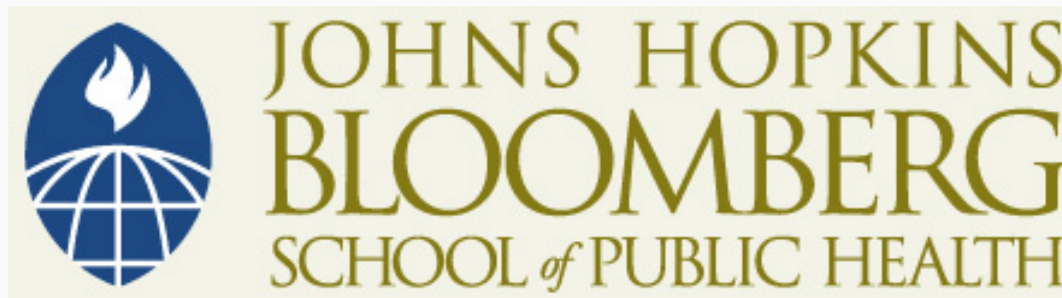


This work is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike License](https://creativecommons.org/licenses/by-nc-sa/4.0/). Your use of this material constitutes acceptance of that license and the conditions of use of materials on this site.



Copyright 2007, The Johns Hopkins University and Kevin Frick. All rights reserved. Use of these materials permitted only in accordance with license rights granted. Materials provided "AS IS"; no representations or warranties provided. User assumes all responsibility for use, and all liability related thereto, and must independently review all materials for accuracy and efficacy. May contain materials owned by others. User is responsible for obtaining permissions for use from third parties as needed.



JOHNS HOPKINS
BLOOMBERG
SCHOOL *of* PUBLIC HEALTH

Cost-Benefit and Cost-Effectiveness Analysis

Kevin Frick, PhD

Johns Hopkins University



JOHNS HOPKINS
BLOOMBERG
SCHOOL *of* PUBLIC HEALTH

Section A

Where Does CBA/CEA Fit into Health Services Research?

Where Does CBA/CEA Fit into Health Services Research?

- Usually efficacy has already been done
- Generally look at effectiveness
 - Pharmaceutical
 - Treatment
 - Intervention program

Where Does CBA/CEA Fit into Health Services Research?

- Usually efficacy has already been done
- Generally look at effectiveness
 - Pharmaceutical
 - Treatment
 - Intervention program
- Effectiveness may already be established or effectiveness research may be simultaneous
- Fits in with multiple study designs
 - Modeling
 - Randomized controlled trial

Economic Reasoning, Public Health, and Medical Epidemiology: Cost-Effectiveness and Cost Benefit Results

Economic Reasoning

Measurement of the Effectiveness of a Treatment, Program, or Intervention
Study Design
Epidemiology
Randomized Trials
Modeling
Statistical Analysis
Uncertainty

Valuation
Economic Theory
Personal and Societal Valuation
Instruments from Economics and Decision Sciences
Validity and Reliability

Time
Discounting
Inflation
Accounting for Possibilities Offered by Technological Change

Cost
Theory of what to measure
Primary Data Collection
Methods
Incorporating Secondary Data

Incremental Cost-Effectiveness Ratio or Net Benefit Calculation
Theory of how to calculate
Theory of how to use in decision making
Sensitivity (or "what if") Analyses
Inference

Choosing which Program to Fund or Treatment to Recommend
Politics
Ethics

Problem and Potential Solution
Identification from Clinical Areas, Population Specific Interests, or the General Policy Process

Economic Reasoning, Public Health, and Medical Epidemiology: Cost-Effectiveness and Cost Benefit Results

Economic Reasoning

Measurement of the Effectiveness of a Treatment, Program, or Intervention
Study Design
Epidemiology
Randomized Trials
Modeling
Statistical Analysis
Uncertainty

Valuation
Economic Theory
Personal and Societal Valuation
Instruments from Economics and Decision Sciences
Validity and Reliability

Time
Discounting
Inflation
Accounting for Possibilities Offered by Technological Change

Cost
Theory of what to measure
Primary Data Collection
Methods
Incorporating Secondary Data

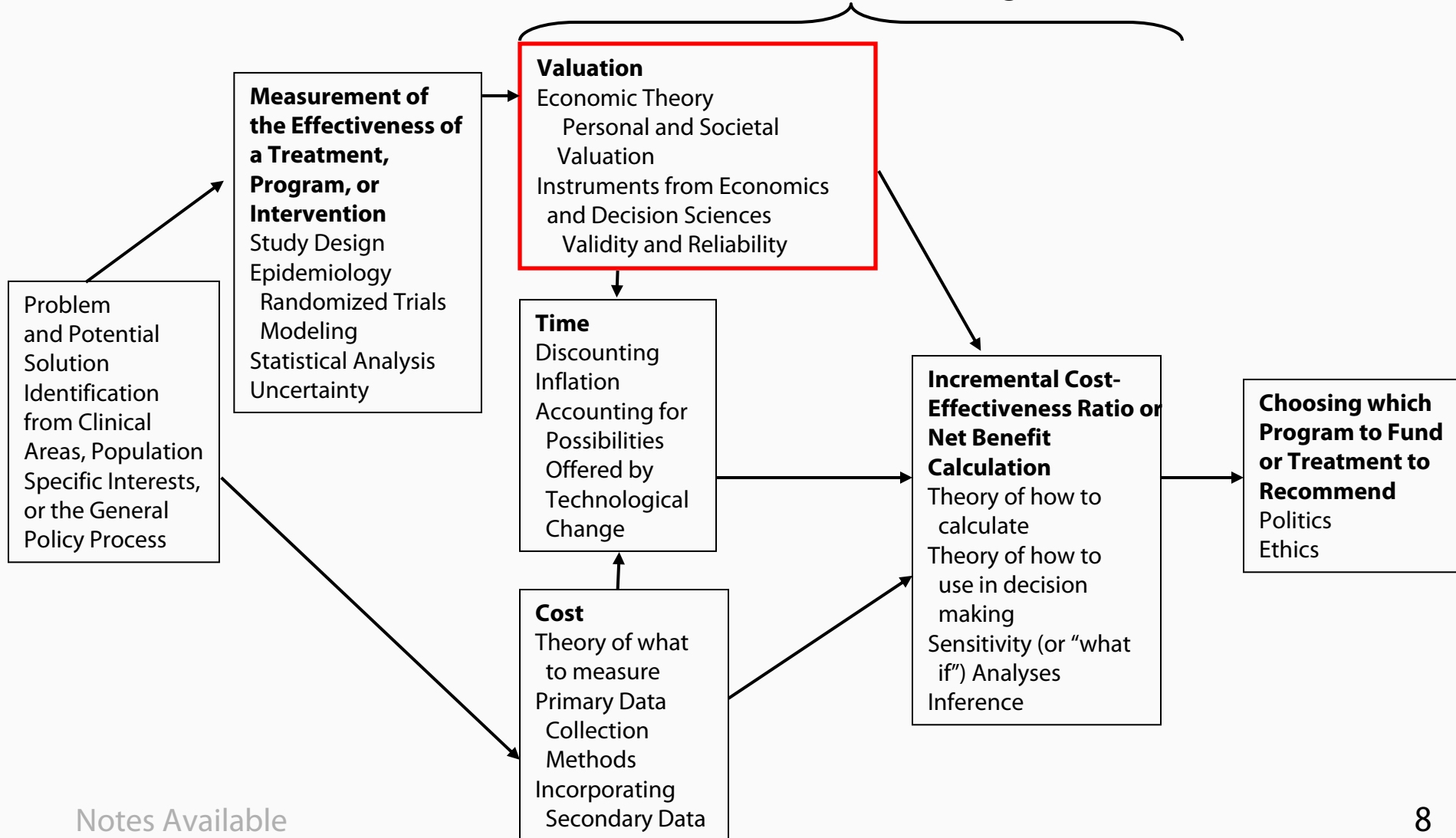
Incremental Cost-Effectiveness Ratio or Net Benefit Calculation
Theory of how to calculate
Theory of how to use in decision making
Sensitivity (or "what if") Analyses
Inference

Choosing which Program to Fund or Treatment to Recommend
Politics
Ethics

Problem and Potential Solution
Identification from Clinical Areas, Population Specific Interests, or the General Policy Process

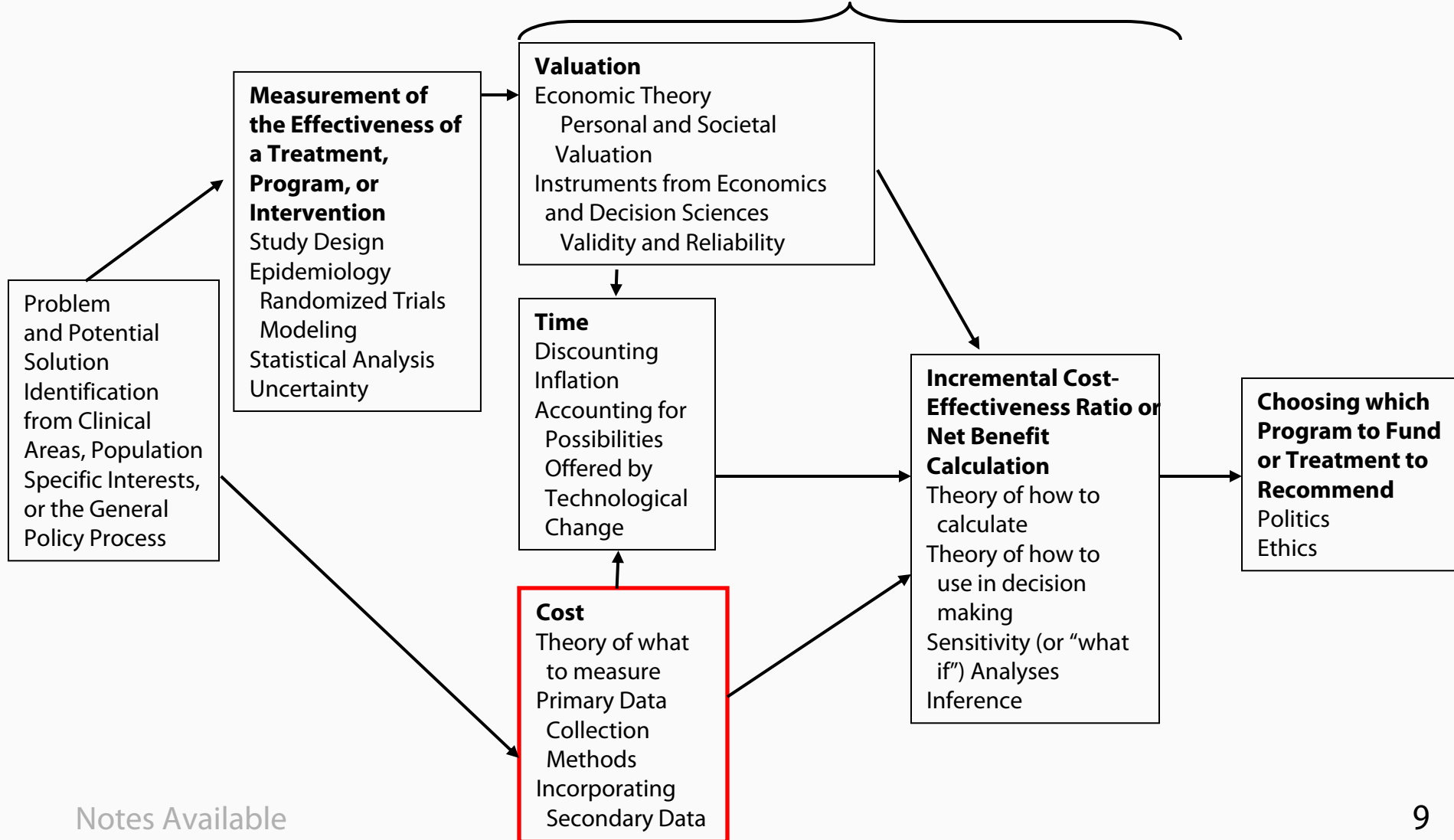
Economic Reasoning, Public Health, and Medical Epidemiology: Cost-Effectiveness and Cost Benefit Results

Economic Reasoning



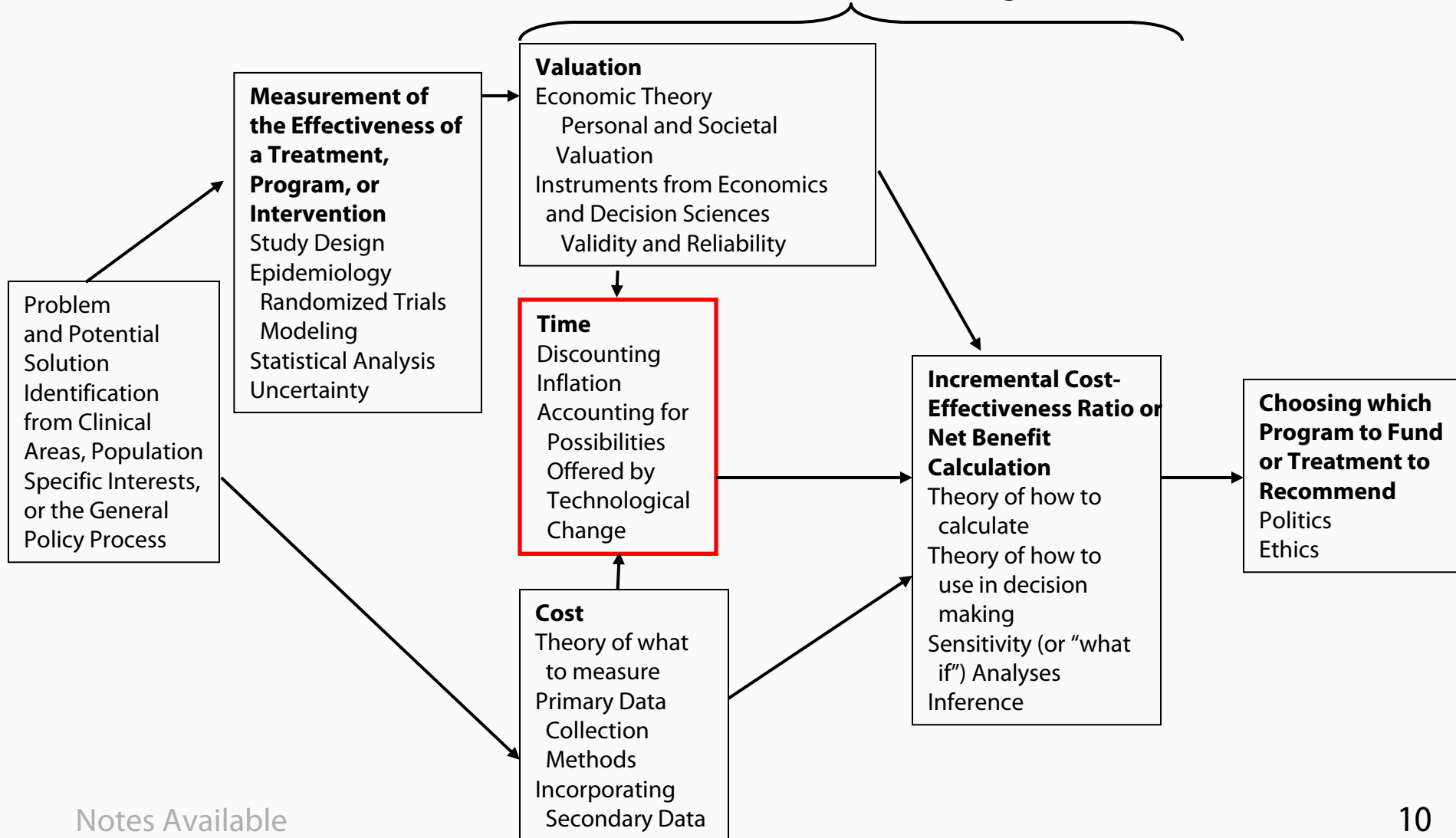
Economic Reasoning, Public Health, and Medical Epidemiology: Cost-Effectiveness and Cost Benefit Results

Economic Reasoning



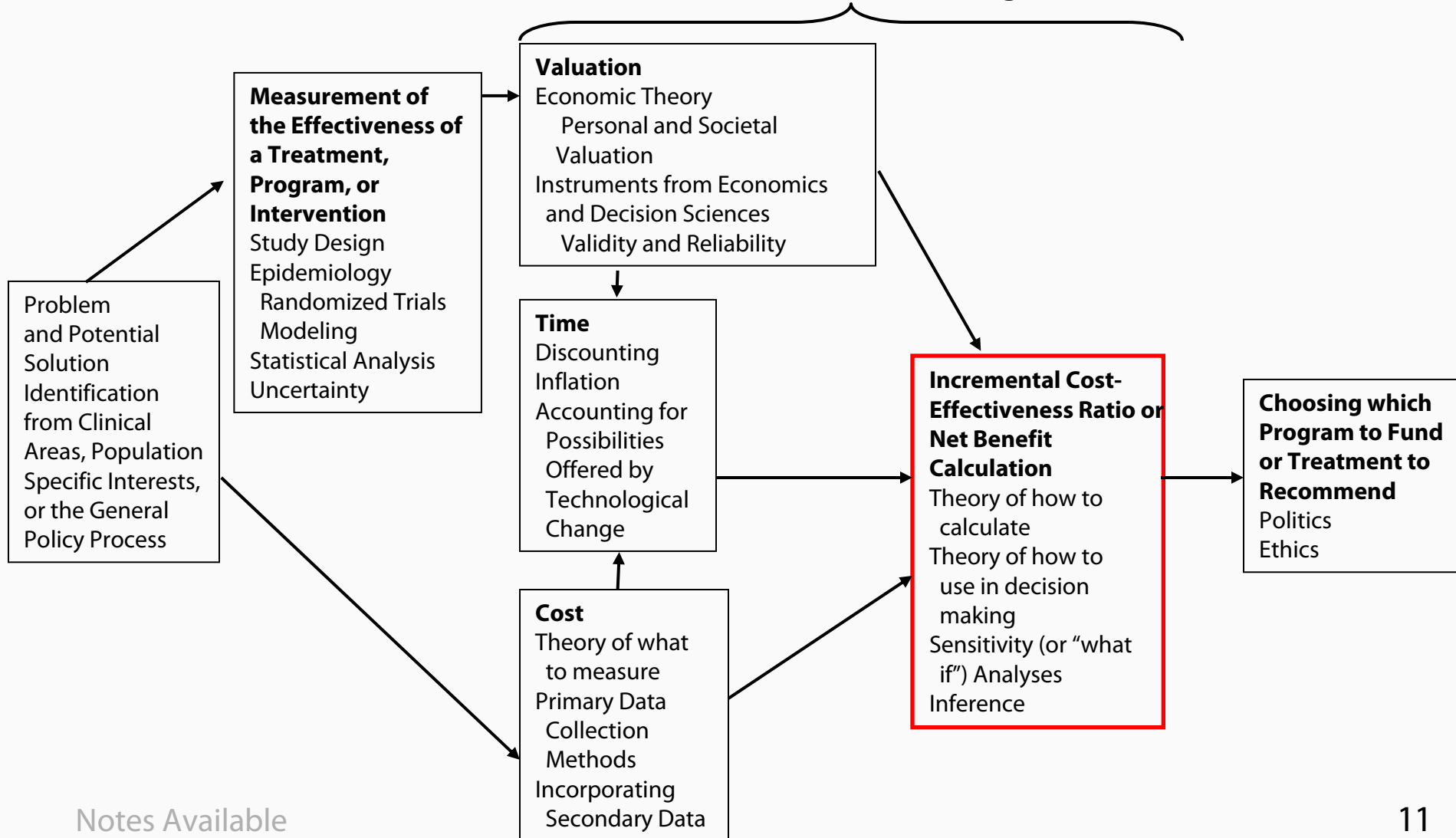
Economic Reasoning, Public Health, and Medical Epidemiology: Cost-Effectiveness and Cost Benefit Results

Economic Reasoning



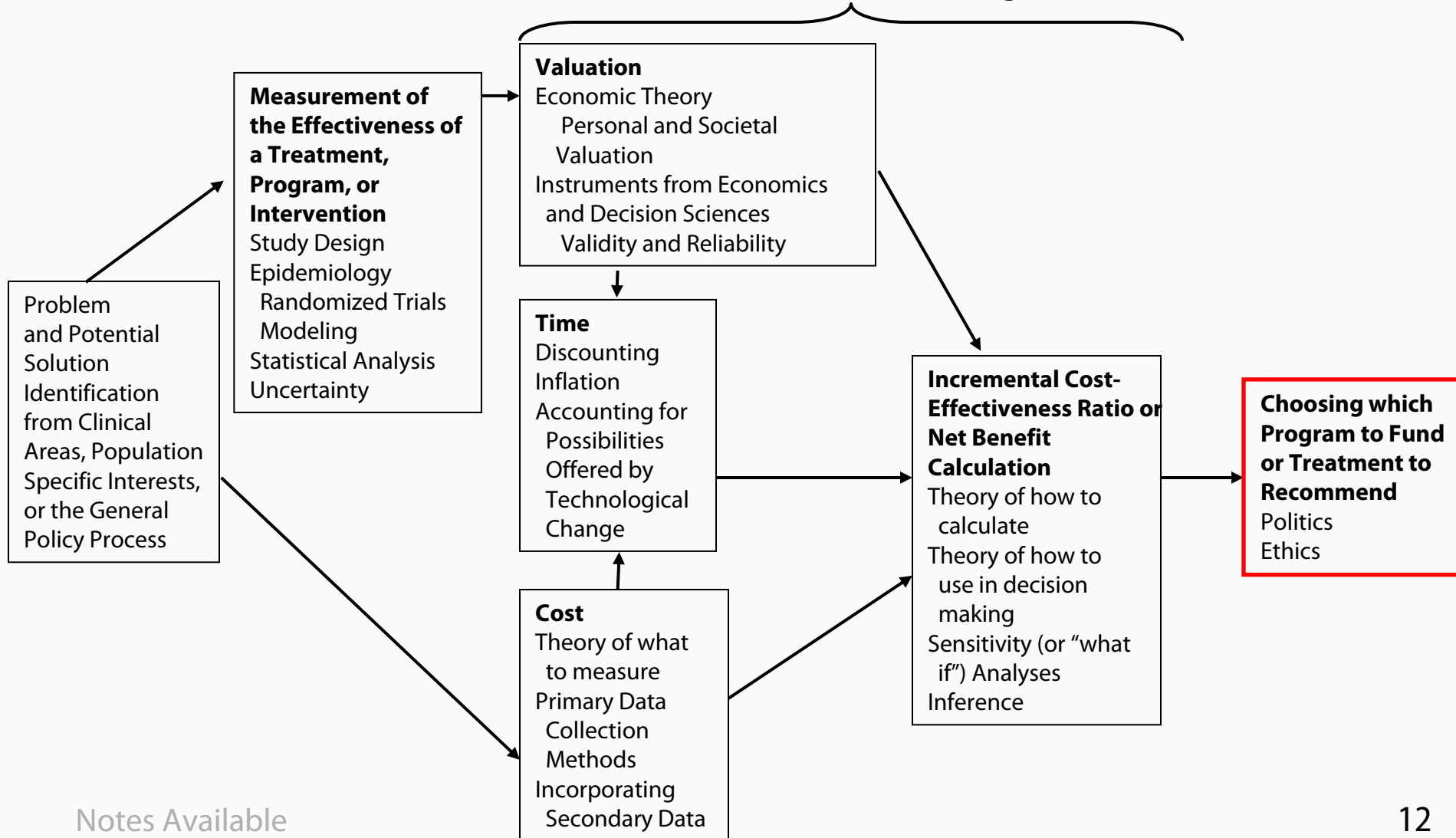
Economic Reasoning, Public Health, and Medical Epidemiology: Cost-Effectiveness and Cost Benefit Results

Economic Reasoning



Economic Reasoning, Public Health, and Medical Epidemiology: Cost-Effectiveness and Cost Benefit Results

Economic Reasoning



Why Do a CBA or CEA?

- Information for resource allocation
- Use of these tools implies rationing
- Results fit into a decision-making process
- Values and ethics also impact on decisions
- Final results may be used less than the data used to do the calculations

Cost-Benefit Analysis

- Cost—dollars
- Consequences—dollars
- Net benefit is final product
 - Difference between valuation of benefits and costs
 - Unique feature that can indicate explicitly whether benefits outweigh costs

Cost-Benefit Analysis

- Cost—dollars
- Consequences—dollars
- Net benefit is final product
 - Difference between valuation of benefits and costs
 - Unique feature that can indicate explicitly whether benefits outweigh costs
- Ratio of net benefit to dollars spent (rather than benefit to dollars spent) is sometimes used to rank programs

Cost-Effectiveness Analysis

- Costs—dollars
- Consequences—non-monetary units
 - Mortality/morbidity
 - ▶ Only compare programs with similar outcomes

Cost-Effectiveness Analysis

- Costs—dollars
- Consequences—non-monetary units
 - Mortality/morbidity
 - ▶ Only compare programs with similar outcomes
- Standardized combinations of mortality and morbidity
 - Quality Adjusted Life Years
 - Implies a “cost-utility” analysis

Set of Types of Analyses

- Cost-benefit
- Cost-utility
- Cost-effectiveness
- **Cost-consequence**

Set of Types of Analyses

- Cost-benefit
- Cost-utility
- Cost-effectiveness
- **Cost-consequence**
- **Cost of illness**



JOHNS HOPKINS
BLOOMBERG
SCHOOL *of* PUBLIC HEALTH

Section B

Decision Maker Perspective

Decision Maker Perspective

- Different perspectives
 - Individual
 - Employer
 - Insurer/MCO
 - Government
 - Society
- Common perspective useful for making comparisons among alternatives

Cost Terminology

- Opportunity cost versus accounting costs

Direct Costs

- Providing medical care
- Transportation to medical care
- Administrative
- Research and development

- CBA only???
- Lost productivity
- Morbidity related costs
- Time receiving medical care
- Anything where money is not exchanged but time must be valued

Future Costs

- During time alive anyway
 - Medical costs associated with disease treated
 - Unrelated medical care cost
- During extra time alive
 - Medical costs associated with disease treated
 - Unrelated medical care cost
 - Other costs

Measuring Costs

- Incremental for analysis
 - Total may be useful for management decisions

- Quantities
 - Micro-costing studies, billing/claims, procedure codes

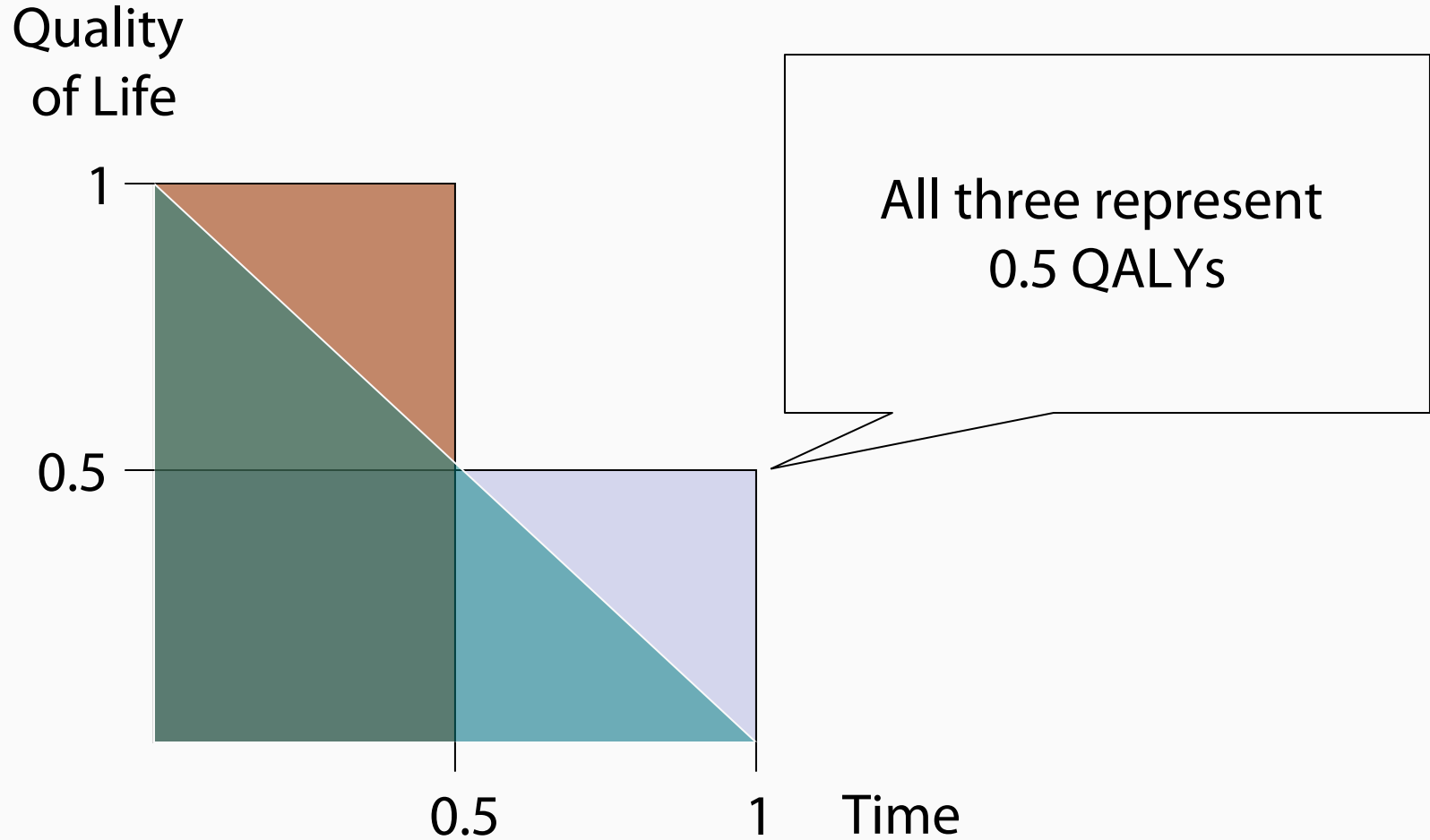
- Quantities
 - Micro-costing studies, billing/claims, procedure codes
- Prices
 - Market prices
 - ▶ Charges
 - ▶ Cost to charge ratios
 - Standard resource measures
 - ▶ DRG
 - ▶ RBRVS

- Health status measures
 - Increased life expectancy
 - Decreased morbidity
 - Reduced disability
- Other measures
 - Lower use of health care resources
 - Increased patient productivity
- Not a uniform valuation

Valuing Effects in Quality Adjusted Life Years

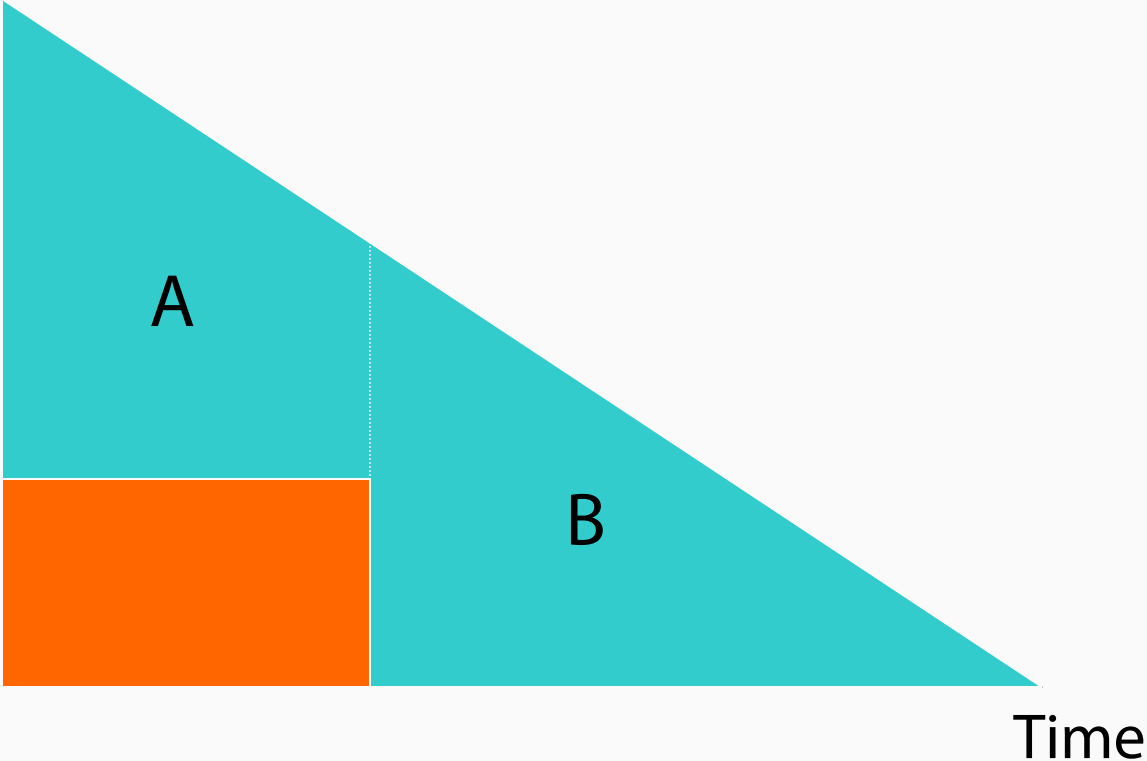
- Health states/functional status
 - Ranked from complete health to being dead
- Preferences
 - Those affected by program or entire community
- Measure of both increased length of life and improved quality of life
- Include lost productivity in quality of life

QALY Example One



QALY Example Two

Quality
of Life



QALY Numerical Example

Program	Funding Level	QALYs	Incr. Funding	Incr. QALYs	Incr. Ratio
A	\$50,000	8	\$50,000	8	6,250
A	\$100,000	12	\$50,000	4	12,500
B	\$50,000	6	\$50,000	6	8,333
B	\$100,000	12	\$50,000	6	8,333

QALY Numerical Example

Program	Funding Level	QALYs	Incr. Funding	Incr. QALYs	Incr. Ratio
A	\$50,000	8	\$50,000	8	6,250
A	\$100,000	12	\$50,000	4	12,500
B	\$50,000	6	\$50,000	6	8,333
B	\$100,000	12	\$50,000	6	8,333



JOHNS HOPKINS
BLOOMBERG
SCHOOL *of* PUBLIC HEALTH

Section C

Hot Topics for QALYs

Hot Issues for QALYs

- Special value for saving people near death?
- Should we consider people's "potential health?"
- Is value of an effect for an individual proportional to length of effect?
- Is value of an effect for a population proportional to the number of individuals?

Hot Issues for QALYs

- Special value for saving people near death?
- Should we consider people's "potential health?"
- Is value of an effect for an individual proportional to length of effect?
- Is value of an effect for a population proportional to the number of individuals?
- Does the distribution of QALYs matter?
- Should we ask individuals about how they would value hypothetical effects on their own health or the effects on groups of individuals?
- Adaptation and recall

Valuing Effects in Dollars

- Human capital model
- Willingness to pay
 - Measure maximum dollars consumer would give up to have effects of program
 - Better basis in economic theory
 - Related to wealth/income
- Consistency in treating items as benefits

Discounting

- A dollar today is worth more than a dollar tomorrow
- Net present value of costs of multiple year program depend on order of costs

Discounting

- A dollar today is worth more than a dollar tomorrow
- Net present value of costs of multiple year program depend on order of costs
- Commonly use real interest rate
 - What a dollar today is worth tomorrow
 - Appropriate rate is open to discussion

Uncertainty

- Range of prices/quantities
- Range of probability of certain events
- Sensitivity analyses
- Secondary data/expert opinion can fill in gaps

Reporting/Interpreting Results

- CBA—net benefit and ratio
- CEA—reference case
- Explicit assumptions
- Sources of any secondary data
- Intermediate results
- Sensitivity analyses