Cost-effectiveness Analysis for HHS

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Objectives

You will learn:

• what types of economic evaluation are available to the evaluator of health and human service programs.

• what cost-effectiveness is

• what are the four essential questions that need to be addressed before a CEA can begin

• how to do a simple CEA

• how to interpret and communicate the results of a CEA effectively
What is economic analysis?

• Comparative analysis of two or more courses of action in terms of the costs and consequences of a program

• Different types of analyses:
  – Cost-minimization
  – Cost-effectiveness
  – Cost-utility
  – Cost-benefit
What is cost-effectiveness analysis?

• A way to measure efficiency of an intervention in which costs are related to a single common effect

• Cost-effectiveness = costs ÷ effects

• Cost-effectiveness ANALYSIS is the cost-effectiveness of one intervention relative to a baseline / comparison
Why do cost-effectiveness analysis of health and human services programs?

• Compare the intervention to doing nothing

• Compare one intervention to another

• Compare an intervention to another intervention

• Determine what the biggest contribution to the cost-effectiveness of a program is

• Determine whether a program is affordable / sustainable
How to do a CEA

- There is a flu epidemic and there is a 100% certainty that you will contract the disease

- Cost of the flu vaccine (100% effective) is $15

- Treatment of a case of flu costs $10

- Cost of flu vaccine strategy is:
  
  \[15 \text{ } - \text{ } 10 \text{ } = \text{ } 5\]
Is it cost-effective?

- Incremental cost-effectiveness ratio (ICER) = difference in costs / difference in effects

- ICER = ($15 – 10) / (1 – 0)
  = $5 / flu case averted

- What if the flu vaccine cost $5?

- ICER = ($5 – 10) / (1 – 0) = – $5 /per flu case averted
Clarifying the question

• **What are you comparing your intervention to?**
  - Doing nothing
  - Another intervention
  - Several other interventions

• **What point of view / perspective are you taking?**
  - Recipient of the intervention
  - One or several of the funders
  - Everyone (societal)

• **Why are you doing the CEA?**
  - Who is your audience?
  - What is the information going to be used for?
Considering the flu vaccine example again

• What were we comparing the intervention to?
  – Doing nothing (or business as usual)

• Whose perspective were we taking?
  – Probably not the patient
  – Maybe the funder of the drugs

• Why did we do it?
  – ?
Data

• **Costs**
  – Cost of the intervention plus the cost of the consequences

• **Effectiveness**
  – Process measures
    • Compliance with treatment standards
  – Recipient outcomes
    • Cases averted, deaths averted, performance increase
  – Composite measures
    • DALYs, QALYs
CEA framework: Decision tree

Strategy A
- Scenario A1
  - Probability_A1
  - Cost_1 / Effect_1
- Scenario A2
  - 1-Probability_A1
  - Cost_2 / Effect_2

Strategy B
- Scenario B1
  - Probability_B1
  - Cost_3 / Effect_3
- Scenario B2
  - 1-Probability_B1
  - Cost_4 / Effect_4
CEA framework: Vax versus No Vax strategy

Vax
- Get flu
  - Probability_Flu_w_vax
  - Stay healthy
    - 1 - Probability_Flu_w_vax
  - Get Flu
    - Probability_Flu_no_vax
  - Stay healthy
    - 1 - Probability_Flu_no_vax

No Vax
- Get flu
  - (Cost_vax + Cost_flu) / Flu_case
- Stay healthy
  - Cost_vax / Flu_case_averted
- Get Flu
  - Cost_flu / Flu_case
- Stay healthy
  - 0 / Flu_case_averted
Calculations: Costs

Vax cost = (0 x 25) + (1 x 15) = 15

No vax cost = (1 x 10) + (0 x 0) = 10
Calculations: Effects

Vax effects = \((0 \times 0) + (1 \times 1)\) = 1 case averted

No vax cost = \((1 \times 0) + (0 \times 1)\) = 0 cases averted
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Cost</th>
<th>Incremental cost</th>
<th>Effect</th>
<th>Incremental effect</th>
<th>Inc. cost-effectiveness ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vax</td>
<td>$15</td>
<td>$5</td>
<td>1 case averted</td>
<td>1 case averted</td>
<td>$5 / flu case averted</td>
</tr>
<tr>
<td>No Vax</td>
<td>$10</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

All data are per recipient of strategy
### Table of results

<table>
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<tr>
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<td>Vax</td>
<td>$5</td>
<td>- $5</td>
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<td>1 case averted</td>
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<td></td>
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</tbody>
</table>

The incremental cost-effectiveness of the vax strategy is -$5 / flu case averted
Cost effectiveness plane

- Higher cost vs. More effective
- Lower cost vs. Less effective

- Accept
- Reject

Willingness-to-pay threshold
Cost effectiveness plane

- Higher cost
- Willingness-to-pay threshold
- Less effective
- More effective
- Lower cost

Willingness-to-pay threshold:
- $5
- -$5

USAID Applying Science to Strengthen and Improve Systems
Economic cost of the problem / intervention

- **Cost of the flu:**
  - Lost productivity / leisure time
  - Time of caregivers
  - Cost of treatment (including cost of seeking treatment)
  - Risk of spreading to uninfected others
  - Risk of complications (can be included in model)
  - Long-term sequellae (can be included in model)

- **Cost of the flu vax strategy:**
  - Cost of the vaccine
  - Time and other resources taken to go and get it
  - Side effects of vaccine
  - Other resources consumed
• Go to Excel Spreadsheets
Excel examples 1

1. If a 100% effective flu vax costs $10, getting the flu costs $100 and 1 in 5 are expected to get the flu, do you recommend the flu vax strategy?

2. If the chance of getting the flu decreased to 1 in 20, do you still recommend the flu vax strategy?

3. What if the flu vax costs $15, getting the flu cost $200, the change of getting the flu without the vax is 0.50 and the chance of getting the flu with the vax is 0.50 and the willingness to pay is $150, would you recommend the vax strategy?

4. What if the flu vax is free, getting the flu cost $200, the change of getting the flu without the vax is 0.45 and the chance of getting the flu with the vax is 0.50 and the willingness to pay is $150, would you recommend the vax strategy?
A hospital is considering implementing a program in its maternity department to decrease the occurrence of unnecessary C-sections.

In a review of all deliveries before the program, it was determined that 40% resulted in C-sections that were not indicated.

It is estimated that the proposed program will decrease unnecessary C-sections by 90%.

The program costs $100 per delivery, a C-section costs an average of $2,000 and a vaginal delivery costs $1,500.

What do you recommend?
• About 50% of substance abuse parolees from a corrections facility re-offend and end up returning to the corrections facility, costing the state, on average, $40,000 per reoffender.

• You are asked to advise the DOC on a post-release program for substance abusers.

• A residential program has been 100% successful previously in keeping parolees from reoffending, but only has capacity for 30% of those released.

• A CCTP covers 90% of those released, decreases recidivism by 25% and costs on average $7000 / parolee.

What do you recommend?
Willingness to pay and uncertainty

- Back to Prezi
Developing your own models

• Strategies must represent the reality of the program as it will be implemented as much as possible

• Consequences are mutually exclusive

• Consequences are collectively exhaustive
Data needs: Costs

- **Costs**
  - Consider the perspective taken and all of the resources consumed by the strategy from that perspective
  - When necessary, assume the most realistic scenario conceivable with your given information
  - Consider the proxy to the counterfactual if using “no intervention” as your comparator
  - Discounting, distributions and confidence intervals
Data needs: Effects / consequences

• Effectiveness measures:
  – Use an outcome measure that makes the most sense for your audience (or can be compared to other relevant programs)
  – Consider the proxy to the counterfactual if using “no intervention” as your comparator
  – Discounting, distributions and confidence intervals
Data Needs: Probabilities

- Can use data from observation
- Can use incidence / prevalence data from epidemiological studies or trials or other evaluations
- May need to make assumptions but these must be defensible
- Probabilities need to sum to 1
When reading a good CEA, you must know:

• Perspective taken
• Timeframe
• Clearly identified strategies that are being compared
• What model was used
• Any assumptions made and the data on which they were based
• All of the costs that were included in calculations
• What the measurements of effectiveness were and how they were obtained
• How the probabilities were calculated / obtained
Your examples

1. In your groups, choose one program to do a CEA

2. Determine the perspective, timeframe, effectiveness measures, costs to be included and data sources.

3. Draw up a decision tree

4. Be prepared to discuss your choices with the whole group
Other considerations

- Discounting
- Markov Modeling
- Sensitivity analysis
- Credibility intervals
But.....

- Efficiency is *only one criteria* for resource allocation decisions
  - We should consider equity
  - We should consider affordability

- Have we considered sustainability?

- Have we considered feasibility?

- Have we captured all of the cost and consequences?

- Does the comparison of outcomes make sense?
Communicating results

- Even if your audience thinks they know what cost-effectiveness is, don’t believe them
- Keep it as simple as possible
- Avoid economic jargon
- Be honest about the assumptions you made and why
Summary

• For all CEAs, you need to know
  – What strategies you are comparing
  – What perspective and time frame you are considering
  – Who is the audience

• When CEAs, you need to consider
  – What framework makes sense to answer the question
  – What are all of the costs to be included
  – What is/are your measure/s of effectiveness

• When you have the results of a CEA, you should
  – Communicate the results clearly for the lay audience
  – Consider feasibility and sustainability
  – Report how robust the results are
Employment at URC?  
Division of labor for studies

Edward

Colleague / intern
Further reading

- Cost-effectiveness analysis in Health: A practical approach. *Peter Muennig*

  http://www.cbcse.org/media/download_gallery/Waiting%20for%20Godot.pdf

- The cost-effectiveness of psychological interventions.