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An Introduction to Cost-Effectiveness and Benefit-Cost Analyses in Education Research

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MAP ACADEMY

Outline

- Overview and Motivation
- Cost Analysis
- Cost-Effectiveness Analysis
- Benefit-Cost Analysis
- Additional Considerations

Acknowledgement

- The Center for Benefit-Cost Studies of Education (CBCSE; cbcse.org) is at the forefront of economic evaluation in education research
  - Tons of resources and examples on their website
  - IES-funded methods training program (now closed)
- Content and organization of presentation is based on their textbook (Levin, et al., 2018)

Overview and Motivation

Economic Evaluation/Analysis

- "Broad set of techniques for evaluation and decision-making" (Levin et al., p. 3)
  - Cost Analysis or Cost Feasibility Analysis (CA/CF)
  - Cost-Effectiveness or Cost-Utility Analysis (CEA/CU)
  - Benefit-Cost Analysis (BCA)

Type	Procedure	Advantages	Disadvantages	Examples
CA/CF	**Estimate** average annual cost of program implementation per participant (or total or marginal cost)	Fully explicate program resources and who finances resources Rule out unaffordable alternatives	No consideration of program outcomes	Bowden et al. (2017)
CEA	**Estimate** incremental cost to achieve 1-unit increase in effectiveness, relative to an alternative program with common goals	Consider costs & outcomes "Straightforward" extension to traditional effectiveness studies	Effectiveness must be represented by a single measure Limited to relative conclusions Alternatives must target (& identically measure) the same outcome	Hollands et al. (2013)
CU	**Estimate** incremental cost to achieve 1-unit increase in utility, relative to an alternative program with common goals	Consider costs & outcomes Allow for multiple effectiveness measures Account for stakeholder preferences	Must determine how to define, weight, & combine utilities Limited to relative conclusions Alternatives must target (& identically measure) the same outcomes	Lewis et al. (1994)
BCA	**Estimate** a program's monetized effects (benefits) relative to its monetized costs	Consider costs & outcomes Provide absolute information Capture all benefits and for as long as they last Compare diverse alternatives	Difficult to monetize some impacts Long-term benefits generally require projection	Belfield et al. (2015) Bowden et al. (2015) Levin & Garcia (2013)

Based in part on Table 1.1 (p. 22; Levin et al., 2018)

Motivation

- Optimize scarce resources and maximize educational outcomes
- Improve education policy via evidence-based decision-making
- Meet the requirements of funding agencies
- Justify use of a particular program

Example Research Questions

- Is the program affordable? (CA/CF)
- Who primarily bears the costs? (CA/CF)
- How scalable is the program? (CA/CF)
- Given a fixed budget, which program (among those with a *common* goal) is most effective (CEA)?
- Given a minimum level of effectiveness, which program (among those with a *common* goal) is least costly? (CEA)?
- Do the returns on the program justify its costs? (BCA)
- Among alternatives targeting the same OR different outcomes, which program is the most "socially desirable investment"? (BCA)

Key Considerations

- Purpose
- Audience
- Perspective
- Relevant alternatives
- Timespan of evaluation
- Analytic method

Cost Analysis

Purpose

- Fully explicate program resources and financing of resources
- Rule out unaffordable alternatives
- First step of larger evaluation (CEA or BCA)

Defining Costs

- “All the resources that are involved in ‘making the intervention work’” (p. 51; Levin et al., 2018)
  - Costs directly tied to program implementation
  - Induced costs (Bowden et al., 2017)
- Opportunity cost (value is next best use)
- Incremental vs. total costs
- Costs vs. who finances costs
- Budgets and expenditure reports ≠ cost analysis

Estimating and Reporting Costs: The Ingredients Method

1) Determine program “ingredients”
2) Assign a value (price) to each ingredient
3) Calculate costs
4) Identify optimal presentation of costs

Determining Ingredients (Step 1)

- Identify all resources needed to replicate effects, e.g.,
  - Personnel (e.g., teachers, volunteers, coaches)
  - Facilities (e.g., classroom space)
  - Equipment/materials (e.g., software, textbooks)
  - Other program inputs (e.g., scholarship funds)
  - Client inputs (e.g., parents' time but usually not children's time)
- Fully detail resources, e.g.,
  - Qualifications (e.g., certifications, experience)
  - Dimensions/Characteristics (e.g., sq ft, special features)
  - Dosage/Quantity (e.g., % of usable time allocated to program)

Sampling Procedures

- Existing program descriptions are generally insufficient
  - Lack precise information about ingredients' characteristics
  - Fail to capture site-by-site variability
  - Describe *intended* resources which may not correspond to the *actual* resources tied to observed impacts
- Need to sample information from implementation sites
  - Use traditional data collection methods
  - Perform concurrently with program implementation

Assigning Prices (Step 2)

- Local (site-specific) prices vs. national (expected) prices
  - Local prices are subject to greater sampling error and are less generalizable, but may be more meaningful to primary stakeholders
  - National prices are more generalizable and thus may be more meaningful to secondary audience(s)
- Market prices vs. shadow prices
  - Market prices can be drawn from national databases (e.g., see Hollands et al., 2015) or site-specific documents (e.g., for local prices)
  - Shadow prices are needed in the absence of market prices and are estimated as the value of the ingredient's next best use
- Account for characteristics of ingredients when identifying prices

Adjusting Prices

Hollands, Hanisch-Cerda, Menon et al. (2015)

- Inflation
  - Convert prices to the same time period
  - $AP = P \times (IE/IP)$
- Geographic location
  - (Potentially) convert national prices to local prices
  - $GP = P \times \left(RPP_e/RPP_p\right)$
- Amortization/Depreciation
  - Calculate adjusted annual costs for assets with lifetime > 1 year (e.g., training, owned facilities)
  - $AC = P \times [R \times (1+R)^L]/[(1+R)^L - 1]$
- Discounting
  - Compute present value (prefer future cost [immediate benefit] to immediate cost [future benefit])
  - $PV = P \times e^{D \times (1-Y)}$
- Personnel Benefits
  - Adjust salary/wage estimates to account for fringe benefits
  - $TC = W \times (1+B)$

AP = inflation-adjusted price; P = unadjusted price; IE = inflation index for year in which prices will be expressed; IP = inflation index for year of unadjusted price. GP = geographically-adjusted price. $\mathrm{RPP_e}$ = geographical index for location in which prices will be expressed. $\mathrm{RPP_p}$ = geographical index for location of unadjusted price. AC = annual cost; R = interest rate; L = lifetime of asset; PV = present value; D = discount rate; Y = year of cost or impact; TC = total compensation; W = wages; B = benefits rate (% of wages)

Calculating Costs (Step 3)

- Cost of ingredient = $C_i = P_i \times Q_i$
- Total cost of program implementation = $\sum_i C_i$
- Average cost per program participant = $\sum_i C_i / N$
- Marginal cost (less straightforward)

C_i = cost of i^{th} ingredient;
P_i = price of i^{th} ingredient;
Q_i = quantity of i^{th} ingredient;
N = number of program participants

Reporting Costs (Step 4)

- Report annual (per intervention year) cost
- Provide aggregate-level information (e.g., average cost)
- Disaggregate information where meaningful, e.g., by
  - constituency (e.g., highlight who finances the costs)
  - site (e.g., identify site-by-site variability)
  - ingredient (e.g., inform scalability questions)
  - year (e.g., identify savings due to increased efficiency)
  - demographic group (e.g., highlight impact of dosage)

Example Cost Table (p. 9; Bowden et al., 2017)

Table 3. Distribution of Core Costs of *City Connects* in Boston.

Ingredients	Total Cost (PV)	Cost to *City Connects*	Cost to School	Cost to Parents
Personnel				
Central program staff	US$174,580	US$174,580	US$0	US$0
School site coordinators	US$900,040	US$900,040	US$0	US$0
School staff	US$93,140	US$0	US$93,140	US$0
Parental involvement	US$4,990	US$0	US$0	US$4,990
Materials	US$5,040	US$2,870	US$2,170	US$0
Facilities	US$16,410	US$0	US$26,760	US$0
Total	US$1,204,560	US$1,077,490	US$122,070	US$4,990
Percentage		89.5	10.1	0.4

Note. Core costs averaged across sites and weighted for site size in 2013–2014. Present value (PV) based on 6 years participation (K–5), discounted back to kindergarten using 3.5% discount rate, expressed in constant 2013 dollars using Boston average prices.

CostOut – the CBCSE Cost Tool Kit

Hollands, Hanisch-Cerda, Levin et al., 2015

- Free online tool developed by CBCSE to facilitate cost analyses
- Includes a multi-source database with national market prices
- Automatically makes price adjustments
- Automatically calculates costs given ingredient quantities and prices
- Disaggregates costs across ingredients and constituencies
- Incorporates effectiveness information for CEA
- Offers simple comparative reports
- For more detail see Hollands, Hanisch-Cerda, Menon et al. (2015)

Hypothetical Example (HYPE!)

- HYPE! is a 9-wk afterschool intervention aimed at decreasing aggression in K-3rd graders with behavior concerns
- Ingredients of intervention (100 kids across 20 schools)
  - Personnel
    - 20 teachers (no special qualifications), each 3 hrs/wk
    - 20 coaches, each 1 hr/wk
  - Facilities
    - 20 classrooms, each 900 sq ft with lifetime of 30 years, 3 hrs/wk
  - Client Inputs
    - 100 parents, each 1 hr/wk for meetings, 12 mi/wk and .5 hr/wk for transportation

HYPE! Costs

Expressed in constant 2016 dollars using national prices and inflation rate of 3.5%, and assuming 1440 hrs/academic year

Ingredient	Unit	Quant	% Use	Unadj. Price	Price Year	Price Source	Benefit Rate	Adjust. Price	Total Cost
Teacher	Hour	3*9 *20 = 540	100	40.00	2015	CostOut: Elementary school teacher grades K-6	0.50	40*(711.104/709.997)*(1+.50) = 60.24	60.24*540 = 32531.91
Coach	Hour	20*9 = 180	100	31.91	2011	CostOut: Teacher (education specialist) grades K-12	0.50	31.91*(711.104/673.818)*(1+.5) = 50.64	50.64*180 = 9115.49
Classroom	Unit	20	(3*9)/ 1440 =1.88	314232.21	2015	CostOut: Elementary classroom (900 sq ft)		314232.21*(711.104/709.997) *((0.035*(1+0.035)^30)/ ((1+0.035)^30-1)) = 17111.86	17111.86* 20*0.0188 = 6434.06
Parent	Hour	100* 1.5*9 = 1350	100	24.14	2016	Independent Sector (value of volunteer time, includes fringe benefits)		24.14	24.14*1350 = 32589.00
Transport	Mile	100* 12*9 = 10800	100	0.54	2016	IRS (standard mileage rate)		0.54	.54*10800 = 5832.00
Total Cost									86502.46
Cost/Student									86502.46/100 = 865.02

Cost-Effectiveness Analysis

Purpose

- Identify, among alternatives with common goals, the program that optimizes educational resources with respect to maximizing educational outcomes

Performing a CEA

1) For all relevant alternatives, concurrently estimate *incremental* program costs and impacts (effects) relative to those of a baseline group
2) Calculate cost-effectiveness ratios (CERs)
3) Compare and rank alternatives programs

Measuring Effectiveness (Step 1b)

- Program impact as indicated by the theory of change
- Strength of evidence depends on the study design
- Standardized effects facilitate interpretation
- Same effectiveness measure needed for all alternatives
- Discounting needed if programs vary in timing of effect
- Programs often target multiple domains at multiple time points but CEA requires a single measure of effectiveness

Calculating CERs (Step 2)

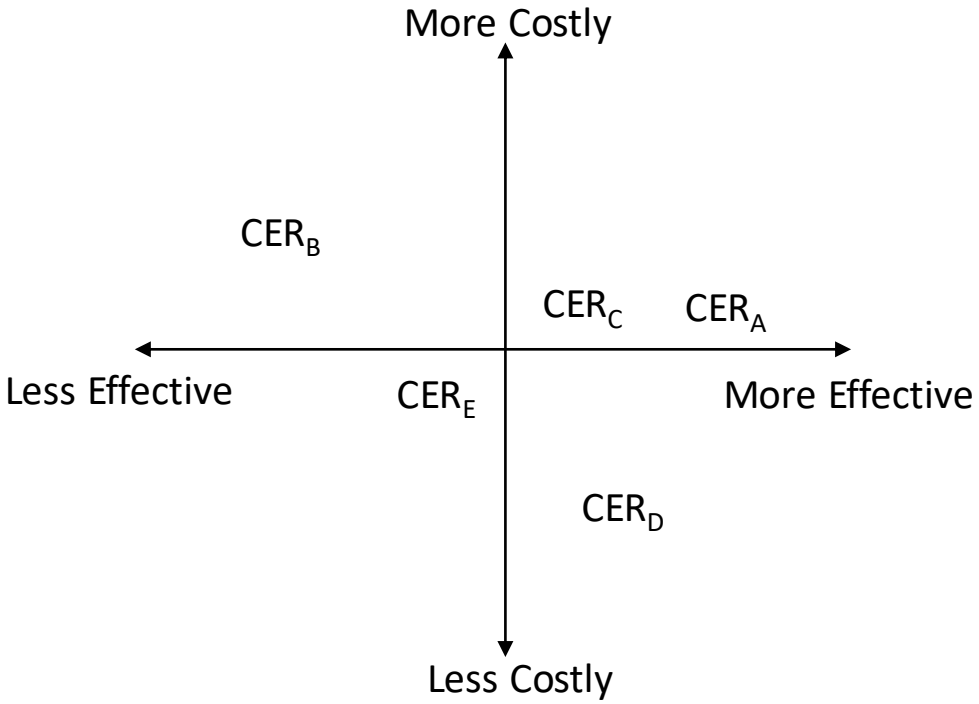
- CERs indicate the *incremental* cost per participant needed to achieve a 1-unit increase in effectiveness per participant, relative to an alternative program with common goals
- $\mathrm{CER} = (C_T - C_C)/(E_T - E_C) = (\Delta C)/(\Delta E)$

C_T = Average cost per participant for target program
C_C = Average cost per participant for alternative program
E_T = Average effectiveness per participant for target program
E_C = Average effectiveness per participant for alternative program

Comparing Alternatives (Step 3)

- Generally prefer alternative with smallest CER but consider
  - sign of ΔC and ΔE
  - relative magnitude of ΔC and ΔE in relation to budget restrictions or minimum required level of effectiveness
  - heterogeneity in CERs

Example Cost-Effectiveness Map



- Origin represents baseline comparison group
- Southeast quadrant is optimal (more effective and less costly)
- Northeast quadrant is more likely (more effective and more costly)

HYPE! Hypothetical CEA

- An RCT was performed to evaluate the impact of HYPE! on aggression as measured by the BASC-3 TRS Aggression scale
- The mean aggression score for HYPE! students was .13 SDs lower than the score for BAU students
- $CER = 865.02/(-.13) = -6654$, i.e., it takes an additional $6654 per student to decrease aggression by 1 SD unit (relative to BAU)

Multiple Measures of Effectiveness

- The CER necessitates one effectiveness measure
- Options for handling multiple measures include
  - calculating multiple CERs to either (a) reveal a clear "winner," or (b) highlight program tradeoffs
  - conducting a CU
  - conducting a BCA

Performing a CU

- Similar to CEA but denominator represents utility (U)
- Use Multiattribute Utility Theory as a guiding framework
  - Choose method for determining individual utilities, $U_i(x_i)$ (e.g., proportional scoring, direct method, variable probability method)
  - Choose method for determining individual importance weights, w_i (e.g., direct method, variable probability method)
  - Choose function for combining $U_i(x_i)$, e.g., $U = \sum_{i=1}^{M} w_i U_i(x_i)$
- Rarely performed in education research
  - Requires sampling preference data from relevant populations
  - Relies heavily on judgment and makes strong assumptions

Benefit-Cost Analysis

Purpose

- Determine, in an absolute sense, whether a program is a “socially desirable investment”
- Determine whether a program is a more “socially desirable investment” than alternative programs, including
  - education programs with common goals
  - education programs with different goals
  - non-education programs with different goals

Performing a BCA

1) Estimate immediate program costs and impacts, and predict long-term impacts
2) Monetize costs and impacts using appropriate price adjustments
3) Calculate economic metrics to combine monetized costs and impacts
4) Evaluate program

Measuring Impacts (Step 1b)

- Consider ALL (ideally causally-linked) program impacts as soon as they occur and for as long as they last
  - Immediate impacts (e.g., decrease in externalizing behaviors)
  - Intermediate impact (e.g., decrease in HS dropout rate)
  - Long-term impacts (e.g., increase in wages, improved health)
- Immediate impacts are directly observed
- Longer-term impacts are typically predicted, e.g., via
  - secondary analyses of large-scale federally-funded datasets
  - published meta-analytic findings (e.g., see WSIPP, 2017)

Snapshot of Exhibit A1 (p. 184; WSIPP, 2017)

Estimated causal links between outcomes	Number of effect sizes	Meta-analytic results before adjusting effect sizes								Adjusted effect size and standard error used in the benefit-cost analysis	
		Fixed effects model					Random effects				
		Weighted mean effect size & p-value			Homogeneity test (p-value to reject homogeneity)		Weighted mean effect eize & p-value				
		ES	SE	p-value	Q-stat	p-value	ES	SE	p-value	ES	SE
Cannabis use <18 years of age, leading to...											
Crime	1	0.271	0.130	0.038	0.000	0.000	0.271	0.130	0.038	**0.27**	**0.13**
High school graduation	13	-0.180	0.016	0.000	109.830	0.000	-0.235	0.064	0.000	**-0.23**	**0.06**
Crime (non-offender pop), leading to...											
High school graduation	6	-0.421	0.029	0.000	23.957	0.000	-0.505	0.079	0.000	**-0.51**	**0.08**
Crime (offender pop), leading to...											
High school graduation	4	-0.174	0.043	0.000	6.516	0.089	-0.191	0.066	0.004	**-0.19**	**0.07**
Depression, leading to...											
Employment	11	-0.296	0.018	0.000	97.244	0.000	-0.336	0.064	0.000	**-0.34**	**0.06**
Earnings given employment	3	-0.022	0.021	0.284	1.083	0.582	-0.022	0.021	0.284	**-0.02**	**0.02**
High school graduation	see Internalizing composite										
Grade retention	see Internalizing composite										
Diabetes, leading to...											
Employment	5	-0.210	0.012	0.000	26.193	0.000	-0.251	0.043	0.000	**-0.25**	**0.04**
Earnings given employment	3	-0.027	0.030	0.366	0.417	0.812	-0.027	0.030	0.366	**-0.03**	**0.03**
Nursing home	8	0.212	0.008	0.000	20.497	0.005	0.210	0.046	0.000	**0.21**	**0.05**
Disruptive Behavior Disorder, leading to...											
High school graduation	5	-0.429	0.029	0.000	6.063	0.195	-0.452	0.046	0.000	**-0.45**	**0.05**
Grade retention	4	0.273	0.055	0.000	1.155	0.764	0.273	0.055	0.000	**0.27**	**0.05**
Test scores-academic	see Externalizing composite										
Special education	see Externalizing composite										
Crime	see Externalizing composite										
Drug Disorder, leading to...											
Employment	5	-0.270	0.033	0.000	12.470	0.014	-0.293	0.059	0.000	**-0.29**	**0.06**
Crime	2	0.304	0.056	0.000	0.072	0.788	0.304	0.056	0.000	**0.30**	**0.06**
Externalizing behavior symptoms, leading to...											
High school graduation	3	-0.225	0.029	0.000	1.261	0.532	-0.225	0.029	0.000	**-0.22**	**0.03**

Monetizing Impacts (Step 2)

- A benefit (B_i) is a monetized impact ($P_i \times E_i$)
  - P_i is typically a shadow price
  - Benefits may be positive or negative
  - Some benefits are ignored because they cannot be monetized
- Total benefits $= B = \sum_{y=1}^{L} \sum_{i=1}^{M} B_{yi} = \sum_{y=1}^{L} \sum_{i=1}^{M} P_{yi} \times E_{yi}$
  - Avoid double-counting benefits
  - Adjust prices as previously discussed (e.g., for inflation, discounting)
  - Adjust effects via ratchet and fadeout functions to capture growth and decay (e.g., see WSIPP, 2017; Belfield et al., 2015)

L = Number of years impact persists
M = Number of impacts

Snapshot of Exhibit 2.7.1 (p. 27; WSIPP, 2017)

Current WSIPP Decay Factors by Outcome

Outcome	ES at time 2	SE at time 2	Time 2
Child abuse & neglect	ES1	SE1	Age 17
Out-of-home placement	ES1	SE1	Age 17
Substance abuse prevention outcomes	ES1	SE1	Age at Time 1 + 10
Substance abuse treatment outcomes			
For most programs	0	0.187	Age at Time 1 + 3
Contingency management (higher-cost)	0	0.125	Age at Time 1 + 1
Contingency management (lower-cost)	0	0.075	Age at Time 1 + 1
Substance abuse outcomes Brief intervention strategies	ES1 * 0.137	$\sqrt{(SE1^2 * 2.25)}$	Age at Time 1 + 2
Crime	ES1	SE1	Age at Time 1 + 10
Adult depression, adult anxiety	ES1 * 0.52	$(SE1^2 * 1.5)^{0.5}$	Age at Time 1 + 2
Adult PTSD	ES1	SE1	Age at Time 1 + 1
Adult psychosis	ES1 * 0.743	$(ES1^2 * 0.569^2 + 0.743^2 * SE1^2 + SE1^2 * 0.569^2)^{0.5}$	Age at Time 1 + 1
Child PTSD	ES1	SE1	Age at Time 1 + 1
Child ADHD	0	$(ES1^2 * 0.048^2 + 0.00317^2 * SE1^2 + SE1^2 * 0.048^2)^{0.5}$	Age at Time 1 + 1
Child depression	ES1 * 0.00099	$(ES1^2 * 0.0811^2 + 0.00099^2 * SE1^2 + SE1^2 * 0.0811^2)^{0.5}$	Age at Time 1 + 1
Child anxiety	ES1* 0.4623	$(ES1^2 * 0.0992^2 + 0.4623^2 * SE1^2 + SE1^2 * 0.0992^2)^{0.5}$	Age at Time 1 + 1
Child internalizing	ES1 * 0.72848	$(ES1^2 * 0.2803^2 + 0.7285^2 * SE1^2 + SE1^2 * 0.2803^2)^{0.5}$	Age at Time 1 + 2
Child externalizing, child disruptive behavior	ES1 *0.47646	$(ES1^2 * 0.2012^2 + 0.47646^2 * SE1^2 + SE1^2 * 0.2012^2)^{0.5}$	Age at Time 1 + 3

Exhibit 4.7.9 (p. 122; WSIPP, 2017)

Exhibit 4.7.9

Fadeout Multipliers for Test Scores:
Estimates of Effect Size Decay Based on Longitudinal Evaluations of Early Childhood Education

Age at measurement	Grade level	Fadeout: Later test score effect size as a % of pre-K effect size	Fadeout multiplier: Multiply the effect size by the % below to estimate end-of-high school effect
4	Pre-K	100%	21%
5	K	66%	31%
6	1	52%	40%
7	2	44%	47%
8	3	38%	54%
9	4	34%	60%
10	5	31%	66%
11	6	29%	72%
12	7	27%	77%
13	8	25%	82%
14	9	24%	87%
15	10	23%	91%
16	11	22%	96%
17	12	21%	100%

Shadow Pricing Methods

- Market analogy method
  - Use market prices for comparable goods (e.g., cost of hiring a tutor to increase test scores; cost of hiring someone to perform volunteer's services)
- Defensive expenditure method
  - Use estimates of how much society is willing to pay to avoid negative outcomes (e.g., cost-of-illness approach; cost of additional school security)
- Hedonic method
  - Use estimates of how much people are willing to pay to live in a good school district (e.g., via unique variability in home prices predicted by test scores)
- Trade-off method
  - Variation of defensive expenditure and hedonic methods
- Contingent valuation method
  - Survey people about how much they are willing to pay

Existing Shadow Prices

- Many shadow prices have been derived for use in economic analyses, e.g.,
  - Lifetime earnings via educational attainment (Table 9.3; Levin et al., 2018)
  - Value of outcomes tied to the labor market, crime, child abuse and neglect, ATOD, teen birth, public assistance, K-12 and higher education, mental health, health care (WSIPP, 2017)
  - Quality-adjusted life years (QALYs) via educational attainment (e.g., Muennig et al., 2010; Schoeni et al., 2011)
  - Value of social and emotional learning outcomes (Belfield et al., 2015)
  - Value of a statistical life (e.g., EPA, 2017)
- Advantages and disadvantages of using existing prices
  - Greater credibility by using prices that are well-established and causally-linked
  - Requires “benefit transfer” step

Calculating Metrics (Step 3)

- Net Present Value
  - $NPV = B_{PV} - C_{PV}$
  - Extent to which total benefits exceed total costs
- Benefit-Cost Ratio
  - $BCR = B_{PV}/C_{PV}$
  - "For every dollar invested in this…program, there will be a return of [$$]" (p. 225; Levin et al., 2018)
- Internal Rate of Return (IRR)
  - Discount rate that results in $NPV = 0$

Evaluating Programs (Step 4)

- Programs are evaluated positively when
  - $NPV > 0$
  - $BCR > 1$
  - No real threshold for a "good" IRR but $\geq .1$ is a rough guideline (Levin et al., 2018)
- Use caution when comparing programs due to
  - differences in their scale of implementation
  - differences in extent to which impacts can be monetized
- Remember audience and perspective

HYPE! Hypothetical BCA

- Conservative analysis
  - Only considered single immediately observed impact (aggression)
  - Assumed complete fade-out after 1 year
- Cost-of-illness approach for shadow pricing
  - Prices derived by Foster et al. (2005), adapted by Belfield et al. (2015)
  - Belfield et al. (2015) expressed prices in 2013 dollars and used 3.5% discount rate to adjust by 1 year
  - Converted Belfield et al. (2015) estimated price ($34,385 per 1 SD decrease in aggression) to 2016 dollars and back-discounted: $\left[34385/\left(e^{.035\times(1-2)}\right)\right] \times (711.104/697.836) = \$36{,}286.83$
  - $B_i = P_i \times E_i = 36286.83 \times .13 = \$4{,}717.29$
- $NPV = 4717.29 \times 100 - 865.02 \times 100 = \$385{,}227$
- $BCR = 4717.29/865.02 = 5.45$

Other Considerations

Acknowledging Uncertainty

- Economic analyses involve
  - parameter uncertainty (e.g., sample & measurement error, rates)
  - structural uncertainty (e.g., different theories of change)
- Usual methods for capturing uncertainty are hard to apply due to
  - small sample sizes underlying cost estimates
  - multiple sources of uncertainty
  - ratio estimation
  - non-normality
- But still need sensitivity testing to gauge impact of uncertainty
  - Informal methods (e.g., vary parameters to determine sensitivity)
  - Formal methods (e.g., Fieller's theorem, bootstrapping, Monte Carlo)

General Recommendations

- Be transparent
- Be consistent
- Err on the side of being conservative
- Follow the principle of proportionality
- See p. 269 of Levin et al. (2018) for a complete checklist of good practices

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Questions?
Comments?

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