



2010 Summer Institute in Public Health Genomics:

Translating Genomics into Policy and Practice

Presented by
The University of Washington
Center for Genomics and Public Health

**SUPPLEMENT FOR VIDEO 3:
DECISION ANALYSIS**

VIDEO 3

DECISION ANALYSIS

INSTRUCTOR

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VIDEO 3

DECISION ANALYSIS

THEMES COVERED IN THIS LECTURE:

- Specific steps of decision analysis
- Application to different aspects of public health
- Why decision analysis is important



KEY CONCEPTS (contextualized for Decision Analysis in Genomics)

- *Economics and Health Economics*: A social science concerned chiefly with description and analysis of the production, distribution, and consumption of goods and services; the study of resource allocation for the production of health.
- *Pharmacogenomics*: A branch of pharmacology that investigates the influence of genetic variation on drug response in patients.
- *Types of study design*: Common study designs are case-control, cohort, cross-sectional, and randomized control trials; others include linkage analysis, commingling analysis, and sib pair analysis.
- *Economic evaluation*: Evaluation of the effects of an intervention. Types include cost-benefit, cost-utility, and cost-effective analyses.
- *Average costs vs. incremental costs*: Compares the average cost of implementing a new intervention in a particular population vs. the added cost of saving one additional life (or gaining one additional positive outcome).
- *Incremental Cost-Effectiveness Ratio (ICER)*: The ICER is used in health economics to compare the change in costs of a therapeutic intervention to the change in effects of the intervention. The intervention is compared to an alternative, such as doing nothing or using the best available alternative treatment.

KEY CONCEPTS (contextualized for Decision Analysis in Genomics)

- *Cost-Effectiveness Plane*: Four quadrants that compare costs of an intervention to effects – 1) increased costs, positive effects; 2) lowered costs, positive effects; 3) increased costs, less positive effects; 4) lowered costs, less positive effects. Ideal interventions will lower costs and increase positive effects; most interventions increase costs and increase positive effects.
- *Quality-Adjusted Life Years (QALY)*: A measure of disease burden, including both the quality and the quantity of life lived. Used in health economics to determine the value or effect of an intervention.
- *Medical vs. non-medical costs of disease and treatment*: Medical costs refer to physiological symptoms and side effects of treatment. Non-medical costs include travel costs, waiting time, wage loss from taking time off, etc.
- *Decision trees*: A tool used in health economics to determine the probability that an intervention (or lack thereof) will produce a particular outcome.
- *Probability calculations*: The “and”/”or” rule is useful here. If “x OR y” might occur, add their individual probabilities to get the total probability of either event occurring. If “x AND y” must happen, multiply their probabilities to get the total probability that both events will occur.

TYPES OF ECONOMIC EVALUATION

| Table 3. Types of economic evaluation in health care | | | | |
|--|-----------------|--|---|--|
| Study design | Costs measured? | Outcomes measured? | Strengths | Weaknesses |
| Cost-minimization | Yes | Not necessary | Easy to perform | Useful only if outcomes are the same for both interventions |
| Cost-benefit | Yes | Yes, in monetary terms | Good theoretical foundation; can be used within health care and across sectors of the economy | Less commonly accepted by health care decision-makers; evaluation of benefits methodologically challenging |
| Cost-effectiveness and cost-consequences | Yes | Yes, in clinical terms (e.g., events) | Relevant for clinicians; easily understandable | Cannot compare interventions across disease areas when using disease-specific end points; does not capture quality-of-life impacts |
| Cost-utility | Yes | Yes, in quality-adjusted life-years (QALY) | Incorporates quality of life; comparable across disease areas and interventions | Requires evaluation of patient preferences; can be difficult to interpret |

Decision Analysis

SYSTEMATIC: Employs a formal strategy to analyze outcomes and associated costs.

QUANTITATIVE: Simple but effective calculations account for varied probability of outcomes and incremental costs and benefits.

EXPLICIT: Is transparent about variables considered, their weight, and yields a numerical value for comparison.

INCREMENTAL COST-EFFECTIVENESS RATIO (ICER):

$$\frac{(\text{Cost of Treatment 2} - \text{Cost of Treatment 1})}{(\text{Outcome of Treatment 2} - \text{Outcome of Treatment 1})}$$

The denominator varies depending on the type of economic evaluation being considered.

Cost-effectiveness example:

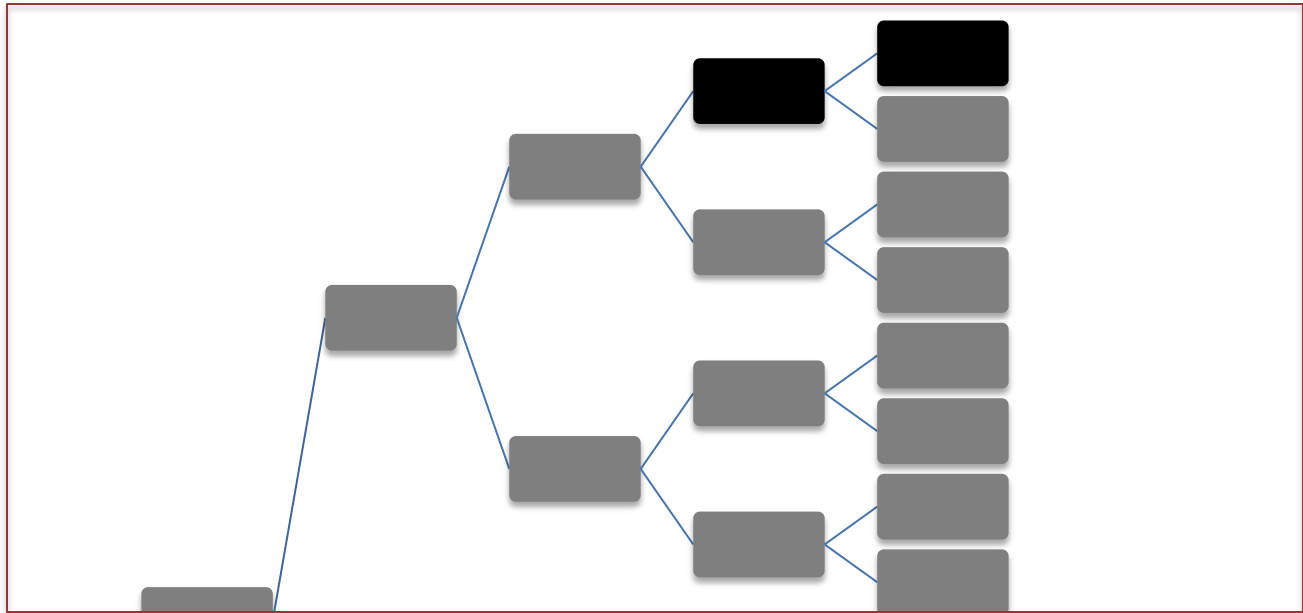
$$\frac{(\$2,000 - \$500)}{(10 \text{ mmHg} - 5 \text{ mmHg})}$$

Cost of an intervention to reduce systolic BP; denominator reflects clinical outcome (amount of BP reduction).

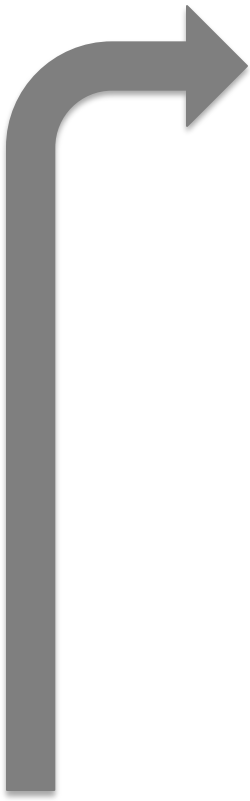
Cost-utility example:

$$\frac{(\$2,000 - \$500)}{(5 \text{ QALY} - 1 \text{ QALY})}$$

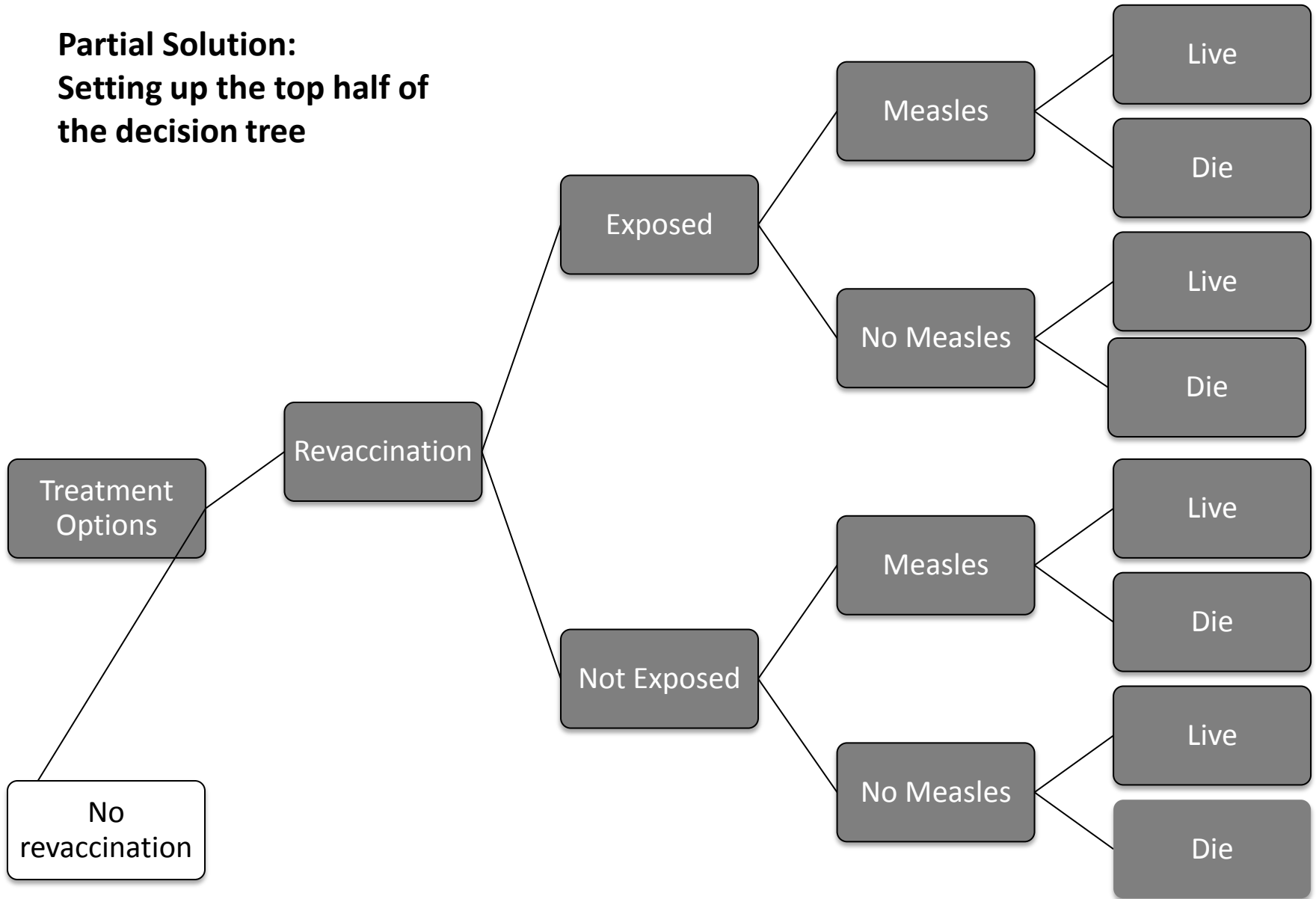
Cost of an intervention to reduce systolic BP; denominator reflects QALYs gained as a result of intervention.



**FOCUSING IN ON THE TOP
HALF OF THE DECISION TREE**



**Partial Solution:
Setting up the top half of
the decision tree**



Partial Solution: Probabilities

