materials. Another example would be a highly successful large-scale reentry program

that provides vocational training. The program's graduates could displace members of the existing workforce; with fewer graduates committing new crimes, declining inmate populations could result in prison closures and job loss in the corrections sector. It is uncommon, however, for justice policies and programs to have an impact large enough to cause general equilibrium effects.

Naturally, there is overlap among people's roles and their perspectives. For example, a person who commits an offense may be a taxpayer as well as a victim of crime. In reality these roles can and do coexist, however, those nuances aren't typically captured in the context of CBA.

Selecting Perspectives to Include in a CBA

The perspectives that analysts include or exclude in a study can affect its results—such as whether the CBA has a net benefit—and if so, the size of the net benefit. That is why analyses should be as comprehensive as possible and include all relevant perspectives. Figure 3 illustrates how net benefits can change depending on the perspectives included. For example, the net benefit of adult drug courts per participant in the state of Washington is $4,767 if taxpayer and victim perspectives are included, but drops dramatically to $372 when only the taxpayer perspective is included.

Figure 3. Options to reduce crime in Washington State:
Benefits and costs by perspective, per participant (2006 dollars)

	TAXPAYER COSTS	BENEFITS		NET BENEFITS (BENEFITS MINUS COSTS)	
		For taxpayers	For victims	For taxpayers	Total
Adult drug courts	$4,333	$4,705	$4,395	$372	$4,767
Intensive supervision: treatment-oriented programs	$7,124	$9,369	$9,318	$2,245	$11,563
Vocational education in prison	$1,182	$6,806	$8,114	$5,624	$13,738

Source: Steve Aos, Marna Miller, and Elizabeth Drake, *Evidence-Based Public Policy Options to Reduce Future Prison Construction, Criminal Justice Costs, and Crime Rate* (Olympia: Washington State Institute for Public Policy, 2006), No. 06-10-1201, http://www.wsipp.wa.gov/rptfiles/06-10-1201.pdf (accessed February 3, 2014).

But practical or methodological limitations may make a comprehensive approach impossible. When the benefits and costs associated with a perspective can be credibly measured, the perspective should be included in the CBA's calculations. When there isn't a reliable way to estimate quantitatively how a perspective is affected by a policy—or to place a monetary value on that effect—the study should describe the costs and benefits from that perspective qualitatively. Most justice-related CBAs report results from the perspectives of taxpayers, victims, and, when applicable, offenders (for example, when they are program participants), while excluding or simply alluding to other costs and benefits.

Apart from the practical challenges of conducting a thorough study, the question of who has standing in a CBA is potentially contentious. Some policymakers may be interested in only the taxpayer perspective, viewing these costs and benefits as the most salient because they have the most clear-cut fiscal or budgetary impacts. But analysts should strive to present all relevant perspectives and disaggregate costs and benefits by perspective to give decision makers the ability to weigh them as they see fit. At a minimum, analysts should document the perspectives they included in a study and explain which ones they excluded or discussed only qualitatively, as well as how they made those choices.

Keep in Mind

When reporting the results of a cost-benefit analysis, consider displaying the costs, benefits, and net benefits (or other metrics) for each perspective, as in Figure 3 above. Disaggregating the information this way improves transparency by allowing readers to see each party's costs and benefits, and the contribution of each perspective to the CBA's bottom line.

Section II: The Evaluation Component of CBA: Predicting or Measuring Program Impacts

Cost-benefit analysis requires predicting or measuring the effects of policy alternatives. Many sources of information can help to make these predictions or measurements, including evaluations of similar policies in the decision maker's jurisdiction or elsewhere.[6] CBA uses evaluation as an empirical basis for assessing the impacts, both beneficial and detrimental, of a program. These effects are then translated into dollar amounts to determine the program's net present value. CBA has thus been characterized as "the merger of evaluation and valuation" and also described, in the crime-prevention context, as a "second-generation evaluation tool," with a prerequisite of rigorous evaluation to determine whether programs had any detectable impact on crime.[7, 8]

Not every person conducting a cost-benefit study of a justice program will be in the position to evaluate the program. But any person conducting or planning a CBA will need to understand some basics about evaluation to perform a high-quality economic study. A quality CBA based on poorly done evaluations could yield spurious results and undermine the study's credibility.

This section describes barriers to evaluation, three basic ways to estimate program impacts, the fundamental elements of a good evaluation design, *meta-analysis*, and some of the common pitfalls in evaluating justice programs.

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[6] Anthony E. Boardman, David H. Greenberg, Aidan R. Vining, and David L. Weimer, *Cost-Benefit Analysis: Concepts and Practice,* third edition. (Upper Saddle River, NJ: Prentice Hall, 2011), 279-313.
[7] Edwin W. Zedlewski, "Conducting Cost Benefit Analyses in Criminal Justice Evaluations: Do We Dare?" *European Journal on Criminal Policy and Research, Special Issue: The Costs of Crime* 15, no. 4 (2009), 355-364.
[8] John Roman and Graham Farrell, "Cost-Benefit Analysis for Crime Prevention: Opportunity Costs, Routine Savings and Crime Externalities," *Crime Prevention Studies* 14 (2002), 53-92.

Barriers to Evaluation

Not every program is amenable to evaluation. For example, some justice-involved populations are exposed to a suite of programs. With an eye on the budget, policymakers may want to know the effect of each program. Yet in such cases the effects of individual programs cannot be disentangled. This is what is known as an *identification problem*. It is frustrating for researchers and practitioners to accept that a program or policy's effects are in a sense unknowable. Thus it is critical to guard against the temptation to amass more yet uninformative data or to make unfounded assumptions or leaps of logic in a vain attempt to overcome an identification problem. The existence of an entire sub-discipline of program "evaluability assessments" testifies to the importance of recognizing this type of barrier.[9]

For programs that do not have an inherent identification problem, a second challenge remains: access to data of adequate quantity and quality. Sometimes this is merely a matter of patience. It would be inappropriate to evaluate a probation program aimed at reducing recidivism two weeks after it commences, unless by then it is already an obvious failure; more time is needed for results to be meaningful. At other times, if not enough people are exposed to a program to make valid inferences about its impacts, as with highly specialized programs, the problem is referred to as insufficient *statistical power*.[10]

Getting the right data can also present a barrier to program evaluation. Important outcomes are often difficult to measure reliably and may not be captured in existing data. How much crime is prevented by notification systems that alert victims to the imminent release of the offenders who victimized them? This is not an easy outcome to measure. It can therefore be tempting to build an evaluation using data that can be readily captured, even though that data is an ambiguous measure of effectiveness. For example, changes in the number of calls for service and the number of arrests are not *per se* evidence that a crime-control program is or is not working. Similarly, conviction rate is not an especially useful outcome for gauging a jurisdiction's adherence to due process.

How Impacts Are Estimated

Another major area of confusion over program evaluation is about which methods produce reliable estimates of *effect size*. Program evaluations can have a non-experimental (that is, observational), experimental, or quasi-experimental design. Each design has advantages and disadvantages. Figure 4 summarizes the three evaluation methods and provides a justice-related example from the research literature for each method.

Non-Experimental Design

Justice programs are often evaluated by comparing specific outcomes before and after implementation. This approach is relatively easy and intuitively appealing. For example, a police department might measure the impact of a gang task force by comparing the number of gang-related crimes in its

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[9] For more information on identification problems in social science, see Charles Manski's books *Identification Problems in the Social Sciences* (Cambridge, MA: Harvard University Press, 1995) and *Identification for Prediction and Decision* (Cambridge, MA: Harvard University Press, 2007).

[10] For more information on statistical power, see Paul Ellis's book *The Essential Guide to Effect Sizes: Statistical Power, Meta-Analysis, and the Interpretation of Research Results* (Cambridge, UK: Cambridge University Press, 2010), 45-82.

jurisdiction before the task force was created to the number of gang-related crimes committed after its formation. The program's effectiveness would be equated with the percentage change in the number or rate of gang-related crimes. Although it is reasonable to suppose that the task force would have a significant impact on gang crime, there is nothing in the *pre-test* and *post-test comparisons* that eliminates or reduces the possibility of alternative explanations. The decline in gang crime could be the result of collective efficacy in gang-afflicted communities, a voluntary cease-fire negotiated by warring gangs, a delayed impact of routine policing, or some other coincident factor. Attributing the entire impact to the task force would require a strong assumption that no other factor played a role in the observed change. Because these confounding factors cannot be ruled out, the basic pre-test and post-test comparison is considered a *non-experimental* method.

As a second example of a non-experimental evaluation design, consider a scenario in which agency leaders want to know how a community policing program has shaped constituents' views about law enforcement. This is a hard construct to quantify. Suppose the department mailed a survey on attitudes about local police to residents who had called them for assistance. The results of such a survey should not be interpreted as a reliable measure of constituent attitudes overall, because people who call the police for assistance may be predisposed to hold a favorable view of law enforcement. By limiting the evaluation to this population, the agency would have introduced a *selection bias*. This bias would not necessarily be eliminated by mailing the survey to everyone, as attitudes toward police may differ between those who submit responses and those who do not.

To meet the scientific standard for demonstrating causality, program evaluations must provide a credible *counterfactual*, that is, a sense of what would have occurred without the program. In the first example, the counterfactual is, "What would have happened to gang crime numbers in the absence of the task force?"—a different question from "What were gang crime numbers before the task force?" The counterfactual in an impact evaluation is represented by a *control group* or *comparison group*, which should resemble the individuals, neighborhood, or jurisdiction that is exposed to the program as closely as possible.

Experimental Design

The *experimental design* method for identifying program impacts is to conduct a randomized controlled trial (RCT). RCTs are the gold-standard method for estimating program effect sizes because they approximate laboratory conditions. The act of randomizing program exposure creates a near-perfect counterfactual or control group. If participant and non-participant individuals, neighborhoods, or jurisdictions (as the case may be) are selected at random, in a large enough sample, the two groups should be essentially equivalent. As a result, any difference in outcome between the groups is for the most part attributable to the program's effects. However, attrition from one or both groups may not be random, in which case the groups are no longer equivalent. For instance, if the program is demanding, some participants may drop out before reaping all of its ostensible benefits. Under such circumstances, the outcomes for those who fail to complete the program should still be tracked; this estimated impact becomes the *intent-to-treat effect*. Also bear in mind that although RCT is the most rigorous standard for estimating an effect size within a sample population, this does not necessarily mean that the result can be generalized to other populations or settings. For example, the estimated impact of a program

Figure 4. Overview of evaluation methods

Description	Advantages	Disadvantages	Example
Experimental Design			
Randomized Controlled Trial Individuals are randomly assigned to a treatment group and a control group.	Highest internal validity because it guards against systematic differences between groups. With sufficient sample size, true random assignment negates confounding factors, observed or unobserved.	May be impractical or infeasible. May raise ethical concerns of denying services to control group.	In Philadelphia, legal representation for indigent defendants accused of murder is essentially assigned at random: one in every five is represented by a public defender, while the remainder have court-appointed private attorneys. Anderson and Heaton (2012) were able to exploit this system to compare the efficacy of two sources of criminal-defense counsel in terms of verdicts and sentencing.[11]
Quasi-Experimental Design			
Instrumental Variables This method is usually a two-stage regression in which the first regression involves using one or more variables to predict a treatment variable and the second regression uses first-stage predicted values of the treatment to predict the outcome of interest.	Enables causal inference when a RCT is infeasible. Can correct issues with omitted variables, selection bias, and reverse causality to give an unbiased, consistent effect-size estimate by removing the variation in the treatment variable that is correlated with the regression error term. An instrumental variable should affect only the outcome of interest through its correlation with the treatment.	In practice it can be difficult to find valid instrumental variables and to prove their validity.	Cook and Ludwig (2004) estimated the social cost of gun ownership by examining the relationship between household gun-ownership prevalence and homicide rates for the 200 largest U.S. counties.[12] To adjust for the reverse causation of crime and gun prevalence (i.e., crime can affect gun prevalence and vice versa), the authors used the counties' rural population in 1950, a number correlated with current homicide rates solely through its correlation with current household gun prevalence.

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[11] James A. Anderson and Paul Heaton, *How Much Difference Does the Lawyer Make? The Effect of Defense Counsel on Murder Case Outcomes,* RAND Working Paper (Santa Monica, CA: RAND Corporation, 2012), WR-870.

[12] Philip J. Cook and Jens Ludwig, *The Social Costs of Gun Ownership,* The Sanford School Working Paper Series SAN04-07; National Bureau of Economic Research Working Paper No. 10736 (Durham, NC: Duke University, 2004), http://www.nber.org/papers/w10736 (accessed January 16, 2014).

Description	Advantages	Disadvantages	Example
Quasi-Experimental Design (continued)			
Propensity Score Matching This method creates a comparison group based on observable characteristics that are predictive of assignment to the treatment group. Program effects are estimated by comparing outcomes for treatment-group members relative to comparison-group members with the same or nearly the same score.	Reduces bias arising from differences of observable characteristics between the program and comparison groups. Enables creation of a comparison group even without complete overlap in the observed traits of treated and untreated groups. Often the most feasible method for programs that were not implemented with evaluation in mind.	Difficult trade-off between matching on enough variables and what's known as the curse of dimensionality (too many traits to find good matches for all treated individuals). By definition the method controls only for observed factors that may affect assignment to treatment and outcome. Any unobserved factors that affect assignment to treatment—and possibly outcome—cannot be accounted for in the matching procedure.	Sampson et al. (2006) attempted to disentangle the effect of marriage on criminal activity by matching individuals within a cohort of males born in Boston between 1924 and 1932 who had been adjudicated as juvenile delinquents.[13] Propensity scores were based on 20 traits, including IQ score, extroversion, age at first arrest, and parents' criminality. The authors found that married men were, on average, 35 percent less likely to engage in criminal activity than their matched unmarried counterparts.
Regression Discontinuity This method compares subjects who fall immediately above and below some threshold—such as age, test score, or income—used as the sole criterion for assignment into treatment and control groups.	Can yield an unbiased estimate of the treatment effect without randomization. Well suited to realities of program implementation, in which treatment assignment is seldom random and is often based on a threshold value.	Can be difficult to attain adequate statistical power; assumes a linear and parallel relationship between assignment variable (e.g., test score) and the outcome variable for treated and untreated groups.	Berk and Rauma (1983) studied the impact of transitional aid on parolee outcomes. Parolees must have worked 652 hours over a 12-month period of incarceration to be eligible for aid.[14] The recidivism rate was approximately 13 percent lower among people who received transitional aid.

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[13] Robert J. Sampson, John H. Laub, and Christopher Wimer, "Does Marriage Reduce Crime? A Counterfactual Approach to Within-Individual Causal Effects," *Criminology* 44, no. 3 (2006), 465-508.
[14] Richard A. Berk and David Rauma, "Capitalizing on Nonrandom Assignment to Treatments: A Regression-Discontinuity Evaluation of a Crime-Control Program," *Journal of the American Statistical Association* 78, no. 381 (1983), 21-27.

Description	Advantages	Disadvantages	Example
Quasi-Experimental Design (continued)			
Difference-in-Differences This method entails a pre-test and post-test comparison of matched treatment and control groups to account for other factors that affect both groups and could influence outcomes.	Provides a more rigorous test of treatment effect than simple before-and-after comparisons; can be designed to account for confounding factors that might explain the differences in outcomes between groups.	Assumes that the treatment and control groups would have followed the same trajectory but for the treatment. In other words, this method usually does not control for unobserved time-variant differences in the groups, a factor that also may have influenced treatment decision.	La Vigne et al. (2011) measured the impact of public surveillance cameras in Chicago and Washington, DC, by comparing the net change in crime for areas with cameras after accounting for, or "differencing out" changes in comparable control areas.[15] The researchers also measured crime changes in areas adjacent to the cameras, to test for displacement of crime or diffusion of benefits.
Pre-Test and Post-Test Comparison This is a comparison of the same group or unit of analysis before and after a given treatment or intervention.	Straightforward and relatively inexpensive. Reasonable when other factors are unlikely to affect the outcome, when the same trend in outcome is seen repeatedly, and when experimental or other quasi-experimental designs are infeasible.	Does not control for unobserved factors that may affect both the receipt of treatment and the outcome(s). Some pre-test and post-test designs may approximate quasi-experiments by taking into account seasonal and other time-related trends.	Cochran et al. (1994) compared homicide counts in Oklahoma before and after the death penalty was reinstituted and a high-profile execution was carried out.[16] Stolzenberg and D'Alesso (1994) examined the long-term effect of Minnesota's sentencing reform on reducing unwarranted (i.e., not legally mandated) sentencing disparities using an interrupted time series.[17]

[15] Nancy La Vigne et al., 2011, ix-xii.

[16] John K. Cochran, Mitchell B. Chamlin, and Mark Seth, "Deterrence or Brutalization? An Impact Assessment of Oklahoma's Return to Capital Punishment," *Criminology* 32, no. 1 (1994), 107-134.

[17] Lisa Stolzenberg and Stewart J. D'Alessio, "Sentencing and Unwarranted Disparity: An Empirical Assessment of the Long-Term Impact of Sentencing Guidelines in Minnesota," *Criminology* 32, no. 2 (1994), 301-310.

designed to teach business skills to a random sample of inmates with demonstrated intellectual ability and pro-social behavior should not be generalized to the entire inmate population, which may not share those traits.

Setting up an RCT for program evaluation purposes can be costly and time-consuming, although opportunities for low-cost experiments occasionally arise. Programmatic treatments are randomly assigned for reasons other than an evaluation, such as when capacity is limited. Researchers can take advantage of the randomization and make use of routinely collected administrative data to conduct a low-cost rigorous evaluation.[18] Nevertheless, ethical issues and operational realities often make an RCT impossible or highly impractical. Fortunately, there are *quasi-experimental* methods that can provide credible estimates of program effects. These research designs rely on the existence of a credible counterfactual—created by researchers or by chance—that mimics experimental conditions.

Quasi-Experimental Design

Quasi-experimental evaluations frequently rely on some form of *regression analysis* to estimate effect sizes. Regression is a statistical modeling technique used to calculate how changes in one or more factors, called independent variables, correlate with changes in an outcome of interest, called the dependent variable. In the context of program evaluation, the independent variable of greatest interest is a treatment variable indicating whether the unit of analysis was part of the treatment group or part of the control group. The estimated amount by which the treatment variable changes the outcome is the effect-size estimate.

Regression analysis is a highly versatile method. The outcome modeled can be discrete counts (e.g., monthly burglary reports for a law enforcement agency), continuous (e.g., court processing time from arraignment to sentencing), ordinal (e.g., a "fear of crime" scale ranging from 1 to 5), or probabilistic (e.g., likelihood of recidivism within three years post-release). Similarly, depending on the circumstances, the treatment can be a yes-or-no (binary) variable, or a categorical or continuous variable that reflects the treatment dosage.

An all too common bias called *simultaneity* arises when an explanatory variable is determined jointly with the dependent variable. As an illustration, Figure 5 is a scatter plot of index crime rates on police officers per capita for large U.S. cities. Notice that officers per capita appears to be positively correlated with the index crime rate (i.e., the regression line through the data slopes upward), contrary to expectations if one believes that having more officers helps to control crime. The scatter plot illustrates how a simple regression analysis can be misleading. The number of police and the index crime rate affect each other. The number of police per capita may reduce crime, but increases in crime may cause policymakers to increase the size of the police force.

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[18] Coalition for Evidence-Based Policy, *Rigorous Program Evaluation on a Budget: How Low-Cost Randomized Controlled Trials Are Possible in Many Areas of Social Policy* (Washington, DC: CEBP, 2012), http://coalition4evidence.org/wp-content/uploads/Rigorous-Program-Evaluations-on-a-Budget-March-2012.pdf (accessed February 3, 2014).

Figure 5. Relationship between police-force size and crime in large U.S. cities, 2007
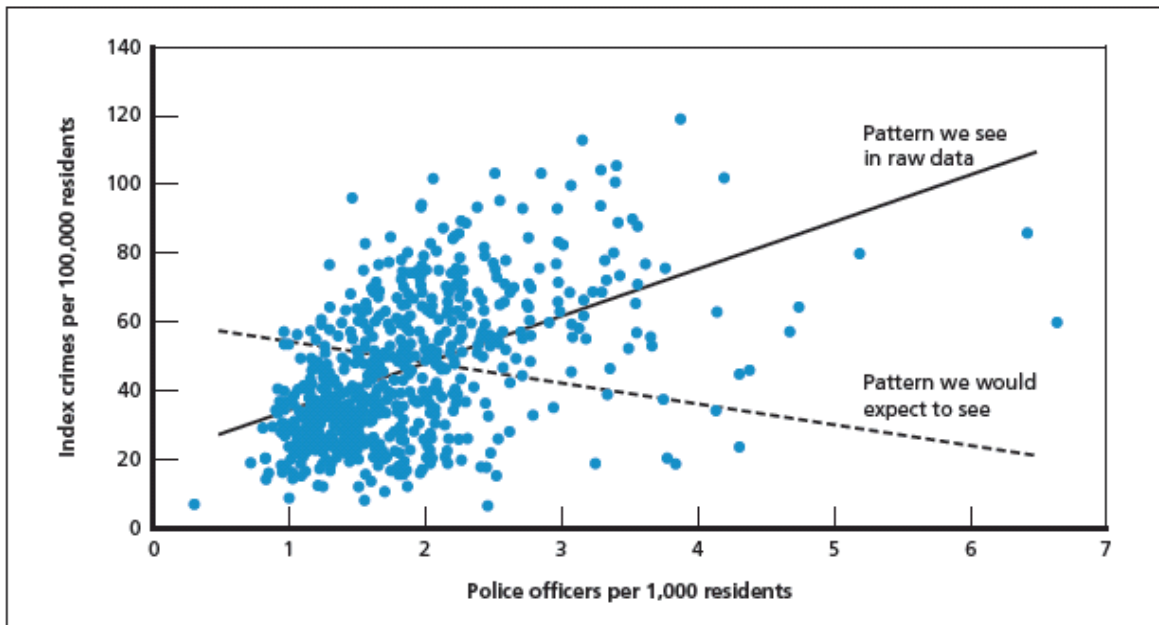
Source: Paul Heaton, *Hidden in Plain Sight: What Cost-of-Crime Research Can Tell Us About Investing in Police* (Santa Monica, CA: Rand Corporation, 2009), http://www.rand.org/pubs/occasional_papers/OP279/ (accessed February 3, 2014).

Instrumental variables. Analysts can overcome the simultaneity problem by introducing *instrumental variables*, a method that usually involves a two-stage regression. The first regression uses one or more variables to predict a treatment variable. The second regression uses the predicted values of the treatment variable from the first stage to predict the outcome of interest. An instrumental variable is a variable whose only effect on the outcome is through its effect on the treatment variable. In the example of the relationship between crime and police-force size, terrorist events and election years can be used as instrumental variables; they present situations in which the size of a police force is at least temporarily increased without regard to the crime rate. By first regressing police-force size on the instruments, one obtains predicted values for police per capita that are uncorrelated with the index crime rate. The outcome can then be regressed on the predicted values to obtain unbiased estimates of the impact of police on crime. Finding valid instruments can be challenging. The instrument must strongly predict the explanatory variable that is jointly determined with the outcome, while having no discernible relationship to other explanatory variables in the regression model, thus demonstrating quasi-random conditions.

Propensity score matching. For programs that target individuals, such as electronic monitoring or pretrial diversion, a technique called *propensity score matching* is sometimes used to ensure that program participants are compared to the subset of non-participants who are most similar to them, thus reducing bias. The propensity score reflects the degree of similarity (on observed characteristics) between any program participants and non-participants, and serves as the basis for matching. The score

is derived by estimating the impact of these observed characteristics on the probability of receiving the treatment. A glaring potential problem with the propensity score method is that treatment and control individuals may differ markedly in ways that are not observed.

Regression discontinuity. In some instances, program assignment is determined by a threshold score on a risk- or needs-assessment test. If the cutoff score is somewhat arbitrary and a sufficient number of people score just above or below the cutoff, the effect of the program can be estimated from the difference in outcomes for these barely eligible and ineligible groups. This method is known as *regression discontinuity*.

Difference-in-differences (DiD). This approach compares net changes between treatment and control groups, before the treatment or intervention versus afterward. Static (time-invariant) differences between the groups are factored out of the equation, while observable time-variant differences can be included in the regression model. Unobserved differences that change over time can be controlled for through inclusion of a second control group to generate a triple-differences estimate. For example, Heaton estimated the public-safety impact of repealing Sunday liquor laws in parts of Virginia using the difference in crime rates before versus after repeals took effect, on Sundays versus other days of the week, and in affected versus unaffected jurisdictions.[19] Looking at other days of the week unaffected by the repeal controlled for unobserved changes within repeal jurisdictions over time, such as a local increase in police personnel. Looking at jurisdictions that did not repeal the law controlled for unobserved changes that might affect crime on Sundays throughout Virginia, such as the release of large numbers of inmates to alleviate state prison overcrowding. DiD is often applied to place-based interventions, thus such an evaluation method might be appropriate for the aforementioned gang task-force study (see "Non-Experimental Design," page 9), as long as one or more neighborhoods with a similar gang problem unaddressed by the task force exist as a comparison group.[20, 21]

Pre-test and post-test comparison. This approach can be considered quasi-experimental under some circumstances. An intervention likely to have an immediate observable impact can be analyzed in a manner similar to regression discontinuity, by comparing brief periods immediately before and after its implementation to mitigate the confounding effect of time

Meta-Analysis

When an agency or jurisdiction considers implementing a program that has been used and evaluated elsewhere, meta-analysis can indicate the expected effect size. Meta-analysis uses the results of prior studies to estimate a program's average impact, which can then be used in a CBA.

Although it is less labor-intensive than carrying out an evaluation, meta-analysis still requires

[19] Paul Heaton, "Sunday Liquor Laws and Crime," *Journal of Public Economics* 96, nos. 1-2 (2012), 42-52.
[20] Jeffrey Grogger, "The Effects of Civil Gang Injunctions on Reported Violent Crime: Evidence from Los Angeles County," *The Journal of Law and Economics* 45, no. 1 (2002), 79-86.
[21] Nancy G. La Vigne, Samantha S. Lowry, Joshua Markman, and Allison Dwyer, *Evaluating the Use of Public Surveillance Cameras for Crime Control and Prevention* (Washington, DC: Urban Institute, 2011), 17.

calculations and scrutiny of the literature, weighting the results according to the strength of the evaluation. If an agency is considering a program that has been meta-analyzed, it is still advisable to verify that the meta-analysis was done well. A meta-analytic review must include the following:

- Clear, logical criteria for inclusion and exclusion of studies;
- An explicit and sufficiently thorough search strategy; and
- Systematic coding and analysis of the studies included.

Meta-analysis has been applied to a number of justice investments, such as corrections-based education, vocation, and work programs for adult offenders.[22] They searched eight literature databases and contacted fellow researchers to find relevant published and unpublished studies. Studies were excluded unless they 1) evaluated an educational, vocational, or work program for convicted offenders; 2) estimated the program's impact on some measure of recidivism; 3) included a control or comparison group, and 4) were published in English after 1975. Studies were weighted according to the estimate precision, follow-up period, and type of recidivism outcome. (For example, reconviction was weighted more heavily than rearrest.) Effect sizes were standardized as odds ratios—the proportion of program and comparison participants who recidivated. Although the effect size was statistically significant, the authors declared the results inconclusive, arguing that selection bias in the program groups was potentially strong enough to account for the difference in outcomes.

Meta-analysis has the appeal of deriving an estimate from a number of studies. It might then bolster the decision makers' confidence in a program or policy's effectiveness, much like consulting several independent ratings reports before buying an appliance reassures consumers of its quality. But meta-analysis results may over-summarize and should be interpreted cautiously. The impact of a small pilot program evaluated several years ago might not correspond to the impact of the more extensive version planned for another jurisdiction, even if the programs otherwise seem very similar. Effects of time, place, and scale, as well as subtle differences in how the programs are implemented, can lead to disparities between an estimated and an actual impact.

Keep in Mind

Program evaluations pose numerous challenges, the first of which is that an evaluation may not even be feasible. For instance, law enforcement interventions, such as intelligence-led policing, can be difficult to study. These programs may represent a series of incremental policy changes that become "a different way of doing things" over time.

CBA's goal of comprehensiveness makes program evaluation even more demanding. Programs often have ramifications upstream and downstream in the justice system, and measuring these impacts can require linking data from disparate sources. Important long-term benefits of justice programs, like educational attainment and employment, may not be captured in a traditional evaluation due to time and budget constraints or because the information is gathered by a government agency not involved in

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[22] David B. Wilson, Catherine A. Gallagher, and Doris L. MacKenzie, "A Meta-Analysis of Corrections-Based Education, Vocation, and Work Programs for Adult Offenders, *Journal of Research in Crime and Delinquency* 37, no. 4 (2000), 347-368.

the evaluation. Nonetheless, measuring such impacts would be vital for predicting benefits and, therefore, for determining the program's net present value.

The reliance on recidivism as an outcome also presents a challenge. Although recidivism is the best index available for measuring the impact of programs on people's propensity to reoffend, it is an imperfect measure of criminal activity. There is no consistent definition of recidivism. Law enforcement agencies may count rearrest as recidivism, courts may use reconviction as the definition, correctional agencies may use recommitment, and probation departments may include technical violations in their definition. For a court system that is heavily backlogged, it will take longer for reconviction and recommitment data to accumulate, but using rearrest will overstate the burden of recidivism on courts and corrections. As with many other issues that arise in conducting evaluations for CBAs, there is no clear right or wrong answer, but there *is* an obligation to be clear about how terms are defined and how those definitions can affect the results.

Section III: Valuing the Costs and Impacts of Justice Policies and Programs

Quantifying program impacts is the end product for many social science studies. But with CBA, both the impacts and the resources expended to achieve them must be monetized to the extent possible. As discussed in Section I, programs can affect government spending, crime victimization, participants, and overall social welfare. Monetizing the positive and negative impacts to all relevant perspectives is the crux of CBA's contribution to economic analysis. But deriving credible dollar-value estimates of some harms and benefits is also one of the biggest challenges in justice-related CBAs.

This section includes a discussion about estimating the costs of implementing a justice policy or program and then focuses on valuing the impacts on taxpayers, victims, offenders, and the rest of society. Our recommendations, many of which follow from those laid out in Section I, are that analysts should do the following:

- Use appropriate cost figures, being careful in particular to use marginal costs rather than average costs for initiatives that will affect government spending—and therefore taxpayers—on the margin.
- Examine all the resources used to implement a policy or program, including the time costs of employees and other stakeholders, when estimating the cost of a justice initiative.
- Assess impacts beyond those to the criminal justice system, when applicable.
- Disaggregate taxpayer costs by unit or level of government, when appropriate.
- Explain the methods and sources used for all calculations.
- Provide qualitative information on impacts and the monetary values of impacts when quantitative information is unavailable or unreliable.

Program Costs

Justice system programs and policies involve allocating resources that would otherwise be put to some alternative use. In the same way that defining the treatment and counterfactual are prerequisites for

program evaluation, distinguishing the cost of an initiative or intervention from "business as usual" operations is essential when estimating program costs. (See "Non-Experimental Design," page 9.) Intrepid accounting is necessary to estimate accurately the cost of a program or policy relative to the status quo or other options, as policies and programs may receive public and private funding and can involve collaboration among multiple agencies and nongovernmental organizations.

A wide range of resources may be used—and costs incurred—in the implementation of justice policies and programs. Direct costs such as staff salary, benefits, office supplies, and other equipment apply to virtually every program. Similarly, when a new facility is built specifically for a program, capital expenses like project planning, real estate, and construction should figure in the program cost estimate, along with indirect costs and start-up costs for furniture and equipment.

Determining the cost of a criminal justice initiative can be a straightforward process. Some programs have dedicated resources, such as equipment and a certain number of full-time employees of known pay grade. Perhaps the program is neatly compartmentalized as one or more line items in a budget or is funded entirely through a grant. But even in these instances, analysts should know that what is appropriated is not always the same as what is spent. Additionally, the cost to taxpayers may not represent the full program cost if the program makes use of donated goods and services. For instance, the full cost of a job-training program for inmates that uses government employees as trainers, volunteers as mentors, and donated supplies should include taxpayer costs as well as the economic value of donated time and supplies.

In other instances, estimating the costs of a criminal justice policy or program is more complex, requiring a careful assessment of the personnel and agencies involved. One approach to estimating employee time and other variable program costs is transactional and institutional cost analysis (TICA), which "micro-costs" government expenses by tracking every employee activity associated with a particular program or policy. The time spent by each employee involved in the transaction is then multiplied by the employee's wage rate and summed for all employees. TICA has been used in comparing the costs of several problem-solving courts to standard case processing by multiplying the duration of court appearances, drug tests, treatment sessions, and other transactions by the salaries of the judges, attorneys, bailiffs, court reporters, case managers, and service providers involved in those transactions. [23] Accurate micro-costing requires the ability to differentiate between what is a programmatic element and what is "business as usual." Thus, a prerequisite for micro-costing is consultation with program personnel to create a logic model or flowchart defining the program and any alternatives to which it will be compared.

Some people who work in government are inclined to dismiss employee time costs for programs run by existing staff, arguing that the employees' time is like a fixed cost, already paid for regardless of the activity. This notion is incompatible with CBA, a tool for determining whether a particular use of time and other readily monetizable resources is more beneficial than an alternative use.

Taxpayer Costs

Taxpayers fund the operations of law enforcement, courts, corrections, and various public-sector

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[23] Shannon Carey and Michael Finigan, *A Detailed Cost Analysis in a Mature Drug Court Setting: A Cost-Benefit Evaluation of the Multnomah County Drug Court* (Portland, OR: NPC Research, 2003).

functions linked to the justice system. Decision makers want to know how much justice policies and programs will affect government costs, so accurate estimation of these costs is critical to CBA. Consider a policy that has the effect of increasing the number of arrests for a particular crime. To conduct a CBA of such a policy, analysts would need to estimate not only the increased cost to the police, but also, depending on the type of crime, the additional costs related to the increased use of court and corrections resources for trying and incarcerating more people—or supervising them (for example, through parole or probation).

Taxpayer costs should be calculated using the *marginal cost* of each activity. The marginal cost is the amount of change in total cost when a unit of production changes. In the context of the criminal justice system, it is how much the total operating costs of an agency change when workload (such as arrests, court filings, or jail days) changes because of a policy or program.

It is critical to use marginal costs in CBA calculations. One of the most fundamental errors an analyst can make is using average costs, a mistake that usually results in overestimating the costs or the avoided costs related to a policy change. This is because the *average cost* includes fixed costs—such as administration and other overhead costs—that policy changes rarely alter. (For more information, refer to Vera's *Guide to Calculating Justice-System Marginal Costs*.[24])

The difference between average and marginal costs is often considerable. In 2011, for example, the average annual per-inmate cost of incarceration in Massachusetts was an estimated $46,000, whereas the marginal cost was only $9,000.[25] Average cost includes costs for administration, utilities, and other expenses that will not change when the prison population is slightly reduced or increased. A small change in the population affects expenses such as food, clothing, and medical care: these are the marginal costs of a *small* increase or decrease in the prison population.

Marginal costs depend on the size of the change in workload and how the government adjusts the budget in response to this change. This means that more than one marginal cost could potentially be used in justice CBAs. Marginal costs that change immediately with even a small change in workload are called short-run marginal costs. When a policy has a larger impact on workload, staffing costs need to be considered, yet it may take time for the government to change staffing levels. Thus, a long-run marginal cost includes the short-run marginal cost as well as the staffing costs that change as governments make adjustments to staffing levels in future budget cycles.

Cost-benefit studies of criminal justice initiatives should use the long-run marginal cost when the effect of the policy on workload is expected to affect staffing needs. Analysts should use the short-run marginal cost when the policy impact is not large enough to affect staffing.

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[24] Christian Henrichson and Sarah Galgano, *A Guide to Calculating Justice-System Marginal Costs* (New York: Vera Institute of Justice, 2013), http://cbkb.org/publication/a-guide-to-calculating-justice-system-marginal-costs/ (accessed January 16, 2014).
[25] Paul Heroux, "Addressing the prison's budget and population," *Taunton Daily Gazette*, February 11, 2011.

Keep in Mind

The outcomes of criminal justice policies and programs sometimes affect spending in other areas of government. Longer sentences for offenders who have children may increase costs for the foster care system; releasing elderly inmates to alleviate overcrowding may impose a greater burden on state-subsidized health care for the indigent; and reduced enforcement of truancy laws might cost public schools money. A careful CBA should take into account these possible effects beyond the criminal justice system.

Cost-benefit studies usually report the total taxpayer cost as one figure. However, it may be helpful to report costs by the level of government—that is, federal, state, or local. In some instances, it might also be appropriate to disaggregate taxpayer costs by unit of government, such as a corrections or social services department.

Costs of Crime

Crime causes substantial financial, psychological, and physical harm. Over the past few decades, economists have used a variety of methods to assign dollar values to these harms and estimate the costs of crime to victims, society as a whole, and offenders themselves. This section discusses the costs each group bears, describes the methods used for estimating them, provides cost estimates from recent studies, and discusses the costs of crime in the context of cost-benefit analysis.

Victim Costs

Victim costs, also referred to as victimization costs, are losses suffered by crime victims and include tangible and intangible costs. Tangible costs are those that easily translate into financial losses, such as medical costs, reduced income, and damaged or stolen property incurred because a person was the victim of a crime. Intangible costs refer to losses such as pain, suffering, and reduced quality of life that a crime victim may experience and are usually harder to monetize than tangible losses. CBAs of criminal justice policies need estimates of the dollar value of these intangibles. Such non-market goods obviously have value, but *how much* is not so obvious, which is why these values are called *shadow prices* in economic parlance.

The Bottom-Up Approach

Placing a dollar value on victimization can be challenging, but several studies have estimated tangible and intangible victim costs by using the *cost-of-illness* or *jury-compensation* methods. The cost-of-illness approach measures direct, tangible costs like medical expenses (obtained from hospital databases) and lost earnings. The jury-compensation approach uses the money awarded to victims by juries to estimate the indirect or intangible victim costs of crime. Relying as they do on adding up the costs in actual criminal cases, the cost-of-illness and jury-compensation methods are collectively referred to as the "bottom-up" approach to estimating victim costs.

The main strength of the bottom-up approach is that these estimates are based on amounts that were paid to plaintiffs in an effort to "make them whole." This allows for offense-specific estimates and also illustrates that the victimization cost of a crime like assault or burglary is highly skewed. In

most cases the physical, psychological, and financial harm is minor, but a relatively few extreme cases (for example, when a crime leaves the victim paralyzed) greatly increases the average victimization cost to many times the median victimization cost.

But the approach also has drawbacks. Some jury awards incorporated in bottom-up estimates were from cases involving death or bodily injury that was not the result of a crime, so using this method assumes that juries award the same amount for injuries regardless of whether they were caused by a defective product, medical malpractice, or a criminal act. In addition, crimes adjudicated in civil court that result in jury awards may not be representative of all crimes, and research has shown regional and plaintiff gender bias in jury awards. Figure 6 summarizes the tangible and intangible victim cost estimates from jury compensation and cost-of-illness studies. All values are expressed in 2012 dollars.

Figure 6. Estimated tangible plus intangible victim costs per crime using a bottom-up approach

Offense Category	Roman (2010)	Cohen & Piquero (2009)	McCollister, French & Fang (2010)
Murder/Manslaughter	$1,673,679	$5,106,000	$9,032,940
Rape	$167,236	$149,850	$213,617
Armed robbery	$320,543[a]	$32,190	n/e
Robbery	n/e	$13,320	$24,155
Aggravated assault	$155,260[b]	$41,070	$101,675
Assault	n/e	$4,995	n/e
Arson	n/e	$63,270	$5,492
Larceny/Theft	$2,841	$500	$11
Motor vehicle theft	$20,301	$6,105	$280
Burglary (household)	$5,945	$2,220	$343
Fraud	n/e	$1,221	n/e
Vandalism	n/e	$411	n/e

n/e = Not estimated

Sources: John K. Roman, "How Do We Measure the Severity of Crimes? New Estimates of the Cost of Criminal Victimization," *Measuring Crime and Criminality: Advances in Criminological Theory* 17, no. 37 (2010), 37-70; Mark A. Cohen and Alex R. Piquero, "New Evidence on the Monetary Value of Saving a High Risk Youth." Vanderbilt Law and Economics Research Paper No. 08-07, *Journal of Quantitative Criminology* 25, no. 1 (2009), p. 33, Table 5; and Katherine E. McCollister, Michael T. French, and Hai Fang, "The Cost of Crime to Society: New Crime-Specific Estimates for Policy and Program Evaluation," *Drug and Alcohol Dependence* 108, nos. 1-2 (2010), p. 105, Table 5, www.ncbi.nlm.nih.gov/pubmed/20071107 (accessed February 3, 2014). The authors' estimates have been adjusted to 2012 dollars using the Bureau of Labor Statistics' Consumer Price Index Inflation Calculator, http://www.bls.gov/data/inflation_calculator.htm, accessed August 21, 2013.
[a] This calculation uses Roman's estimate for robbery for the cost of armed robbery.
[b] This calculation uses Roman's estimate for assault for the cost of aggravated assault.

The Top-Down Approach

The cost of crime to society is not the same as the sum of victimization costs across all crime categories in a jurisdiction, because crime imposes costs even on those not directly victimized. In a

broad sense, crimes are a transgression against all members of society, a belief underscored by the legal convention that prosecutors represent "The People" in criminal trials.

Economists use two methods to estimate societal costs of crime: *contingent valuation* and *hedonic pricing*. Whereas the bottom-up approach of cost-of-illness and jury-compensation methods attempts to sum up the costs borne by crime victims specifically, contingent valuation and hedonic pricing methods attempt to capture the cost of crime to society as a whole or the value society places on the amenity of public safety. As such, these methods are referred to as "top-down" approaches to estimating crime costs.

The contingent valuation method relies on surveys that ask people to place a dollar value on changes in crime levels. A survey might ask individuals how much they are willing to pay for a reduction in crime, or how much they would have to be compensated for an increase in crime rate.[26, 27] In theory, contingent-valuation estimates encompass victimization costs, tangible crime avoidance costs, and the associated intangible fear of crime felt by potential victims and even offenders. Contingent-valuation estimates therefore tend to be significantly higher than jury award and cost-of-illness estimates.

Contingent valuation has at least three limitations. First, there is some debate as to which costs survey respondents actually take into account—tangible or intangible. Second, contingent-valuation surveys may overstate what people are willing to pay to avoid crime because respondents don't have to pay the amount they specify. Third, the surveys require respondents to make a difficult appraisal—the valuation of a minute reduction in the risk of victimization—the type of assessment usually left to actuarial statisticians.

Yet despite its flaws, leading economists are of the opinion that the contingent-valuation shadow price of a crime is less precise but more correct than estimates based on a bottom-up approach. Because contingent valuation attempts to measure crime's effect on property values, the monetary value of fear of crime, social degradation, and avoidance behavior by potential victims, shadow prices based on contingent valuation present more of a neighborhood or community perspective on crime. In addition to contingent-valuation surveys, researchers use hedonic pricing to infer how individuals value public safety. Hedonic prices are determined by collecting information about property characteristics, such as square footage and number of bedrooms for homes across a large area (such as a city or county) and neighborhood characteristics, such as public school quality and access to transit. This information is then put into a regression model to tease out or "unbundle" the portion of area property values attributable to intangible benefits like less noise pollution. Several studies have estimated the dollar value residents place on crime and potential victimization by examining the effects of crime on property values.[28]

Shadow prices developed through hedonic pricing typically do not apply to specific types of offenses, such as rape or theft, but to broader categories of violent and property crime or to crime

[26] Mark A. Cohen and Alex R. Piquero, "New Evidence on the Monetary Value of Saving a High Risk Youth," Vanderbilt Law and Economics Research Paper No. 08-07. *Journal of Quantitative Criminology* 25, no. 1 (2009), 25-49.

[27] Mark A. Cohen, "Pain, Suffering, and Jury Awards: A Study of the Cost of Crime to Victims," *Law & Society Review* 22, no. 3 (1988), 537-556, http://www.jstor.org/stable/3053629 (accessed February 3, 2014).

[28] Allen K. Lynch and David W. Rasmussen, "Measuring the impact of crime on house prices," *Applied Economics* 33, no. 15 (2001), 1981-1989.

overall. An exception is the victim cost of murder, which has been calculated by hedonic pricing applied to the labor market. Wage differentials can be used to determine how much workers in occupations like mining and construction need to be compensated to accept jobs that involve a risk of death. These compensation premiums are used to calculate the value of a statistical life, which serves as the estimate of the victim cost of murder.

Hedonic pricing also has its limitations. It assumes that all of the components of property value can be unbundled, and that buyers consciously select from those components. Perhaps more problematic, most hedonic pricing studies naturally assume that crime affects property values, but neglect to consider that property values can also affect crime. The potential gains to burglary are apt to be higher in wealthy neighborhoods. On the other hand, criminals are known to commit most of their crimes close to home, and high-risk parolees, for example, are unlikely to possess the means to live in affluent areas of town. Failure to account for potential reverse causality will bias the value of public safety estimated from home prices. Last, a majority of hedonic pricing studies report the estimated value of an incremental change in the crime rate, but a few hedonic pricing researchers have eschewed crime rate as the variable of interest. These researchers instead use crime density (the number of crimes per unit area), which some have shown is a better predictor of fear of crime and property values.[29] Figure 7 summarizes the tangible and intangible societal cost estimates from contingent-valuation studies. All values are expressed in 2012 dollars.

Figure 7. Estimated tangible plus intangible societal costs per crime using a top-down approach

	Cohen & Piquero (2009)
Murder/Manslaughter	$13,098,000
Rape	$321,900
Armed robbery	$310,800
Robbery	$43,290
Aggravated assault	$94,350
Assault	$21,090
Arson	$127,650
Larceny/Theft	$4,440
Motor vehicle theft	$18,870
Burglary (household)	$38,850
Fraud	$6,105
Vandalism	$2,220

Source: Mark A. Cohen and Alex R. Piquero, 2009, p. 33, Table 5. The authors' estimates have been adjusted to 2012 dollars using the Bureau of Labor Statistics Inflation Calculator, http://www.bls.gov/data/inflation_calculator.htm (accessed August 21, 2013).

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[29] Keith Ihlanfeldt and Tom Mayock, "Panel data estimates of the effects of different types of crime on housing prices," *Regional Science and Urban Economics* 40, nos. 2-3 (2010), 161-172.

Using Victim and Societal Cost-of-Crime Estimates in a CBA

A comprehensive cost-benefit analysis of an initiative that affects crime, whether directly or indirectly, should take into account the shadow price of crime. If a policy or program reduces crime, the costs of avoided victimization and fear of crime are counted as benefits. If a policy or program increases crime, victim costs are incurred.

When reporting on victim and societal costs of crime in a CBA, be explicit about the method used to obtain the estimates. Top-down cost estimates are more appropriate for CBA because they are more comprehensive than estimates based on a bottom-up approach and provide a measure of the full externality of criminal offenses on society. The disadvantage of using top-down estimates is that they reduce transparency because estimates are harder to disaggregate into types of costs. Figure 8 illustrates this problem in comparing the elements of bottom-up and top-down victim-cost estimates for the crime of rape. Both analysts and policymakers may find the greater precision of bottom-up estimates appealing, but should be aware of the important costs these estimates fail to capture.

Figure 8. Victim costs of rape: Comparison of bottom-up vs. top-down approaches

	Bottom-Up Approach	Top-Down Approach
Out-of-pocket costs	$650	Included
Lost productivity	$2,800	Included
Counseling	$2,800	Included
Pain and suffering	$103,500	Included
Justice-system costs	$3,250	Included
Avoidance costs; prevention costs; fear	Not included	Included
Total	$113,000	$237,000

Source: Mark A. Cohen, "Economic Cost of Crime and Public Policy Decisions" (presentation at seminar on "The Costs of Crime and Violence in Latin America and the Caribbean: Methodological Innovations and New Dimensions," Inter-American Development Bank, Washington, DC, Jan. 24, 2013, http://www.livestream.com/idbcitizensecurity/video?clipId=pla_70100625-3061-4771-a060-b791e4b1933f , accessed February 4, 2014).

Readers of your CBA may be skeptical about intangible costs, especially given that for certain types of offenses, intangible costs can be several times larger than tangible costs. Presenting tangible and intangible costs in separate columns, as in Figure 9, provides a more complete and comprehensible view of victim costs, and shows that the full cost of victimization for serious violent crimes is much higher than the tangible costs alone.

Figure 9. Victim costs of crime[30]

Type of Offense	VICTIM COSTS ($)		
	Tangible	Intangible	Total
Murder	$737,517	$8,442,000	$8,442,000
Rape/Sexual assault	$5,556	$199,642	$205,085
Aggravated assault	$8,700	$95,023	$96,254
Robbery	$3,299	$22,575	$24,211
Motor vehicle theft	$6,114	$262	$6,352
Arson	$11,452	$5,133	$16,127
Household burglary	$1,362	$321	$1,653
Larceny/Theft	$480	$10	$489

Source: Katherine E. McCollister, Michael T. French, and Hai Fang, "The Cost of Crime to Society: New Crime-Specific Estimates for Policy and Program Evaluation," *Drug and Alcohol Dependence* 108, nos. 1-2 (2010), 98-109, www.ncbi.nlm.nih.gov/pubmed/20071107 (accessed February 3, 2014).

Keep in Mind

The studies and methods described above represent some of the best available research on victim and societal crime costs, but further research is needed. Notice that most studies do not calculate these costs for drug offenses, even though substance abuse affects health outcomes and generates medical costs for users and society. Cohen and Piquero have estimated the lifetime cost of a heavy drug user at $1.15 million to $1.3 million, and though the user bears much of the cost, this figure does include the cost of child neglect and endangerment.[31] Likewise, there are few estimates on social costs of white-collar crimes, even though the tangible victim costs inflicted by fraud, insider trading, and other forms of business-related theft may far exceed the tangible costs of street crimes. Future research should address these limitations. In the meantime, using current victim or societal cost-of-crime figures is better than excluding these estimates from cost-benefit analysis.

Offender Costs

All government spending has an *opportunity cost*, that is, an alternative is forgone because money is spent on a given program or service and not on something else. To aid in the evaluation of programs

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[30] For most offenses, values in the Total column do not equal the sum of the values in the Tangible and Intangible columns. The tangible and intangible costs of murder are estimated using two distinct methodologies. Tangible costs reflect the value of forgone lifetime earnings, whereas intangible costs represent the value of a statistical life. (See W. Kip Viscusi and Joseph E. Aldy, "The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World," *The Journal of Risk and Uncertainty* 27, no. 1 [2003], 5-76, http://camra.msu.edu/documents/ViscusiandAldy2003.pdf, accessed February 21, 2014.) The two estimates should not be combined to create a "total victim cost per murder." The tangible and intangible costs for the other offenses listed in Figure 9 include valuations of the risk of homicide costs attributable to those crimes; therefore the total victim costs were adjusted to avoid double-counting. For more information about these calculations, see Katherine McCollister et al., 2010.

[31] Cohen and Piquero, 2009, 46.

that decrease recidivism or divert offenders from prison altogether, researchers have calculated the opportunity cost of incarceration. They do this either by using survey data on the legitimate earnings of offenders prior to imprisonment or by assuming full-time employment at minimum wage, yielding estimates of $14,626/year (1997 USD) and $13,624/year (2008 USD), respectively (see Figure 10). Justice programs may help offenders become more productive. Statistically, an offender is more likely to achieve a higher salary with gains in educational attainment and vocational training, and is more likely to have a longer and more productive career with increased health and longevity. If an adolescent is diverted from a life of chronic drug abuse, for example, this saves an estimated $43,500 in productivity loss due to drug-related illness and $125,000 to $220,000 in productivity loss due to premature death.[32]

Figure 10. Estimated costs of crime to offenders, in forgone earnings

	McCollister et al. (2010)	Cohen & Piquero (2009)	Rajkumar & French (1997)
Murder/Manslaughter	$158,954	$155,400	n/e
Rape	$9,857	$4,995	n/e
Armed robbery	n/e	$8,880	n/e
Robbery	$4,571	$4,440	$1,747
Aggravated assault	$2,275	$7,104	$1,284
Assault	n/e	$1,443	n/e
Arson	$625	$777	n/e
Larceny/Theft	$174	$777	$74
Motor vehicle theft	$592	$1,110	$186
Burglary (household)	$729	$1,110	$366
Embezzlement	$706	n/e	n/e
Fraud	$706	$777	n/e
Stolen property	$1,211	n/e	n/e
Forgery	$706	n/e	$183
Vandalism	$750	n/e	n/e

n/e = Not estimated

Sources: McCollister, French, & Fang (2010), page 7, Table 4; Cohen & Piquero (2009), page 33, Table 5. Rajkumar & French (1997), page 301, Table 1. These authors' estimates have been adjusted to 2012 dollars using the Bureau of Labor Statistics' Consumer Price Index Inflation Calculator (http://www.bls.gov/data/inflation_calculator.htm; accessed August 21, 2013.)

In CBA, offenders also have standing with respect to policies that involve due process or other constitutional issues. Empirical inquiry into the cost of due-process violations is lacking, and it is not altogether clear how analysts would quantify these concepts. As with other indirect or intangible costs, the challenge of quantifying the cost should not prevent considering these important impacts in a qualitative sense.

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[32] Ibid, p. 44.

Time Horizons and Discounting

Justice system programs and policies can generate costs and benefits over a span of several years, decades, or indefinitely. In CBA, the period over which benefits and costs are assessed is referred to as the time horizon or the time frame. For example, the time horizon for a new jail could be 30 years, the expected period that the facility will be operating.

To compare projects with different time horizons—or even projects with the same time horizon but with different timing of cost and benefit streams—economists use a technique called discounting. Discounting adjusts future costs and benefits downward, by an annual percentage called the discount rate, in recognition of the time value of money. This is the concept that money is worth more now than later, whether it is spent for immediate gratification or invested for profit. For this reason, CBA results should be expressed in terms of net present value, the net difference in costs and benefits after discounting.

Selecting appropriate discount rates and time horizons is important because they can affect cost-benefit results and thus policy recommendations. The higher the discount rate, the more steeply future costs and benefits depreciate. A lower discount rate decreases the value of future costs and benefits less, keeping them closer to current dollar values. A time horizon that does not capture future costs and benefits can make a project's return on investment seem better or worse than it is.

Figure 11 demonstrates how time horizons and discount rates affect cost-benefit findings and the resulting policy recommendations. Consider two programs, A and B. The only cost for Program A is an upfront investment of $45,000, while Program B has upfront costs of $20,000, followed by annual costs of $2,500. Both programs yield $6,000 per year in benefits. Figure 11 shows the net present value for each program using three discount rates—0, 3, and 7 percent—and computes the net present value at 10-year and 20-year time horizons. When the time value of money is taken into account, Program B, with its lower initial costs, has a higher net present value than Program A at year 10. If the discount rate is 7 percent, Program A does not even recoup its initial costs after 10 years. However, by year 20, the ongoing annual costs of Program B have diminished the net present value, and Program A looks like a better option, underscoring the importance of the time horizon choice.

Figure 11. Discounting with 0, 3, and 7 percent rates

TIME	PROGRAM A			PROGRAM B		
	0%	3%	7%	0%	3%	7%
Year 0	($45,000)	($45,000)	($45,000)	($20,000)	($20,000)	($20,000)
Year 1	$6,000	$5,825	$5,607	$3,500	$3,398	$3,271
Year 2	$6,000	$5,656	$5,241	$3,500	$3,299	$3,057
Year 3	$6,000	$5,491	$4,898	$3,500	$3,203	$2,857
Year 4	$6,000	$5,331	$4,577	$3,500	$3,110	$2,670
Year 5	$6,000	$5,176	$4,278	$3,500	$3,019	$2,495
Year 6	$6,000	$5,025	$3,998	$3,500	$2,931	$2,332
Year 7	$6,000	$4,879	$3,736	$3,500	$2,846	$2,180
Year 8	$6,000	$4,736	$3,492	$3,500	$2,763	$2,037
Year 9	$6,000	$4,599	$3,264	$3,500	$2,682	$1,904
Year 10	$6,000	$4,465	$3,050	$3,500	$2,604	$1,779
Net present value (10-year time horizon)	$15,000	$6,181	($2,859)	$15,000	$9,856	$4,583
Year 11	$6,000	$4,335	$2,851	$3,500	$2,528	$1,663
Year 12	$6,000	$4,208	$2,664	$3,500	$2,455	$1,554
Year 13	$6,000	$4,086	$2,490	$3,500	$2,383	$1,452
Year 14	$6,000	$3,967	$2,327	$3,500	$2,314	$1,357
Year 15	$6,000	$3,851	$2,175	$3,500	$2,247	$1,269
Year 16	$6,000	$3,739	$2,032	$3,500	$2,181	$1,186
Year 17	$6,000	$3,630	$1,899	$3,500	$2,118	$1,108
Year 18	$6,000	$3,524	$1,775	$3,500	$2,056	$1,036
Year 19	$6,000	$3,422	$1,659	$3,500	$1,996	$968
Year 20	$6,000	$3,322	$1,551	$3,500	$1,938	$904
Net present value (20-year time horizon)	$75,000	$44,265	$18,564	$50,000	$32,071	$17,079

Ideally, CBAs should measure costs and benefits for as long as they persist, but in practice may estimate them for a shorter duration. Few CBAs estimate intergenerational impacts of investments even when they are viewed as potentially sizeable, because of the practical impediments to carrying out such a long-term evaluation. Analysts sometimes avoid the issue of time horizons and discounting by estimating the net benefits on a within-year basis. This is reasonable for programs with stable costs and benefit streams that are roughly contemporaneous.

CBAs of programs with large start-up costs and/or significant lag time between costs incurred and benefits realized should clearly document the time horizon and discount rate used in the analysis, because the effect of discounting becomes more pronounced over longer time frames. Political realities may influence elected officials to favor programs that promise net benefits in the short term, even if another option might offer greater benefits in the long term.

Finally, recognize that a long time horizon implies a strong assumption about the state of the world remaining fairly constant. The pace of innovation may render public safety technologies obsolete much more quickly than anticipated, or an unforeseen demographic shift may cause a correctional program's reach—and therefore its impact—to fall short of projections. This uncertainty highlights the need for challenging the inputs and assumptions of CBA, a topic discussed in Section IV.

Section IV: Dealing with Uncertainty in Impacts

Some degree of uncertainty is inherent in even the most rigorous cost-benefit study. The impacts of policies or programs may be difficult to measure or predict, and the value of those impacts may be hard to monetize. Cost-benefit studies must make assumptions and use estimates to calculate the expected costs and benefits of a policy or program. But what if the assumptions and estimates are off? Would different information change the bottom line results drastically, slightly, or not at all?

A cost-benefit study isn't meant to guarantee precise costs and benefits, and will be misleading if its results are calculated using only point estimates for the CBA model's inputs. A CBA that considers a range of possible scenarios and explains the likely outcomes will not only be more credible than one that looks only at the *base-case scenario*, but more informative.

Sensitivity analysis is a tool for assessing a cost-benefit model's tolerance to deviations from the base-case scenario. It can also be used to calculate the likelihood of achieving a certain result, for example, the probability that a project will break even.

This section provides an overview of sensitivity analysis and describes four types: *partial sensitivity analysis*, *best-case and worst-case scenarios, break-even analysis,* and *Monte Carlo analysis*.

Sensitivity Analysis

Sensitivity analysis is a group of techniques that can be used to examine the degree of uncertainty in a CBA and how that affects a study's results. Sensitivity analysis provides a way to show how a study's

results would be affected and how responsive or sensitive those results would be to changes in the values of specific variables.

To illustrate the different types of sensitivity analysis, consider a cost-benefit analysis of a hypothetical prison education program for first-time offenders that aims to improve employment outcomes and reduce recidivism. This CBA examines only the recidivism outcome. For purposes of this CBA, recidivism is defined as a reconviction, and the program's impact on recidivism is assumed to apply equally across offense categories. The program's recidivism impact is estimated relative to three-year reconviction patterns for a cohort of inmates who would have been eligible for the program but were released just before it started. Bottom-up estimates similar to those discussed in Section III are used to approximate recidivism costs. Recidivism impact, estimated from tracking post-release outcomes for the earliest cohort of participants, is a statistically significant 12 percent decrease (−12%), but standard errors for the estimate are large, indicating that the recidivism impact may fall anywhere between a 25 percent decrease (−25%) and a 2 percent decrease (−2%). Program attrition is a cause for concern, because participants who don't complete the program appear to fare no better than the comparison group post-release. Program cost varies by individuals' needs but is known to range from $2,000 to $4,000 with a mean of $2,500. The base-case scenario is shown in Figure 12.

Figure 12. Base-case scenario for a hypothetical prison education program

BASELINE RECONVICTION RATE PER 100 PAROLEES				COST PER RECONVICTION				
	Year 1	Year 2	Year 3	Justice System	Victim (Tangible)	Victim (Intangible)	Offender	Total
Homicide	0.06	0.03	0.03	$385,040	$592,000	$6,776,300	$250,000	$8,003,340
Sex assault	0.44	0.30	0.15	$91,800	$21,644	$772,170	$50,000	$935,614
Robbery	0.61	0.25	0.21	$61,850	$7,800	$11,770	$15,000	$96,360
Assault	0.45	0.29	0.34	$36,680	$22,680	$35,000	$40,000	$134,360
Property crime	6.23	3.16	1.95	$20,200	$5,000	$0	$10,000	$35,200
Drug crime	9.04	5.92	4.76	$13,100	$0	$0	$3,000	$16,100
Other crime	3.11	2.55	1.90	$24,280	$0	$0	$750	$25,030
Program costs (100 participants)				($232,000)				($232,000)
Program benefits				$93,866	$18,673	$161,000	$32,396	$305,955
Net present value				($138,114)	$18,673	$161,000	$32,396	$73,955

Note: The average program cost per graduate is $2,500. The average program cost per nongraduate is $500. The program attrition rate is 9%, and the expected three-year impact on recidivism for program graduates is a 12% decrease. The discount rate used in calculations is 3%.

Partial Sensitivity Analysis

In a partial sensitivity analysis, variables are selected one at a time and their values are changed while holding the values of other variables constant to see how much the CBA results change in response.

Figure 13 illustrates the results of a basic partial sensitivity analysis that looks at the effect of changes in recidivism on the net benefit of the hypothetical prison education program when program costs and other inputs are held constant. The figure indicates that a 25 percent reduction in recidivism would lead to a net benefit of more than $405,000, a 15 percent reduction would result in a net benefit of $150,000, and a 2 percent reduction would generate a net cost of $181,000.

Figure 13. Partial sensitivity analysis results for a hypothetical prison education program

Change in Recidivism	−2%	−10%	−15%	−20%	−25%
Program costs	$232,000	$232,000	$232,000	$232,000	$232,000
Program benefits	$51,000	$255,000	$382,450	$510,000	$637,400
Net benefit	−$181,000	$23,000	$150,450	$278,000	$405,400

Conducting a partial sensitivity analysis for all variables can highlight the ones that have the greatest impact on the program's net present value. This information is sometimes conveyed graphically using what's called a tornado diagram. This is a bar chart that ranks model inputs by the amount the net benefit deviates from base-case estimates over a percentile (or percentage deviations) of the inputs. Figure 14 depicts a tornado diagram of the hypothetical prison education program. The central axis is the expected net present value of the program, about $74,000 for 100 participants, as shown in Figure 12; the bars show how much the net present value increases (to the right) or decreases (to the left) within the 5th and 95th percentile range for the variables indicated, holding all other variables constant at the base-case scenario value. The recidivism impact, the program cost, and the rate of reconvictions for serious violent crime are the variables that have the greatest influence on the net present value, and only recidivism impact and program cost have enough influence to push the program's net present value below zero.

Figure 14. Tornado diagram of a hypothetical prison education program (10 most-influential variables)
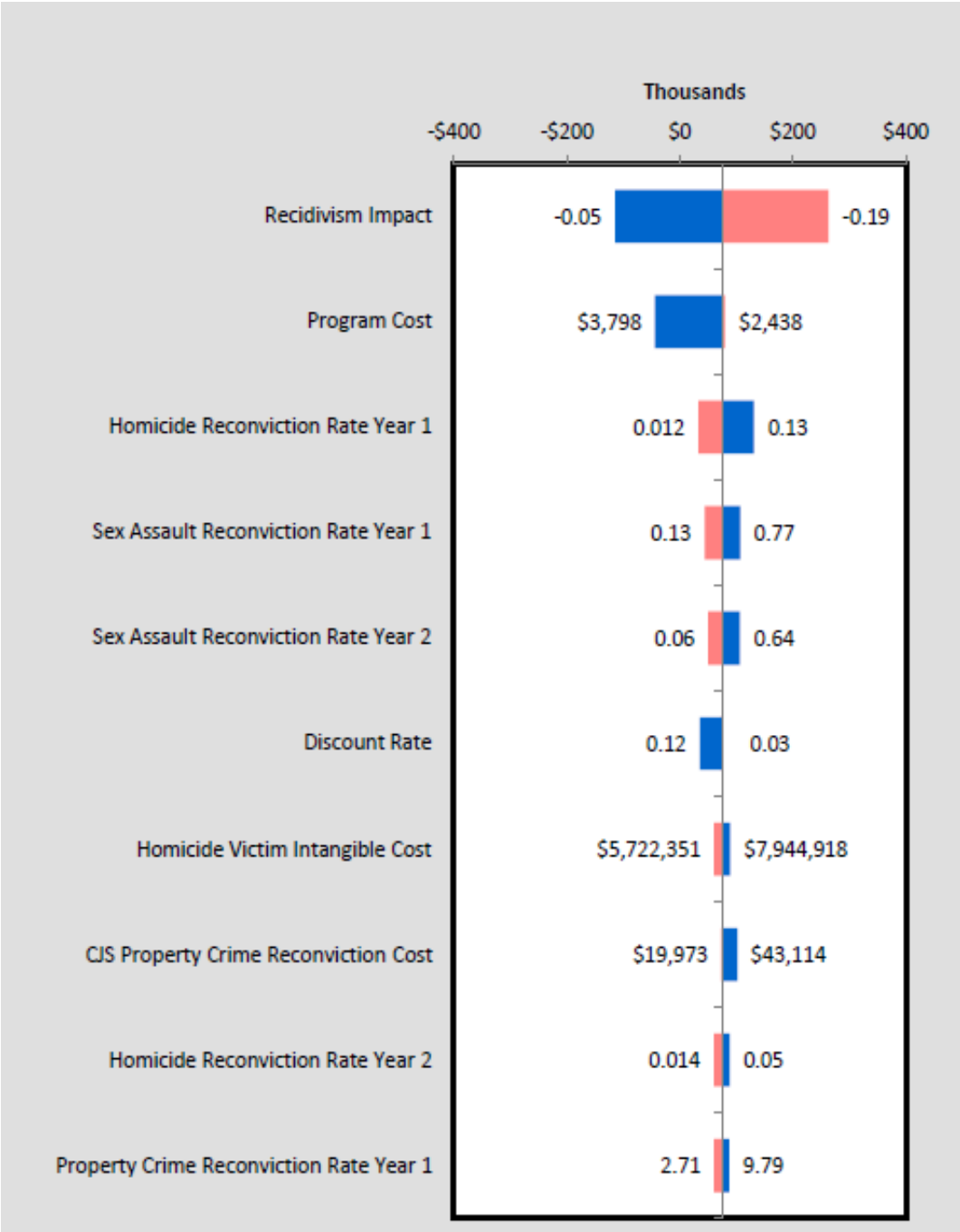
Note: The total net present value of the hypothetical prison education program for 100 participants is $73,955.

Best-Case and Worst-Case Scenarios

These scenarios establish the upper (best-case) and lower (worst-case) boundaries of a cost-benefit study's results. This type of sensitivity analysis shows how a broad range of a program's possible outcomes affects the bottom line. The best-case scenario uses all of the most-favorable assumptions about the program's outcomes, such as the upper limit of the estimated effect on recidivism and the lowest projected program attrition rate; the worst-case scenario uses all of the least-favorable assumptions, such as the lower limit estimate of recidivism impact and the highest projected program attrition rate.

For the prison education program, the best-case scenario—when accounting only for the impact on recidivism—is that recidivism decreases by 25 percent. As Figure 13 shows, this would yield a net benefit of more than $405,000 for 100 participants. If discount rate and program cost are also near their lower bounds, and if baseline recidivism rates and crime costs are near their peak values, the net present value increases to only about $440,000. Conversely, the most unfavorable assumptions result in a net present value of approximately −$340,000.

To project best and worst outcomes that are plausible, refer to existing research on similar programs, possibly including a pilot study of the program under consideration. Keep in mind that best-case and worst-case scenarios are extreme cases; the odds of them occurring should be low unless input estimates are badly off the mark.

Break-Even Analysis

Break-even analysis can be used in the following situations: if the goal is to determine a policy's minimum necessary effectiveness; if the policy's most likely effects cannot be estimated; or if there are no comparable studies to help determine the policy's best-case and worst-case scenarios. This type of sensitivity analysis estimates what effect size a policy must have for its benefits to equal its costs, that is, to break even. By definition, breaking even results in a net benefit of $0.

If exceeding the break-even point is feasible, benefits would potentially outweigh the costs. If reaching the break-even point is not feasible, the costs are likely to exceed the benefits. Consider the hypothetical prison education program: According to the CBA model, the policy would need to reduce recidivism by 9.1 percent to be economically neutral.

As with partial sensitivity analysis and best-case and worst-case scenario analysis, break-even analysis can be applied to inputs other than program effect size. It is not uncommon, especially in the financial industry, for cost-benefit studies to solve for the discount rate at which the program breaks even as an index of its profitability. In this case, a 21.75 percent break-even discount rate indicates that the program is a good investment (under the base-case scenario) because the break-even discount rate is much higher than the prevailing time value of money.[33]

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[33] The guideline at the Office of Management and Budget, the Executive branch office that evaluates federal programs using CBA, is to set the discount rate at 3 and 7 percent for CBAs of non-regulatory programs. See Office of Management and Budget, *Circular A-94: Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (Washington, DC: OMB, 1992), http://www.whitehouse.gov/omb/circulars_a094 (accessed February 3, 2014).

Monte Carlo Analysis

The three methods previously described may not fully characterize the uncertainty associated with a cost-benefit study, because they convey little about the likelihood of certain program outcomes. For this, Monte Carlo analysis can be helpful. This method can be used to examine multiple variables simultaneously and simulate thousands of scenarios, resulting in a range of possible outcomes and the probabilities that they will occur. Monte Carlo simulation repeatedly draws random values for each model input to create a probability distribution of outcomes. The CBA results can then be expressed as the estimated probability that the program will yield net benefits or as the range of forecasted net present values within some confidence interval.

To illustrate, consider again the prison education program for first-time offenders. Suppose the program cost varies by individuals' needs but is known to range from $2,000 to $4,000, with a mean of $3,000. Figure 15 depicts the probability distribution of net present values for 3,000 simulations of this hypothetical program. The distribution indicates that the program is forecast to have a 60 percent probability of achieving a positive net present value (i.e., a 60.60 percent "certainty" of net present value results that are cost-neutral or better, colored blue). The 5th and 95th percentiles are marked as vertical lines, indicating that the program has a 5 percent chance of a net present value exceeding $283,063 and an equal probability of a net present value of less than −$175,702. A risk-averse agency might therefore opt against making this investment in first-time offenders. Note, however, that the calculus might change if the analysis included the program's impact on employment earnings.

Monte Carlo simulations can be done with some effort using ordinary spreadsheet applications. Special statistical software packages can be used to conduct the analysis in seconds, which can make the procedure seem seductively simple. Recognize that Monte Carlo analysis increases data requirements. The outcome probability distribution it produces is only as reliable as the model and the variable distributions that serve as inputs, so if the effect-size estimate is biased, the Monte Carlo results will be too.

Figure 15. Monte Carlo analysis results for a hypothetical prison education program
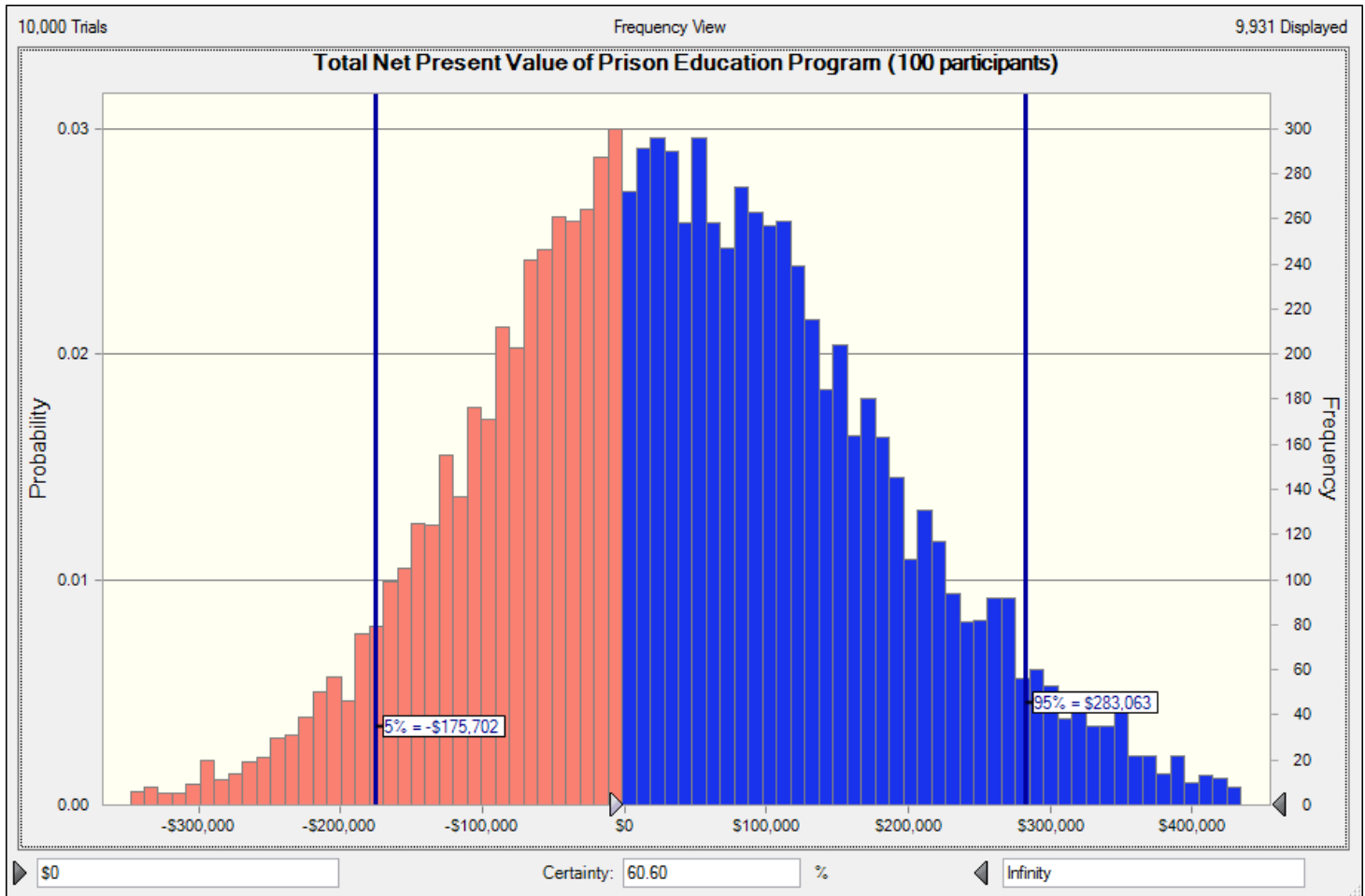
Keep in Mind

Sensitivity analysis is part of making cost-benefit analysis transparent to others. Although the idea may seem paradoxical, practitioners come across as more dependable when they explicitly address uncertainty. A CBA report should clearly state its underlying assumptions, how estimates were obtained, and where potential errors might exist.

Section V: Making CBAs Clearer and More Accessible

Cost-benefit analyses can be difficult to understand, and the technical details of a study may be complex and hard to follow. But analysts should strive to make their reports clear and accessible. Doing so enhances the value of their work by making their studies more useful to policymakers as well as other analysts. Figure 16 summarizes the recommendations that Vera's Cost-Benefit Analysis Methods Working Group made for improving the clarity of cost-benefit studies. (For more about the working group, see "About This Paper" before the Table of Contents.)

Figure 16. Ways to improve the clarity of a CBA

GENERAL RECOMMENDATIONS
- Include a 1- to 2-page executive summary.
- Include detailed appendices.
- Define all CBA-related terms.
- Define all criminal justice-related terms.
- Provide a visual model (e.g., a diagram or flowchart) of the CBA.

DOCUMENTATION
- Be explicit about which costs and benefits the analysis includes.
- Describe the costs and benefits that have not been quantitatively measured/monetized.
- Document the limitations of the analysis.
- Document the details of the sensitivity analysis.
- Share your CBA model in electronic format when feasible.

REPORTING RESULTS
- Net present value is the preferred summary metric.
- Tables and figures should be understandable on their own, independent of the text.
- Costs and benefits should be shown in the same table.
- Costs, benefits, and net benefits should be disaggregated by perspective.

General Recommendations

The working group made several recommendations to improve the clarity of cost-benefit methods and results. First, begin a CBA with an executive summary. Write the executive summary for a nontechnical audience and summarize the study's main points and most important details. A good rule is to write the executive summary under the assumption that the reader won't have time to read the rest of the report.

Don't bog down the main body of a study with technical details. Instead, include a thorough set of appendices with information such as assumptions underlying the study, derivations of costs and benefits, modeling equations, data sources, and a glossary of key terms. Make the appendices sufficiently detailed to allow others to see what you have done and to possibly re-create your work.

Define criminal justice and CBA-related terms, either in the main body of the text or in a sidebar or glossary. Do not assume that every reader understands the terminology you use or defines terms exactly as you do. Certain CBA terms (such as discounting, marginal costs, and effect size) have commonly accepted definitions, but will be unfamiliar to some readers. And keep in mind that some criminal justice terms can have different meanings. Statutory definitions for criminal offenses can vary by jurisdiction, and recidivism can be measured in numerous ways. Well-defined terms will increase the clarity of the analysis and help prevent inappropriate comparisons of results.

Provide a visual representation of the CBA, such as a diagram or flowchart. Visuals depict the relationships among resource investments (costs), outcomes, and the changes that occur as a result (benefits) and serve to connect the dots for readers. Such visuals should clearly illustrate how the costs of an initiative lead to the outcomes that generate benefits. Don't make diagrams so complex or detailed that they overwhelm readers.

Documentation

To paraphrase the Golden Rule, you should provide as much documentation for others as you would want them to provide to you. This means that you should document all perspectives, program impacts, marginal costs, shadow prices, assumptions, limitations, and data sources in the study. A CBA should explain which costs and benefits have been included, by perspective, and which ones have not been monetized and/or quantitatively measured. Acknowledge uncertainty by specifying how sensitivity analyses were conducted and being up-front about any assumptions—including any reasonable alternatives—that would affect the findings. Finally, when feasible, provide electronic copies of the raw data, the CBA model (including any statistical coding), and any relevant information that can help others understand, evaluate, replicate, or build on your work.

Reporting Results

Analysts can present CBA results in a number of ways, but some are clearer and more useful than others. The consensus among cost-benefit analysts is that net present value, which is the sum of all discounted costs and benefits over the lifetime of a program, is the correct summary metric.[34] A benefit-cost ratio (BCR) can identify whether a program has positive net benefits. But BCRs alone will not provide sufficient information to decide among multiple programs with positive net benefits. The program with the highest BCR may not yield the highest net benefits, the metric decision makers should pay attention to. Some CBAs will report an internal rate of return (IRR), which is the discount rate at which the program is cost-neutral. Compare the IRR with the current interest rate to determine whether the projected benefits exceed the cost of borrowing capital. Like the BCR, the IRR won't help people compare programs, because it communicates nothing about net benefits. And a program may have more than one IRR, a factor that is potentially confusing.

Because tables and figures are meant to highlight important information, some readers will tend to skip over the text and refer directly to the visuals. Policymakers will naturally gravitate to the study's bottom line. CBAs should therefore feature a summary table showing the costs, benefits, and net benefits for each perspective included. Tables and figures should be titled and include explanatory notes to clarify, for example, the source of an input or the meaning of an axis label, row, or column heading. See Figure 17 for an example of a thoroughly documented table of cost-benefit results.

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[34] Zerbe et al., 2010, p. 41.

Figure 17. Example: Table of cost-benefit results

The Enhanced Services for the Hard-to-Employ Demonstration

Table 4.4

Net Benefits and Costs (in 2009 Dollars),
Full Sample

Center for Employment Opportunities

	Taxpayer ($)	Victim ($)	Participant ($)	Total ($)
Benefits				
Criminal justice	2,912	432	0	3,344
Employment				
Earnings	0	0	590	590
Tax payments and credits[a]	190	0	-190	0
Value of output from CEO transitional jobs[b]	4,576	0	0	4,576
Costs				
CEO program costs[c]	-3,603	0	0	-3,603
Net benefits (per person)	4,075	432	400	4,907
Benefit-cost ratio	2.13	NA	NA	2.36

SOURCES: Marginal costs were estimated using information provided by New York City and state criminal justice agencies, New York State executive budget agencies, and Taifa (1995). See Appendix Table F.1 for more detail. For additional employment data sources, see Table 3.1; for additional criminal justice data sources, see Table 3.2.

NOTES:
[a] Income taxes and the federal and state Earned Income Tax Credit were based on tax rules for filing year 2009.
[b] The value of output from CEO transitional jobs was calculated using information from the Department of Citywide Administrative Services.
[c] CEO program costs were calculated using CEO's financial expenditure reports for Fiscal Year 2005 and CEO's management information system (MIS), adjusted for inflation.

Source: Cindy Redcross, Megan Millenky, Timothy Rudd, and Valerie Levshin, *More Than a Job: Final Results from the Evaluation of the Center for Employment Opportunities (CEO) Transitional Jobs Program* (Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services, 2012), OPRE Report 2011-18, p. 67.

Finally, when reporting results, it is important to remind readers that net benefits are not the same as taxpayer savings. Net benefits include social benefits, productivity savings, and benefit transfers (that is, monetary savings realized by an agency other than the one making the investment) that may not translate into budgetary savings. Even benefits that accrue to taxpayers require budgetary actions or decisions to go from theoretical gains on paper to actual cost savings.

Keep in Mind

Authors who communicate clearly about their decisions, their data, and their calculations make their work more accessible. In so doing, they offer readers and decision makers a deeper, more nuanced, and more meaningful look into a CBA and its results.

Conclusion

Although CBA is a well-established economic method, its use in justice policy has not yet met its potential. This white paper draws on the experience and recommendations of Vera's Cost-Benefit Methods Working Group about important conceptual and practical issues in conducting justice-related CBA.

The paper examines five topics: selecting perspectives; predicting and measuring the impacts of justice-system initiatives; monetizing justice-system initiatives; addressing uncertainty; and making cost-benefit studies clearer and more accessible. The key recommendations:

- Include taxpayer and victim perspectives, at a minimum, in an analysis. Discuss any relevant perspectives that are excluded and the reasons for the exclusion.
- Assess impacts beyond those to the criminal justice system.
- Be careful to avoid bias and identification issues, which can threaten the validity of program evaluation results.
- Evaluate programs using an experimental design (random assignment) when feasible, and if it is not, use quasi-experimental methods to create as plausible a counterfactual as possible.
- A careful meta-analysis may be the best and easiest means to estimate effect sizes for criminal justice programs that have already been evaluated extensively.
- Use appropriate cost figures, being careful to use marginal costs rather than average costs for policies that will affect government spending on the margin.
- Include victim or societal cost-of-crime figures and state explicitly the source of the estimates. Top-down estimates are more inclusive; if you use bottom-up estimates, be aware of the important costs they fail to capture.
- When reporting results, disaggregate and display the costs, benefits, and net benefits (or other metrics) for each perspective included in the study.
- Report the results of analysis as a net present value, which is the sum of all discounted costs and benefits over the lifetime of the project.
- Provide qualitative information about impacts and their monetary values when quantitative information is unavailable or unreliable.
- Apply sensitivity analysis; the study should present a range of possible scenarios and explain the likely outcomes.
- Strive to make reports clear and accessible.
- Document thoroughly the assumptions, decisions, sources, data, methods, and calculations that went into conducting the study. Provide enough information to help others evaluate and understand your work, if not replicate it.

Because many questions pertaining to cost-benefit analysis in criminal justice lack clear right and wrong answers, and because many challenges are associated with this work, this paper could have the unintended effect of discouraging people from using CBA. We hope not. It may help to bear in mind the axiom "Don't let the perfect be the enemy of the good." Even if not all costs and benefits can be adequately evaluated, going through the disciplined thought process of conducting a CBA can yield useful information and insights to aid in the decision-making process.

The science behind CBA and justice program evaluation is dynamic. Our collective understanding of how impacts can be measured and monetized is evolving, as is our information technology. On the whole, these advances are improving the quality, quantity, and accessibility of data for CBAs, and should reduce the uncertainty related to some inputs and the cost of conducting an analysis.

Cost-benefit analysis can provide useful information to help policymakers better understand the consequences of criminal justice policies and programs and of their decisions. We hope the information in this white paper will aid analysts if they run into practical and conceptual challenges when conducting cost-benefit studies, and will help to increase the quantity and the quality of CBAs.

Appendix: Regression Analysis

At its most basic, a regression model resembles the equation for a line, with the formula $Y_i = \alpha + \beta T_i + \varepsilon_i$. In this equation, Y_i is the outcome for the *i*th unit of analysis in the data, T_i is the treatment status for the *i*th unit of analysis in the data, β is the average treatment effect (the average amount by which treatment changes the outcome), and α is the intercept (the average value of Y when T is zero, that is, the average outcome for the comparison groups). The last term, ε_i, is the error term for the *i*th unit of analysis, the residual variation in the outcome that is not explained by the treatment. The error term is used to test the hypothesis that the average treatment effect is not equal to zero by establishing the range of possible values for β. An effect-size estimate with a range that does not include zero is said to be *statistically significant*.

Certain conditions must be met for regression analysis to produce reliable effect-size estimates. Ideally the error term is truly random. If the sign and magnitude of the error term systematically changes over time or with different values of the *X*s, a situation called heteroskedasticity, the test of statistical significance may give an incorrect result because the range of possible values for β is biased. Multicollinearity refers to the situation in which two or more explanatory variables in the model are moderately to strongly correlated with each other, creating a redundancy that increases the range of possible values for β. When the explanatory variables are correlated with the error term, a problem known as *endogeneity*, both the range and estimated average effect size for β will be biased.

Regression models typically include a number of independent variables so that the effect size is estimated after taking into account—or controlling for—the variation in outcome that is explained by other factors (such as education, criminal record, or drug addiction). Including additional factors reduces the error term and can mitigate the problem of *omitted variable bias*, which is inaccuracy in an effect-size estimate due to one or more important factors that are missing from the regression model, affecting both participation and the outcome. For example, in estimating the recidivism effect size of a voluntary DUI court, motivation to get sober is a key factor in whether a person elects to enter the program as well as whether they complete it. Omitting the variable of motivation will bias the effect size, making the program appear more effective than it is. Thus, the voluntary DUI court suffers from selection bias like the survey on attitudes toward police cited in the section on non-experimental design .

Glossary

Average cost: Total cost divided by the quantity of output. For example, the average cost of probation is calculated by dividing total probation department expenditures by the average probation population.

Base-case scenario: A starting point, that is, a preliminary result based on plausible or best-estimate assumptions about the value of inputs into the cost-benefit model. The base-case scenario is typically the result on which one conducts sensitivity analysis.

Best-case and worst-case scenarios: A type of sensitivity analysis used to establish the upper (best-case) and lower (worst-case) boundaries of a cost-benefit study's results. A best-case scenario uses all of the most-favorable assumptions about the program or policy's outcomes; the worst-case scenario uses all of the least-favorable assumptions.

Break-even analysis: A method of sensitivity analysis used to determine how great a policy's impact must be for its benefits to equal its costs. By definition, "breaking even" results in a net benefit of $0.

Comparison group: A group that serves as the counterfactual when estimating the effects of an intervention using a quasi-experimental method. A comparison group should resemble the group exposed to the intervention (the treatment group) as closely as possible, but unlike a control group it is not created through random assignment.

Control group: A group that serves as the counterfactual when estimating the effects of an intervention using an experimental design, which randomly assigns exposure to the intervention so that the intervention is essentially the only difference between groups.

Contingent valuation: A method that uses surveys to estimate the monetary value of something that is not commonly traded in the marketplace, such as environmental preservation or crime reduction. For example, a contingent-valuation survey might ask individuals what they are willing to pay for a 10 percent reduction in violent crime.

Cost-benefit analysis: A type of economic analysis that compares the costs and benefits of policies and programs over a long term. The hallmark of CBA is that both costs and benefits are monetized, allowing the comparison of initiatives with different purposes and outcomes.

Cost-of-illness approach: A method that measures tangible victim costs, such as medical costs and lost earnings, using information from hospital databases and typical salary rates.

Counterfactual: A representation of the outcome that would have occurred in the absence of the intervention being studied. *See **control group** and **comparison group***.

Difference-in-differences: An evaluation technique that estimates the treatment effect by subtracting the change in the treatment group from the change in the comparison group before and after the intervention.

Discounting: This technique translates future costs and benefits into present-day values to account for the time value of money. *See **time value of money***.

Discount rate: A rate used to reduce or discount future costs and benefits to account for the time value of money. The federal Office of Management and Budget (OMB) recommends both 3 and 7 percent discount rates. The 3 percent rate is the rate of return for the average consumer. The 7 percent rate is OMB's estimate of the average rate of return for private investments.

Effect size: A measure of the magnitude of a policy or program's effectiveness. In cost-benefit analysis, the effect size is a key input for calculating the costs and benefits a policy generates.

Endogeneity: A bias that arises when a correlation exists between an explanatory variable and the error term in a regression model. *See **omitted variable bias, selection bias,** and **simultaneity***.

Experimental design: A research design in which treatment and control groups are created through a random-assignment process.

General equilibrium effects: The effects of a program or policy on the economy as a whole.

Identification problem: A situation in which it is not possible to estimate the effect of a particular variable, such as a program, on an outcome because other variables could explain the observed outcomes equally well. This occurs frequently in the context of the inability to tease out the effect of individual program components from the whole.

Instrumental variable: An instrumental variable is a variable whose only effect on the dependent variable is through its effect on the treatment variable. Instrumental variables can be used to correct for endogeneity in regression analysis. *See **endogeneity***.

Intent-to-treat effect: The estimated treatment effect for all subjects assigned to a program, including individuals who drop out or are noncompliant.

Hedonic pricing: A technique to estimate the dollar value of items that are not commonly traded in the marketplace, by measuring their impact on the prices of market goods, often real estate. Hedonic pricing can be used to estimate the value of crime by measuring how changes in crime rates affect local property values, for instance.

Intangible costs: Costs that cannot be measured directly in dollar terms. Examples of intangible costs include pain and suffering, lost confidence in the justice system, and reduced quality of life.

Jury-compensation method: A method to estimate the intangible costs of crime using the money awarded to victims by juries.

Marginal cost: The amount of change in total cost when output changes by one unit. In the context of the criminal justice system, it is the amount the total operating costs of an agency change when workload (such as arrests, court filings, or jail intakes) changes because of a policy or program.

Meta-analysis: A method of estimating a program's impact by aggregating results from numerous studies.

Monte Carlo analysis: A type of sensitivity analysis that examines multiple variables simultaneously and simulates thousands of scenarios, resulting in a range of possible outcomes and the probabilities that they will occur.

Non-experimental design: A method of research that creates treatment and control groups without attempts to control for differences between the groups.

Omitted variable bias: A bias that occurs when a model leaves out one or more important explanatory variables. The treatment effect is confounded with the effect of the missing variable, leading to over- or under-estimation of the true effect.

Opportunity cost: The value of the best forgone alternative use of a resource.

Partial-sensitivity analysis: A type of sensitivity analysis in which the value of only one variable is changed while holding the values of other variables constant to see how much cost-benefit analysis results change in response.

Perspectives: Used to describe parties—such as taxpayers and crime victims—whose costs and benefits are included in a cost-benefit analysis. It is also said that perspectives included in an analysis have *standing*.

Pre-test and post-test comparisons: A comparison of the same group before and after some treatment or intervention.

Quasi-experimental design: A type of research that uses a variety of statistical methods to create a treatment group and a comparison group and that simulates an experimental design.

Regression analysis: A statistical technique used to model how changes in one or more variables, called independent variables, affect an outcome of interest, called the dependent variable. In cost-benefit analysis, this technique can be used to estimate marginal costs.

Regression discontinuity: A quasi-experimental design that estimates the causal effects of an intervention by comparing outcomes for individuals who fall immediately below and above a threshold that determines assignment into treatment and control groups.

Selection bias: A bias that occurs when assignment to a program is influenced by a factor that also affects the outcome of interest. For example, participation in many correctional programs is conditional on good behavior, confounding estimation of the effect of the program itself on behavior.

Shadow prices: Estimates of the dollar value of intangible costs and benefits that cannot be directly measured. *See **contingent valuation**, **hedonic pricing**, and **jury compensation method**.*

Simultaneity: In regression analysis, simultaneity refers to the problem of a dependent variable and an explanatory variable being jointly determined. For example, the size of a police force can affect the amount of crime, but the amount of crime can also affect the size of a police force.

Standing: *See **perspectives**.*

Statistical power: The probability that a statistical test will reject the null hypothesis when the null hypothesis is false. It is a measure of the sample size required to be confident that an effect, if present, will be detectable.

Statistical significance: An effect size is called statistically significant if the estimate for the study population is highly unlikely, usually 5 percent chance or less, to be observed if the true effect size is zero.

Tangible costs: Costs that can be measured directly in dollar terms. Tangible costs to crime victims include medical expenses, property damage and loss, and lost wages.

Time frame: The period over which benefits and costs are assessed.

Time horizon: *See **time frame**.*

Time value of money: The concept that money is worth more today than in the future because people prefer to spend now rather than later and because today's dollar can be invested for a profit.

Victimless offense: An action that has been ruled illegal but does not directly violate or threaten the rights of another individual. In the United States, victimless crimes include prostitution, gambling, and drug use.

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