TYPES OF ECONOMIC EVALUATION

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Adapted from Dr. Rimal Mousa presentation

LEARNING OUTCOMES

By the end of this lecture you will be able to:

- Understand what contribute to a full economic evaluation
- Define cost-minimisation analysis
- Define cost-effectiveness analysis
- Understand cost effectiveness plane
- Learn how to estimate cost-effectiveness ratio and incremental cost-effectiveness ratio

Health Economic evaluation types

Imagine a scenario !!!

- You are a hospital manger and you are considering to hire a clinical pharmacist..

What might be the most urging questions?

Questions to consider

- Can it work? **i.e. Evidence of efficacy (theoretically)**
- Does it actually work ?**i.e. evidence of effectiveness (in application)**
- Is it **better** than usual care (i.e. without the presence of clinical pharmacist) ? **i.e. more output, but how is output to be measured ?**
- Can we afford to pay for it ? **i.e. How much will it cost/ save ?**
- Does it represent an efficient use of resources? **Is it worth transferring resources from another health care area to pay for?**

How we can answer these questions

- Health economic evaluations help us to Answer theses question and aid in decision making.
- Health economic evaluations are tools to make comparison.
- They are used to ensure that society gets a good return on its investment in public health
- i.e. Economic evaluation methods provide a systematic way to **identify, measure, value, and compare the costs and consequences** of various programs, policies, or interventions.

Remember !!

- The overall goal of Health Economic evaluations is to identify, measure, value and compare the costs and consequences of the alternatives being considered in order **to achieve the most efficient use of resources**

- It is not about determining the cheapest health care alternatives, but determining those alternatives that provide the best health care outcome per Dinar/ $ spent.

Remember from the previous lectures

- Economic evaluations are tools that health economists use to assess the costs and the effectiveness of health care interventions.
- An economic evaluation is about comparing the cost and outcome of alternative treatments
- They consist of two components:
  - inputs (costs)
  - outputs (benefits)

Definition

Economic evaluations can be described as either partial or full.

- **Full economic evaluation**: must be a comparison of two or more alternatives and both the costs and consequences of the alternatives must be examined
- **Partial economic evaluation:** Consider costs and/or consequences, but which either do not involve a comparison between alternative interventions or do not relate costs to benefits.

<table>
<tr><td></td><td colspan="4">Question2: Are both costs and consequences of alternatives examined?</td></tr>
<tr><td rowspan="5">Question1: Is there Comparison of two or more alternatives?</td><td rowspan="3">NO</td><td colspan="2">NO</td><td>YES</td></tr>
<tr><td>Examines only consequences</td><td>Examines only costs</td><td></td></tr>
<tr><td colspan="2">Partial Evaluation</td><td rowspan="2">Partial Evaluation
Cost-outcome description</td></tr>
<tr><td rowspan="2">YES</td><td>Outcome description</td><td>Cost description</td></tr>
<tr><td colspan="2">Partial Evaluation</td><td rowspan="2">Full Economic Evaluation
Cost-effectiveness analysis
Cost-utility analysis
Cost-benefit analysis</td></tr>
<tr><td>Efficacy or effectiveness evaluation</td><td>Cost analysis</td></tr>
</table>

Partial economic evaluation

- Evaluate the costs or/both outcomes of a single service, interventions or health care program
  - Cost description (Cost of illness)
  - Outcome description
  - Cost-outcome description

- Evaluate cost or outcome for two or more alternatives, services, or programs
  - Cost analysis only
  - Effectiveness analysis only

Full economic evaluation

Compare both the costs and outcomes of two or more health programs or treatment

- There are three basic methods of economic evaluation:-
  - cost effectiveness analysis (CEA)
  - cost utility analysis (CUA)
  - cost benefit analysis (CBA)

- They differ in the **type of outcome measure** used.
- cost minimisation analysis (CMA) is a special case in each of the above methods

Types of Health economic Analysis

- Cost-minimization analysis (CMA)
  - assumes equal outcomes
- Cost-effectiveness analysis (CEA)
  - measures outcomes in natural/physical units
- Cost-utility analysis (CUA)
  - measures outcomes in QALYs and DALYs
- Cost-benefit analysis (CBA)
  - measures both benefits and costs in $$$ or JDs

Types of Health economic Analysis

- Cost Benefit Analysis – Weighs up the costs and benefit of an option but uses money as the principle unit. Can't quantify in monetary terms the benefit of a lot of health care treatments. Therefore, there is limited role for CBA.

- Cost Effectiveness Analysis – Weighs up an outcome based on a unit of benefit e.g. Amount of weight lost, amount of asthma free days, improvement of eyesight in dioptres. It can only compare procedures with the same unit of outcome.

- Cost Utility Analysis – Converts an outcome into a standard unit of benefit (utility) e.g. QUALY or DALY

Decision Making

	Higher Cost	Lower Cost
Higher Effectiveness	?	Yes
Lower Effectiveness	No	?

Cost Minimization analysis (CMA)

The analysis of the comparative costs of alternative treatments or health care programmes for which the consequences of the interventions have been shown to be therapeutically equivalent

i.e.

- The outcomes of different interventions are the same
- Choose the intervention that costs the least

e.g. branded/generic product for the same drug entity and the same dosage form, assuming the products have been shown to be therapeutically equivalent in outcome.

example

If the dose required to cause a 10mmHg reduction in systolic blood pressure was known for several different medicines.

- Drug A £3 per month
- Drug B £1.50 per month
- Drug C £28.00 per month

The acquisition costs of the medicines could be calculated and the cheapest one selected (CMA)

Cost Minimization analysis (CMA)

- Nice in theory
- Simple to implement
- Used when buying the same service from different providers

Not really suitable for new health interventions for which outcomes are not precisely identified yet:

- Outcomes are rarely identical
- Effects are multi-factorial

Cost Minimization analysis (CMA)

- Unfortunately health outcomes are usually not that simplistic. Different medicines tend to achieve different magnitudes of the therapeutic outcome, have different adverse event profiles (hence monitoring requirements) and different levels of patient acceptability.
- For these reasons, cost-minimisation analyses are rarely the analysis of choice (unless there is strong prior evidence of equivalent outcomes).
- Only appropriate for making resource allocation decisions if differences in other health-related outcomes or elements of care are ignored.

Remember from last time!!

Example: Comparing laparoscopic cholecystectomy versus open cholecystectomy:

Different methods to remove the gallbladder.

- Health outcomes for the two techniques were considered equivalent!!!

Is it appropriate to use a CMA?

TYPE OF ANALYSIS	COST OF INTERVENTION	OUTCOME	CONCERN
Cost benefit analysis	Monetary units	Valued In cash terms	Net cost: benefit ratio
Cost effectiveness analysis	Monetary units	Qualitative non-monetary units eg: reduced morbidity or years of life gained or saved	Cost per unit of consequence or cost per years of life gained/saved
Cost utility analysis	Monetary units	Valued as Utility Eg: Quality adjusted life year (QALY)	Cost per unit of consequence or cost per QALY
Cost-minimisation-analysis		Equivalent outcome in all respect	The least cost alternative

Cost-effectiveness analysis (CEA)

- The term "cost effective" is one of the most overused and inappropriately applied. A medicine or service should only be described as cost effective if it has been proven so by economic analysis
- Costs are measured in monetary terms
- **Effectiveness is the outcome of an intervention or service used in this type of economic evaluation and measured in natural units**
- outcome measure is common to both alternatives but, may be achieved to different degrees

  (ie there is a difference in effectiveness).

Cost-effectiveness analysis (CEA)

Cost-effectiveness analysis is an economic study design in which consequences of different interventions are measured using a single outcome, usually in 'natural' units (for example, life- years gained, deaths avoided, heart attacks avoided or cases detected, amount of weight lost, amount of asthma free days, improvement of eyesight in dioptres).

Alternative interventions are then compared in terms of cost per unit of effectiveness.

Cost-effectiveness analysis (CEA)

Cost-effectiveness analysis as tool decision-makers can use to assess and potentially improve the performance of their health systems. It indicates which interventions provide the highest 'value for money' and helps them choose the interventions and programmes which maximize health for the available resources.

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Purposes of Cost Effectiveness Analysis

To identify the most cost-effective intervention from a group of alternatives

To provide empirical justification for a program

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Purposes of Cost Effectiveness Analysis

- To identify and exclude programs that is wasting resources.
- To provide general information on the relative costs and health benefits of different alternatives
- To evaluate the interventions in terms of efficacy (cost effective ratio), absolute health gain and affordability (absolute cost)

Effectiveness in CEA

- General (Long-term) outcome measures:
  - cases successfully diagnosed or treated
  - life years saved
  - life years gained

- It is also possible to use clinical indicators (Intermediate outcome measures) : Serve as a proxy for the final outcome measure
  - Percentage reduction in LDL
  - percentage reduction in blood pressure
  - effect on nausea and vomiting frequency

Effectiveness

E.g.

- Lipid lowering agents used to decrease LDL-CH (intermediate outcome) to express final outcomes (decrease in MI or an increase in lives saved).

□WHY?

- Humanistic reasons; i.e. Ethical issues
- Easier to demonstrate clinical efficacy
- Faster and thus reduce cost and time required to conduct a clinical trail

Outcomes that could be used for a cost-effectiveness analysis

Service	Measure of outcome
Anticoagulant monitoring	Reduction in adverse events (e.g. bleeding)
Asthma management service	Improvement in forced expiratory volume

CEA is an appropriate technique to use when the therapeutic outcomes of different interventions can be expressed in common natural units

i.e. Is the extra cost justified by higher efficacy?

Example

Let us once again consider which medicines should be used to treat hypertension.

- Drug A causes a 10mmHg drop in blood pressure and costs 120 JDs per year

OR

- Drug B causes a 15mmHg drop in blood pressure but costs 180 JDs per year.

Can we use cost minimisation?

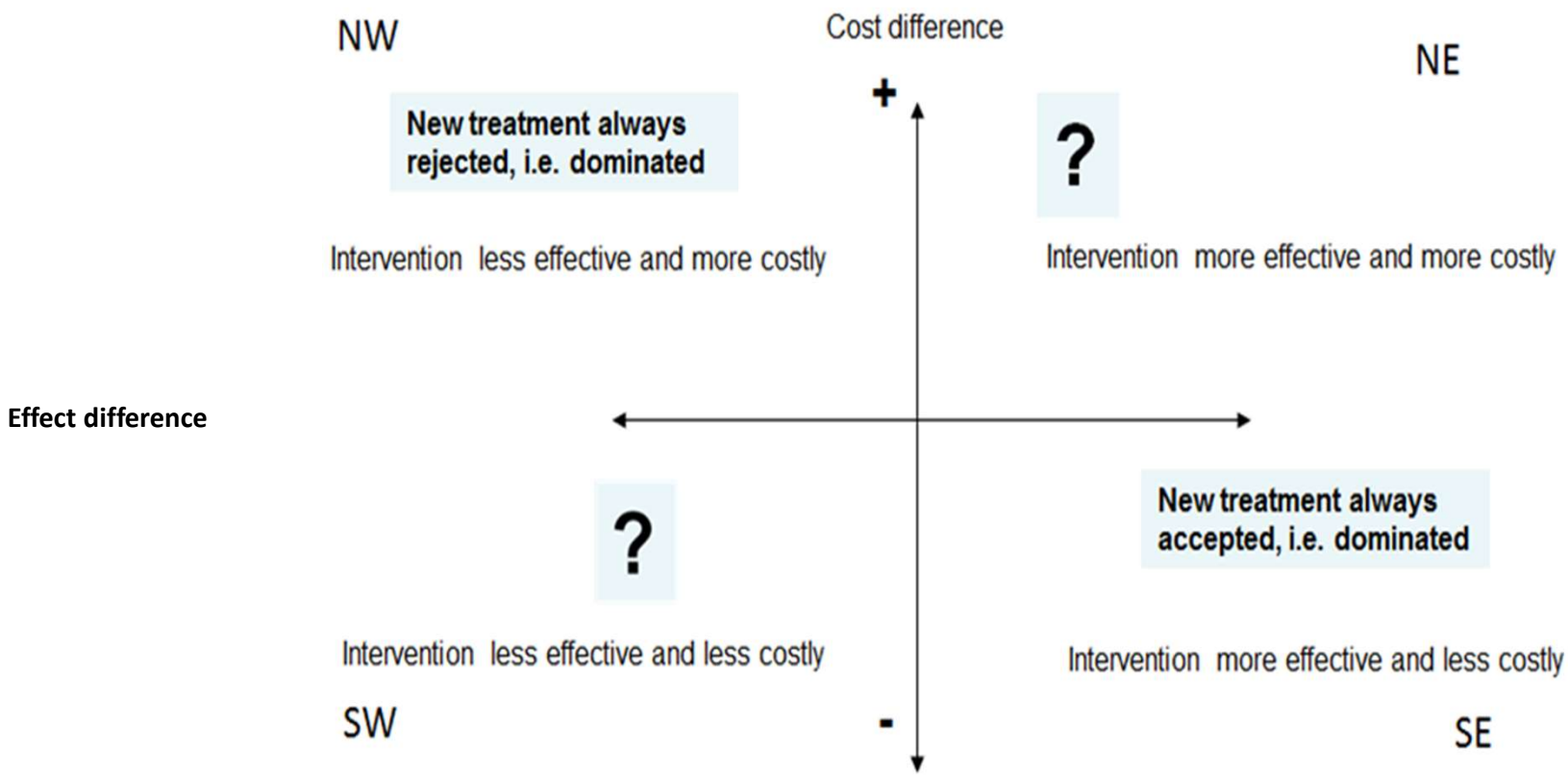
We cannot use a cost-minimisation analysis in this instance because the outcome achieved is different.

PROCEDURAL STEPS IN COST-EFFECTIVENESS ANALYSIS

- *Defining the Problem*
- *Adopting a Research Strategy*
- *Specify Audience*
- *Define Perspective*
- *Specify the Time Frame Work*
- *Prepare the Analytic Horizon*
- *Decide the Type of Study Design*
- *Identify the Outcome Measures or Variable*
- *Search for Available Alternatives*
- *Identify the Types of Costs to be included in CEA*
- *Analysis*

Compare cost-effectiveness?

- In cost-effectiveness analysis, it is important to use the incremental economic analysis, which identify the difference (increment in costs and outcomes) between two health care programs. OR To assess the consequences of expanding an existing program.
- Incremental economic analysis enable identifying the dominance of the intervention or the control should be evaluated
- Graphically this can be illustrated by the cost-effectiveness plan
  - The incremental costs a (Y-axis) re plotted against the incremental effects (X-axis)


NW
Cost difference
NE
+
New treatment always rejected, i.e. dominated
?
Intervention less effective and more costly
Intervention more effective and more costly
Effect difference
?
New treatment always accepted, i.e. dominated
Intervention less effective and less costly
Intervention more effective and less costly
SW
-
SE

Cost-effectiveness analysis

- A new intervention is said to dominate control being less costly and more effective

  i.e. located in the southeast quadrant.
- Vice Versa, a control dominates an intervention if the new intervention is less effective and more costly

  i.e. it is located in the northwest quadrant
- In the case of dominance, it is clearly appropriate to implement the least costly and most effective (or dominant) option

Cost-effectiveness analysis

However, more common is a new intervention to be more effective and more costly (less common new intervention with less effectiveness and cost)

- A decision should be made in such circumstances whether the additional health benefit is worth the additional cost

What to do???? We need to estimate the incremental cost-effectiveness ratio (ICER)

Incremental cost-effectiveness ratio (ICER):

ICER: The costs required to achieve one extra unit of outcome

It is calculated by dividing the difference in costs to the difference in effects between the interventions

$$\text{ICER} = \frac{\Delta\ \text{Costs(JD)}}{\Delta\text{Efficacy}} = \frac{\text{Cost A- Cost B}}{\text{Effectiveness A- Effectiveness B}}$$

ICER: more accurate and more meaningful since it represents the costs and benefits of each new treatment compared with an existing one.

Again Drug b vs. Drug A

- Drug A costs 10 JDs per month and causes a 10mmHg drop in Blood Pressure
- Drug B costs 25 JDs per month and causes a 12mmHg drop in Blood pressure ……..**Calculate ICER?**

ICER = Cost Drug B (new) – Cost Drug A (old)

Effectiveness Drug B (new) – Effectiveness Drug A (old)

= 25 - 10 / 12 mmHg – 10mmHg

Costs an additional 15 JDs for an extra 2 mmHg drop in BP

ICER is 7.5 JD /1 mmHg drop in BP

Another example

	Cost/unit (USD)*	No. of units	No. of patients	Total cost (USD)
Medicine A				
Medicine cost	40	12	100	48,000
Lab cost	20	1	100	2,000
Adverse event	50	2	100	10,000
Physician	25	2	100	5,000
Total				65,000
Medicine B				
Medicine cost	25	12	100	30,000
Lab cost	20	2	100	4,000
Adverse event	50	3	100	15,000
Physician	25	3	100	7,500
Total				**56,500**

- The effectiveness unit is: number of patients with ≥ 1% decrease in glycosylated hemoglobin over one year

Effectiveness

Medicine A	Medicine **B**
25/100 patients	19/100 patients

What is ICER?

Comparison between medicines A and B for 100 patients for 1 year

	Medicine A	Medicine B
Net costs USD*	65,000	56,500
Effectiveness		
No. patients with ≥ 1% decrease in glycosylated hemoglobin	25	19

Incremental Cost Effectiveness Ratio =
(65,000-56,500)/(25-19) = USD1,416.67 per extra patient with ≥ 1% decrease in glycosylated hemoglobin.

Advantages of cost-effectiveness analysis

- Adv:
  - ✓ An appropriate method when the outcome of intervention or program are measured in the same unit.
  - ✓ This method is easy to understand and more readily suited to decision making.
  - ✓ It provides empirical results for the decision makers to compare the costs and consequences associated with alternative programs.

Disadvantages and Drawbacks of cost-effectiveness analysis

- The data regarding direct costs such as doctors' or nurses' time and supplies used; indirect costs such as a portion of administrative costs, the cost of equipment are usually not readily available.
- Cost-effectiveness is the only one criterion for judging whether an intervention is effective or not.
- It does not facilitate comparing alternatives or health care programs with different types of outcomes E.g. MI treatment (Life year gained) versus vaccination for influenza (Reduction in infection rate)
- When the intervention or program has an impact on quality and quantity of life