Economic Evaluation and Cost-Benefit Analysis

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Economic Evaluation

- Examines a program’s costs and effects
- Major types of economic evaluation
  - Cost-benefit analysis
  - Cost-effectiveness analysis
  - Cost-utility analysis
Cost-Benefit Analysis (CBA)

- Considered “gold standard” of economic evaluation
  - Supports broadest range of comparisons
- Common applications
  - Programs, policies, meta-analysis
- Use in criminal justice is still not mature
CBA and Outcome Evaluation

- Outcome evaluation provides foundation
- CBA can be part of a comprehensive outcome evaluation or an add-on later in time
- Confidence in CBA results linked to underlying evaluation design
Cost-Benefit Analysis (CBA) in Practice

- Benefits - Costs = Return on Investment
- Measurement, valuation can be difficult
  - Benefits can be diverse and may accrue to many different parties
  - Practical balance is key
- Many different approaches
Basic Steps in CBA

- Adopt an analytical perspective
- Identify and value program costs
- Identify and value program benefits
- Adjust monetary values
- Calculate return on investment
- Sensitivity analysis
Analytical Framework

- **Purpose and audience**
  - Whose costs and benefits will be analyzed
    - Taxpayer perspective; government agencies, crime victims
    - Broader societal perspective
  - Time horizon for the analysis
Program Costs

- Value of all resources the program utilizes
  - Type, amount, and when it occurred
  - Complete cost inventory
    - Based on opportunity rather than financial costs
    - Resources where no financial transaction takes place
    - Indirect, downstream cost
Key Concepts

- **Opportunity costs** - Value of a resource had it been used in another way
- **Total cost** - Resources used in a given time period
- **Average cost** - Total cost/number of units of output
- **Marginal cost** - Cost of adding one additional unit of output

- Fixed vs. operational costs
Boot Camp Example

- Total cost = $1.486 million (FY X)
- Average cost
  - Total cost/number of units of output
  - $1.486 million/54 average daily population
  - Average cost = $75 per day
- Marginal cost
  - Cost of adding one more inmate to the boot camp
Capacity Threshold

- At a certain point, a marginal cost increase can result in a fixed cost increase

  Example—when adding an additional inmate will require the building of a new prison facility
Cost Valuation

- Market value
- Shadow price
  - Estimate of the opportunity cost
- Amortize capital costs if they are relevant
Identifying Costs

- Discrete, exhaustive classification scheme
- Many costing approaches
  - Line item, activity area, source of funding
- Top down vs. bottom-up costing
  - Budgets often are an inadequate source
  - Bottom up typically more accurate
Identifying Costs

- Program ingredients
  - Labor, facilities, equipment, supplies, other inputs
- Surveys, time-studies
- Familiarity with program is key
- Any new crimes produced by the program should be included as costs
Program Costs

- **Common budget categories**
  - Direct and indirect
  - Capital and operating
  - Fixed and variable

- **Count only costs due to program**
  - Exclude fixed costs that would be incurred in absence of program
  - Recognize capacity thresholds
Program Benefits

- Positive effects
- Benefit valuation most difficult part of CBA
- Benefits accrue to many different parties
- May be tangible or intangible
  - Tangible has market price, intangible does not
- Societal benefits, life-course gains, many intangibles difficult to measure
Program Benefits

- Focus often limited to victim and justice system savings due to crimes averted
- Savings or gain due to crimes averted
  - Victimization
  - Offender processing
- Valuation based on cost of crime research
  - Cost of a crime and savings produced when that crime is averted are the same
Identifying Benefits

- How much crime was prevented
- What type and when
  - Not all crimes have the same cost impact
- What would the cost have been had each crime been committed
Cost of a Crime

- **Tangible**
  - Realized consequence of a crime: cost to replace stolen item, criminal investigation
  - Anticipatory cost: protection against future victimization

- **Intangible**
  - Realized: victim pain and suffering
  - Anticipatory: fear of crime
Valuing Benefits

- Tangible based on market price
- Intangible estimated using shadow pricing or contingent valuation
  - Willingness to pay study
  - Willingness to accept study
- Proxies often used
  - Existing cost of crime data
Cost of Crime Data

- Victim Costs and Consequences study
  - Tangible and quality of life losses for multiple crime types
  - Criminal justice costs are incomplete

- Other sources
  - Rajkumar and French (1997); Cohen (1998); Roman et al. (2007)

- Jurisdiction-specific criminal justice processing estimates
  - State of Washington
  - Vermont Results First
Cost of Crime

- Costs to victims
  - Direct property losses
  - Expenditures for medical/mental health care
  - Lost wages
  - Pain and suffering
  - Reduced quality of life
  - Death

- Offender processing costs
  - Investigations and arrests
  - Prosecutions
  - Hearings and trials
  - Indigent defense
  - Jail, prison, community-based sanctions, and offender reentry
<table>
<thead>
<tr>
<th>Crime Type</th>
<th>Medical Care/Ambulance</th>
<th>Mental Health Care</th>
<th>Police/ Fire Services</th>
<th>Social/ Victim Services</th>
<th>Property Loss/ Damage</th>
<th>Subtotal: Tangible Losses</th>
<th>Quality of Life</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal Crime</td>
<td>$1,000,000</td>
<td>$16,300</td>
<td>$4,800</td>
<td>$1,300</td>
<td>$0</td>
<td>$1,200</td>
<td></td>
<td>$1,200</td>
</tr>
<tr>
<td>Rape, Assault, etc.</td>
<td>724,000</td>
<td>17,000</td>
<td>4,000</td>
<td>1,000</td>
<td>0</td>
<td>21,600</td>
<td>900</td>
<td>31,400</td>
</tr>
<tr>
<td>Arson Deaths</td>
<td>310,000</td>
<td>60,000</td>
<td>12,000</td>
<td>0</td>
<td>0</td>
<td>5,700</td>
<td></td>
<td>5,700</td>
</tr>
<tr>
<td>DWI</td>
<td>150,000</td>
<td>18,300</td>
<td>4,800</td>
<td>740</td>
<td>0</td>
<td>9,700</td>
<td></td>
<td>19,400</td>
</tr>
<tr>
<td>Child Abuse</td>
<td>2,200</td>
<td>430</td>
<td>2,500</td>
<td>29</td>
<td>1,800</td>
<td>10</td>
<td></td>
<td>4,500</td>
</tr>
<tr>
<td>Sexual Abuse (incl. rape)</td>
<td>2,100</td>
<td>460</td>
<td>5,500</td>
<td>56</td>
<td>1,100</td>
<td>0</td>
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<td>8,800</td>
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<td>Physical Abuse</td>
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<td>790</td>
<td>2,700</td>
<td>20</td>
<td>2,100</td>
<td>26</td>
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<tr>
<td>Emotional Abuse</td>
<td>900</td>
<td>0</td>
<td>2,700</td>
<td>20</td>
<td>2,100</td>
<td>0</td>
<td></td>
<td>8,000</td>
</tr>
<tr>
<td>Rape &amp; Sexual Assault (excluding Child Abuse)</td>
<td>2,200</td>
<td>500</td>
<td>2,200</td>
<td>37</td>
<td>27</td>
<td>30</td>
<td></td>
<td>8,700</td>
</tr>
<tr>
<td>Other Assault or Attempt</td>
<td>950</td>
<td>423</td>
<td>76</td>
<td>60</td>
<td>16</td>
<td>26</td>
<td></td>
<td>2,770</td>
</tr>
<tr>
<td>NCVS with Injury</td>
<td>3,100</td>
<td>1,470</td>
<td>97</td>
<td>84</td>
<td>46</td>
<td>30</td>
<td></td>
<td>8,000</td>
</tr>
<tr>
<td>Age 0-17 with Injury</td>
<td>2,800</td>
<td>1,470</td>
<td>100</td>
<td>84</td>
<td>46</td>
<td>39</td>
<td></td>
<td>8,540</td>
</tr>
<tr>
<td>Non-NCVS Domestic</td>
<td>720</td>
<td>510</td>
<td>81</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td></td>
<td>1,560</td>
</tr>
<tr>
<td>No Injury</td>
<td>720</td>
<td>510</td>
<td>81</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td></td>
<td>1,560</td>
</tr>
<tr>
<td>Robbery or Attempt</td>
<td>950</td>
<td>370</td>
<td>66</td>
<td>130</td>
<td>25</td>
<td>750</td>
<td></td>
<td>2,000</td>
</tr>
<tr>
<td>With injury</td>
<td>2,500</td>
<td>1,000</td>
<td>65</td>
<td>160</td>
<td>44</td>
<td>1,400</td>
<td></td>
<td>5,200</td>
</tr>
<tr>
<td>No Injury</td>
<td>75</td>
<td>0</td>
<td>66</td>
<td>110</td>
<td>15</td>
<td>400</td>
<td></td>
<td>700</td>
</tr>
<tr>
<td>Drunk Driving</td>
<td>2,800</td>
<td>1,400</td>
<td>82</td>
<td>40</td>
<td>?</td>
<td>1,600</td>
<td></td>
<td>4,200</td>
</tr>
<tr>
<td>With injury</td>
<td>12,100</td>
<td>6,400</td>
<td>62</td>
<td>120</td>
<td>?</td>
<td>3,600</td>
<td></td>
<td>22,300</td>
</tr>
<tr>
<td>No Injury</td>
<td>170</td>
<td>0</td>
<td>62</td>
<td>0</td>
<td>10</td>
<td>100</td>
<td></td>
<td>170</td>
</tr>
<tr>
<td>Arson</td>
<td>1,750</td>
<td>1,100</td>
<td>18</td>
<td>1,000</td>
<td>?</td>
<td>15,500</td>
<td></td>
<td>19,500</td>
</tr>
<tr>
<td>With injury</td>
<td>15,400</td>
<td>10,000</td>
<td>24</td>
<td>1,000</td>
<td>?</td>
<td>22,400</td>
<td></td>
<td>40,200</td>
</tr>
<tr>
<td>No Injury</td>
<td>8</td>
<td>0</td>
<td>18</td>
<td>1,000</td>
<td>0</td>
<td>14,600</td>
<td></td>
<td>16,000</td>
</tr>
<tr>
<td>Larceny or Attempt</td>
<td>8</td>
<td>0</td>
<td>6</td>
<td>80</td>
<td>1</td>
<td>270</td>
<td></td>
<td>370</td>
</tr>
<tr>
<td>Burglary or Attempt</td>
<td>12</td>
<td>0</td>
<td>5</td>
<td>130</td>
<td>5</td>
<td>970</td>
<td></td>
<td>1,800</td>
</tr>
<tr>
<td>Motor Vehicle Theft or Attempt</td>
<td>45</td>
<td>0</td>
<td>3</td>
<td>140</td>
<td>0</td>
<td>3,300</td>
<td></td>
<td>3,500</td>
</tr>
</tbody>
</table>

Notes: All estimates in 1993 dollars. Totals may not add due to rounding. Major categories are in bold, subcategories listed under bold headings. *Child neglect is not included in any of the total figures reported in the remaining tables. See text.
Offender Processing Costs: Primary Data Collection

- Resource intensive but doable
- Focus on processing stages and agencies
- Determine flow through system and processing costs at various stages
  - Marginal costs most accurate
  - Average costs often used by default
The Washington State Institute for Public Policy's
Cost-Benefit Model for the Criminal Justice System:
Types of Crimes and Resource Costs Analyzed

<table>
<thead>
<tr>
<th>Six Types of Crime</th>
<th>Fourteen Types of Resource Costs Incurred</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Murder/Manslaughter</td>
<td>1. Police and Sheriffs’ Offices</td>
</tr>
<tr>
<td>2. Rape/ Sex Offenses</td>
<td>2. Superior Courts &amp; County Prosecutors</td>
</tr>
<tr>
<td>3. Robbery</td>
<td>3. Juvenile Detention, with Local Sentence</td>
</tr>
<tr>
<td>4. Aggravated Assault</td>
<td>4. Juvenile Detention, with JRA Sentence</td>
</tr>
<tr>
<td>5. Felony Property Crimes</td>
<td>5. Juvenile Local Probation</td>
</tr>
<tr>
<td></td>
<td>7. Juvenile Rehabilitation, Parole</td>
</tr>
<tr>
<td></td>
<td>8. Adult Jail, with Local Sentence</td>
</tr>
<tr>
<td></td>
<td>9. Adult Jail, with Prison Sentence</td>
</tr>
<tr>
<td></td>
<td>10. State Community Supervision, Local Sentence</td>
</tr>
<tr>
<td></td>
<td>11. Department of Corrections, Institutions</td>
</tr>
<tr>
<td></td>
<td>12. Dept. of Corrections, Post-Prison Supervision</td>
</tr>
<tr>
<td></td>
<td>13. Crime Victim Monetary Costs</td>
</tr>
<tr>
<td></td>
<td>14. Crime Victim Quality of Life Costs</td>
</tr>
</tbody>
</table>
# Offender Processing Costs

**Exhibit B.2**

Estimates of Marginal Resource Operating Costs, Per Unit

<table>
<thead>
<tr>
<th>System Component</th>
<th>Units Used in Cost Estimate</th>
<th>Costs, Per Unit, By Type of Crime</th>
<th>Costs Paid by Crime Victims</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Murder</td>
<td>Manslaughter</td>
</tr>
<tr>
<td>Police and Sheriff's Offices</td>
<td>$ Per Arrest</td>
<td>$31,648</td>
<td>$6,413</td>
</tr>
<tr>
<td>Superior Courts &amp; County Prosecutors</td>
<td>$ Per Conviction</td>
<td>$127,505</td>
<td>$6,665</td>
</tr>
<tr>
<td>Juvenile Detention, with Local Sentence</td>
<td>Annual $ Per ACP</td>
<td>$10,500</td>
<td>$30,100</td>
</tr>
<tr>
<td>Juvenile Probation</td>
<td>Annual $ Per ACP</td>
<td>$1,522</td>
<td>$1,522</td>
</tr>
<tr>
<td>Juvenile Rehabilitation, Institutions</td>
<td>Annual $ Per ACP</td>
<td>$16,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Juvenile Rehabilitation, Parole</td>
<td>Annual $ Per ACP</td>
<td>$8,000</td>
<td>$8,000</td>
</tr>
<tr>
<td>Adult Jail, with Local Sentence</td>
<td>Annual $ Per ACP</td>
<td>$17,047</td>
<td>$17,047</td>
</tr>
<tr>
<td>Adult Community Supervision, Local Sentence</td>
<td>Annual $ Per ACP</td>
<td>$2,688</td>
<td>$2,688</td>
</tr>
<tr>
<td>Department of Corrections, Institutions</td>
<td>Annual $ Per ACP</td>
<td>$23,800</td>
<td>$23,800</td>
</tr>
<tr>
<td>Department of Corrections, Post-Prison Supervision</td>
<td>Annual $ Per ACP</td>
<td>$2,688</td>
<td>$2,688</td>
</tr>
</tbody>
</table>

**Victim Costs—Monetary, Out of Pocket Costs**

|                  | $ Per Crime | $1,096,626 | $6,413 | $2,913 | $6,159 | $5,103 | $0 | $0 | 1996 | 0.0% |

**Victim Costs—Quality of Life**

|                  | $ Per Crime | $2,038,966 | $30,100 | $30,100 | $30,100 | $30,100 | $30,100 | $30,100 | 1996 | 0.0% |

Source: WSIPP, Aos et al. (2006)
### Exhibit B.3

**Adult Sentence and Resource Use Information**

<table>
<thead>
<tr>
<th>Crime</th>
<th>Percent Receiving Prison Sentence</th>
<th>Percent Receiving Community Supervision Sentence</th>
<th>Average Prison Sentence, in Years</th>
<th>Average Prison Length of Stay, in Years</th>
<th>Post-Prison Supervision, in Years</th>
<th>Average Jail Length of Stay, in Years</th>
<th>Average Community Supervision Length of Stay, in Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murder/Manslaughter</td>
<td>96%</td>
<td>2%</td>
<td>16.0</td>
<td>13.4</td>
<td>2.6</td>
<td>0.85</td>
<td>1.00</td>
</tr>
<tr>
<td>Rape</td>
<td>38%</td>
<td>62%</td>
<td>7.9</td>
<td>6.9</td>
<td>3.0</td>
<td>0.29</td>
<td>2.00</td>
</tr>
<tr>
<td>Robbery</td>
<td>74%</td>
<td>26%</td>
<td>5.3</td>
<td>3.9</td>
<td>2.0</td>
<td>0.47</td>
<td>1.00</td>
</tr>
<tr>
<td>Aggravated Assault</td>
<td>39%</td>
<td>61%</td>
<td>3.3</td>
<td>2.7</td>
<td>2.0</td>
<td>0.35</td>
<td>1.00</td>
</tr>
<tr>
<td>Property</td>
<td>31%</td>
<td>69%</td>
<td>2.2</td>
<td>1.6</td>
<td>0.0</td>
<td>0.23</td>
<td>1.00</td>
</tr>
<tr>
<td>Drug</td>
<td>35%</td>
<td>65%</td>
<td>1.9</td>
<td>1.3</td>
<td>1.0</td>
<td>0.24</td>
<td>1.00</td>
</tr>
<tr>
<td>Misdemeanor</td>
<td>0%</td>
<td>100%</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.25</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Source: WSIPP, Aos et. al. (2006)
Adjusting Monetary Values

- Adjusting for inflation
  - Monetary value expressed in real terms
  - Base year is usually the most recent
  - Based on Consumer Price Index

- Discounting
  - Future values
  - Accounts for time value of money
  - Use a web-based “present value” calculator
Adjusting for Inflation

- Year Annual
  1994, 148.2
  1995, 152.4
  1996, 156.9
  1997, 160.5
  1998, 163.0
  1999, 166.6
  2000, 172.2
  2001, 177.1
  2002, 179.9
  2003, 184.0
  2004, 188.9

- To adjust a $100 cost in the year 2000 to base year 2004 dollars:
  $100 \times \left( \frac{\text{CPI value for the year 2004}}{\text{CPI value for the year 2000}} \right) = $110

- $100 \times \left( \frac{188.9}{172.2} \right) = $110
Discounting

<table>
<thead>
<tr>
<th>Year</th>
<th>$Value</th>
<th>Present value = Future value/(1+discount rate) ( ^{\text{year}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>$25,000</td>
<td>$25,000/(1+.03)^{1} = 24,271</td>
</tr>
<tr>
<td>2007</td>
<td>$10,000</td>
<td>$10,000/(1+.03)^{2} = 9,434</td>
</tr>
</tbody>
</table>

Where year is equal to 1 for next year, 2 for the following year, 3 for the following, etc.

Using a 3% discount rate
Calculate Economic Summary Statistics

- Benefit Cost Ratio
  Benefits divided by costs

- Net Value
  Benefits minus costs
WSIPP Adult Drug Court Example

- Criminal justice costs avoided per participant .... $3,759
- Crime victim costs avoided per participant ........ $3,020
- Total costs avoided per participant $6,779

- Costs of the drug court per participant ............ $3,891

- Net value per drug court participant ............... $2,888
  (Benefits $6,779 – Costs $3,891 = $2,888)

- BCR = $1.74 ($1.74 in benefits for each $1 of cost)
  (Benefits $6,779 /Costs $3,891 = $1.74)

Source: Barnoski and Aos (2003)
Sensitivity Analysis

- Attempts to address uncertainty
- Tests the response of CBA results to different assumptions
  - Analytical perspective
  - Modeling sometimes used
  - Alter discount rate, monetary values
Cost-Effectiveness

- Cost-effectiveness ratio = cost/effect
  - Cost/crimes prevented
  - Total cost $10,000/25 crimes prevented
  - CE ratio = $400 per crime prevented

- Program comparisons possible only when outcome objectives are the same
CBA and Decision Making

- **Significant value for decision making**
  - Economic perspective is compelling; CBA supports broadest range of comparisons

- **Cautions and limitations**
  - Direction, magnitude vs. precision
  - Cross-study comparability
  - CBA lacks capacity to address need
  - Program scale-up

- **Net value and BCR should be reported**

- **Transparency is critical**
CBA Examples

- Imprisonment in Three States

- Breaking the Cycle

- Diverting Children from Life of Crime

- DNA Field Experiment
  - https://www.urban.org/sites/default/files/publication/31856/411697-The-DNA-Field-Experiment.PDF
Resources

- WSIPP (www.wsipp.wa.gov)
- Vera Institute, Cost Benefit Knowledge Bank (www.vera.org/projects/cost-benefit-knowledge-bank-for-criminal-justice/)
- Univ. of Miami, DATCAP (www.datcap.com)
- Urban Institute (www.urban.org)
- JRSA Juvenile Justice Evaluation Center handbook (www.jrsa.org)
- NIJ Research in Brief (https://www.ojp.gov/pdffiles1/nij/246769.pdf)
Resources

Questions?