COST-BENEFIT ANALYSIS PART II

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CLOSED-ENDED QUESTIONS

Closed-ended questions are also called "**take-it-or-leave-it**" questions.

Respondents are asked whether or not they will pay a specified dollar amount for the program or intervention. Here is an example:

Would you be willing to pay $60 for a 1-hour consultation with a pharmacist?

_____Yes _____No

CLOSED-ENDED QUESTIONS

This method more closely resembles the **marketplace**. When **consumers** shop for products, they must decide based on the **price** of the product whether to "take-it-or-leave-it."

One **drawback** to this method is that **only one question is asked**, so only one WTP value can be elicited from a respondent.

Thus, a very large sample would be required to determine the overall WTP value.

BIDDING GAME

The bidding game resembles an **auction** in that **several bids** are offered to reach a person's maximum WTP.

Before soliciting a second response, the bids are adjusted based on the first response.

This iteration could go on a number of times, but it is suggested that three times is optimal.

BIDDING GAME

Here is an example:

Would you be willing to pay $60 for a 1-hour consultation with a pharmacist?

_____**Yes** If yes, ask: **"Would you be willing to pay $80?"**

_____**No** If no, ask: **"Would you be willing to pay $40?"**

BIDDING GAME

This method is useful to try to arrive at a **person's maximum WTP value**.

It is **time consuming** and is best conducted via a face-to-face interview or over the Internet.

In addition, the **WTP values** can be **biased** depending on how high (or low) the first bid is. This is called "**starting point bias.**"

PAYMENT CARD

The payment card method provides the respondent with a list of possible WTP amounts (i.e., payment card) to choose from. Here is an example:

What is the maximum amount that you would be willing to pay for a 1-hour consultation with a pharmacist? Please circle your choice.

$150	**$90**	**$30**
$130	**$70**	**$10**
$110	**$50**	**$0**

PAYMENT CARD

This method is very easy to use and it provides respondents with a range of values to choose from.

The advantages of the method can also result in disadvantages. Providing respondents with a range of values can bias their WTP values.

The range provided can "**suggest**" the value of the intervention and can influence what respondents say. Also, "**range bias**" can influence the WTP amount.

PAYMENT CARD

For example, if the range of values was from

$0 to **$75** versus **$0** to **$150**

The respondents' WTP amount can vary depending on which range or starting point was provided.

ADVANTAGES AND DISADVANTAGES OF THE WILLINGNESS-TO-PAY METHOD

The main advantage of the WTP approach is that it is a method to place a dollar value on intangible benefits.

However, there are several disadvantages to the WTP methodology.

It is **difficult** for people to place a **dollar value** on a

- *health benefit or*
- *an increase in health-related quality of life or*
- *satisfaction*

ADVANTAGES AND DISADVANTAGES OF THE WILLINGNESS-TO-PAY METHOD

Because a "**hypothetical**" or **artificial scenario** is presented, it is possible that

- respondents might give a "**hypothetical response**"

or

- respondents may **not understand** the value of the market being presented (e.g., pharmaceutical care program).

CALCULATING RESULTS OF COSTS AND BENEFITS

After all costs and benefits have been identified and quantified, the results of the analysis must be presented in ways that help decision makers understand the value of the program or intervention.

CBA can be presented in the following three formats:

- *net benefit calculations*
- *benefit-to-cost ratios*
- *internal rate of return (IRR)*

CALCULATING RESULTS OF COSTS AND BENEFITS

When evaluating interventions, it is important to consider the time horizon for the project.

If retrospective data are collected for more than 1 year or if the project inputs or outcomes are estimated for more than 1 year into the future, it is important to **adjust** or **discount** these **costs** one **point in time**.

NET BENEFIT (OR NET COST) CALCULATIONS

The **net benefit** or **net cost** calculation simply presents the difference between the total costs and benefits.

Net benefit = total benefits — total costs

Net cost = total costs — total benefits

Interventions would be considered to be **cost beneficial** if:

Net Benefit > 0 or Net Cost < 0

BENEFIT-TO-COST (OR COST-TO-BENEFIT) RATIO CALCULATIONS

CBA results can also be calculated by summing up the total benefits and dividing by the total costs.

The ratio may be expressed as a **benefit-to-cost** ratio or a **cost-to-benefit** ratio.

Depending on how the ratio is calculated, interventions are **cost beneficial** if:

Benefit-to-cost > 1 or Cost-to-benefit < 1

EXAMPLE USING DIFFERENT CALCULATION TECHNIQUES

Suppose a decision maker had to choose between two proposals for implementation. Also assume that the projects are for **1 year**, so discounting is not needed.

Proposal A: Cost = $1000; Benefit = $2000

Proposal B: Cost = $5000; Benefit = $7500

TABLE 7.4. COMPARISON OF TWO PROPOSALS USING NET AND RATIO CALCULATIONS

	Proposal A	*Proposal B*
Net benefit	\$2000 − \$1000 = \$1000	\$7500 − \$5000 = \$2500
Net cost	\$1000 − \$2000 = −\$1000	\$5000 − \$7500 = −\$2500
Benefit/cost ratio	\$2000/\$1000 = 2.0	\$7500/\$5000 = 1.5
Cost/benefit ratio	\$1000/\$2000 = 0.5	\$5000/\$7500 = 0.7

EXAMPLE USING DIFFERENT CALCULATION TECHNIQUES

Table 7.4 shows the net and ratio calculations for both proposals.

Although four calculations are shown in the table, the benefit-to-cost ratio (when compared with the cost-to-benefit ratio) and the net benefit calculation (when compared with the net cost calculation) are used most often because the higher the result, the more cost beneficial an option becomes.

EXAMPLE USING DIFFERENT CALCULATION TECHNIQUES

Using the criteria outlined above for cost-beneficial programs, it is apparent that both programs are cost beneficial using both the net and ratio methods of calculations.

When comparing **net calculations**,

proposal B is more cost beneficial than proposal A

(net benefit = $2500 versus $1000)

When using **ratio**, proposal A is more cost beneficial than proposal B calculations.

(benefit-to-cost ratio = 2.0 versus 1.5)

EXAMPLE USING DIFFERENT CALCULATION TECHNIQUES

In this example, in which both proposals are cost beneficial, the decision maker may consider other issues, such as the **amount of money available for investment**.

Whereas

- proposal A would require $1000 input costs.
- proposal B would require $5000 input costs.

EXAMPLE USING DIFFERENT CALCULATION TECHNIQUES

Another consideration may involve **the return on investment**.

Proposal A (2:1 benefit-to-cost ratio)

has a higher return than

Proposal B (1.5:1 benefit-to-cost ratio)

A third consideration is the **actual net benefit amount**.

Proposal B ($2500) has a higher net benefit than proposal A ($1000)

WORKED EXAMPLE 7.1 Economic evaluation of management of anaemia in haemodialysis patients

Patients with chronic renal failure who are on haemodialysis suffer from profound anaemia, which is often extremely debilitating. This is due to a reduction in the production of erythropoietin in these patients, and loss of blood during haemodialysis. Historically, these patients have been managed by the use of blood transfusions. Now, synthetic erythropoietin is available. It is considered to be highly effective, but is very expensive. So, the alternatives are either to give erythropoietin or to give blood transfusions when the patient's haemoglobin level is below 8 g/dl.

Total costs to manage the 1000 patients for 1 year using blood transfusions: £3,128,000.

Total costs to manage the 1000 patients for 1 year using erythropoietin: £5,547,100.

Outcome information

A willingness-to-pay study for the two alternatives available from the literature suggests that patients maintained on erythropoietin are

'willing to pay' for the extra perceived health benefits over blood transfusions. In a study, 50 patients stated that they would be willing to pay a mean of £2,000 a year for the extra health benefits associated with erythropoietin.

1. **What is the difference in cost between the two alternatives for the 1000 patients?**
   £2,419,100.

2. **What is the difference in benefit between the two alternatives, expressed in monetary terms, i.e. how much are patients willing to pay for the health benefits for erythropoietin per year of treatment, for the 1000 patients?**

   Change in benefit = £2,000 more benefit per annum per patient when given erythropoietin.

Change in benefit = £2,000,000 more benefit per annum per 1000 patients when given erythropoietin.

3. What is the overall net benefit of erythropoietin compared with blood transfusions?

Overall net benefit = Change in benefit − Change in cost
= 2,000,000 − 2,419,000
= −£419,000.

Therefore, the overall net benefit from giving erythropoietin is −£419,000.

If the net benefit is negative, the net cost (to society) is positive, so the preferred option must be the blood transfusions.

USING COST-BENEFIT ANALYSIS TO ALLOCATE RESOURCES TO DIFFERENT SERVICES

Worked example 7.1 shows how WTP can be used in a CBA to generate net benefit.

However, in that example we were trying to decide between two ways of treating the same illness.

We could also have used a common outcome such as the presence of anemia, and the resulting economic evaluation would have been a CEA (see previous lectures, worked examples).

USING COST-BENEFIT ANALYSIS TO ALLOCATE RESOURCES TO DIFFERENT SERVICES

It is more difficult to compare two healthcare interventions that do not have comparable outcome measures.

CEA cannot be used in this situation, and we have to use an outcome measure that can be used across different diseases, such as WTP.

CBA can be used to generate net benefit in different disease areas, and so diseases with different clinical outcomes can be compared.

This means that CBA can be used to allocate resources to different services. Worked example 7.2 illustrates how this can be carried out

WORKED EXAMPLE 7.3.

A group of community nurses (**Group A**) wants to set up an asthma patient monitoring service for a GP practice which has 200 asthma patients.

Results from a study suggest that the practice will have **cost reductions** and the patients will have **improved outcomes** (see the coming table).

WORKED EXAMPLE 7.3.

Impact of a nurse-led asthma monitoring services

Costs and outcome measures for 1 year	Before asthma service	With asthma service	Difference
Prescribing costs (£)	20,000	16,000	- 4,000
Hospital costs (£)	2,000	1,000	- 1000
Nurse services costs (£)	0	4,000	4,000
Total costs (£)	22,000	21,000	- 1,000
Emergency hospital admission due to asthma	20	10	- 10

WORKED EXAMPLE 7.3.

Another group pf community nurses (**Group B**) wants to set up an ischemic heart disease (IHD) patient monitoring services for the same GP practice, which has 250 IHD patients.

Results from a study suggest that the service will be **cost neutral** and the patients will have **improved outcome**.

WORKED EXAMPLE 7.3.

Impact of a nurse-led ischemic heart disease monitoring services

Costs and outcome measures for 1 year	Before IHD service	With IHD service	Difference
Prescribing costs (£)	25,000	20,000	- 5,000
Hospital costs (£)	10,000	5,000	- 5,000
Nurse services costs (£)	0	10,000	10,000
Total costs (£)	35,000	35,000	0
Emergency hospital admission due to chest pain	50	25	- 25

WORKED EXAMPLE 7.3.

The practice has to decide whether

to reduce **emergency admissions** due to **asthma** by

10 a year and save £1,000

reduce **emergency admissions** due to **chest pain**

by 25 a year at no change in costs

How can the GP objectively compare and choose between improving the health of asthma and that of IHD patients?

Groups A and B elicit WTP values from the 200 asthma and 250 IHD patients (Table 7.3).

Table 7.3 WTP values for asthma and IHD patients

Service	*Mean WTP per patient (£)*	*Range of WTP values (£)*	*Total WTP for group (£)*
Asthma monitoring (200 patients)	250	50–1,500	50,000
IHD monitoring (250 patients)	350	40–2,500	87,500

What do these results mean?

The asthma patient group has a combined WTP of £50,000. The IHD patient group has a combined WTP of £87,500. Therefore, £37,500 more benefit will be obtained by funding the IHD monitoring service.

Net cost to society = Cost of service − Benefit of service.

The asthma service costs −£1000 and provides £50,000 of benefit. The IHD service costs £0 and provides £87,500 of benefit. This equates to − £51,000 for the asthma service and − £87,500 for the IHD service. Therefore the IHD service provides £36,500 more benefit. It has an incremental net cost of − £36,500 to society.

So, this CBA would suggest that, because both services have a net negative cost (positive net benefit) to society, both are 'worth it'. It would then go on to recommend the IHD service over the asthma service.

COST-BENEFIT OR COST-EFFECTIVENESS ANALYSIS

Cost-benefit and cost-effectiveness analyses are useful tools for assessing the clinical economic impact of medical care programs or interventions.

There are, however, several important distinctions between the two approaches.

COST-BENEFIT OR COST-EFFECTIVENESS ANALYSIS

First, CBA may be applied to single or multiple programs, while cost-effectiveness analysis is applied to multiple programs.

Second, CBA may be used to compare programs with disparate outcomes. In contrast, cost-effectiveness analysis is a method for identifying the least costly approach to achieving a single outcome.

COST-BENEFIT OR COST-EFFECTIVENESS ANALYSIS

A third distinction is that CBA requires that all the outcomes or benefits be assigned a dollar value. The outcome or effect is not valued in cost-effectiveness analysis.

Which approach should you use in the pharmacy arena? It depends. A general guideline is that cost-effectiveness analysis is most appropriate when a single effect or outcome can be defined.

CBA is usually most appropriate when a single program is to be evaluated or when budget allocation decisions must be made among programs with unrelated outcomes.

Thank you