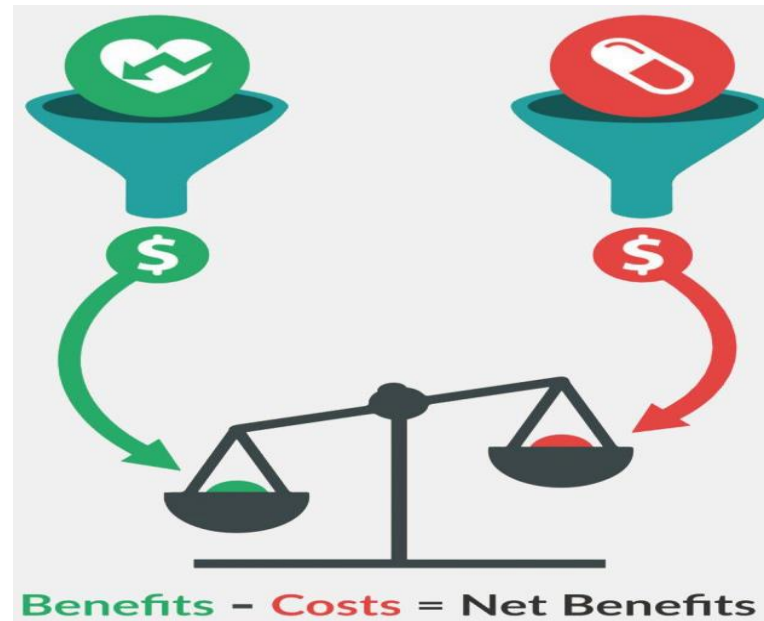


Cost Benefit Analysis

Chapter 7



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Objectives

- Upon completing this chapter, you will be able to:
 - define and describe cost-benefit analysis (CBA)
 - discuss the methods of measuring productivity and intangible costs
 - discuss how CBA can be used to quantify the value of clinical pharmacy services
 - explain the two methods of presenting CBA results
 - net benefit Vs benefit to cost ratio



- Cost benefit analysis (CBA) is a method that allows for the identification, measurement, and comparison of the benefits of an intervention with costs incurred to achieve this benefit
- CBA measures both the costs and the outcomes in **monetary terms**
 - compares intervention costs to the monetary value of outcomes
 - determines whether benefits are greater than costs

- it is difficult to determine the monetary value of health outcomes of an intervention
 - therefore, CBA is usually employed to evaluate **clinical services or programs** rather than individual patient t/t
 - usually the perspective of CBA is societal
- one of the applications of pharmacoeconomics is to justify or evaluate clinical services/programs
 - should a new pharmacy service be implemented?
 - is an immunization or vaccine plan cost-beneficial?

- although clinical pharmacy programs have shown **improvements** in clinical outcomes, financial pressures are forcing decision makers to consider the following questions:
 - do the benefits of a program or intervention outweigh the costs?
 - which program will provide the greatest benefit?
- CBA is a tool that can be used to address these questions

Steps in Conducting Cost Benefit Analysis

1. determine the type of program or intervention to be evaluated
2. identify alternative programs or interventions
3. identify the costs and benefits
4. calculate results of costs and benefits

1. Determine the type of program or intervention to be evaluated

- pharmacists are working in many areas of health care providing **clinical services** and developing **specialty clinics** in areas such as:
 - anticoagulation clinic, diabetes mgt clinic, asthma mgt clinic, pharmacokinetic monitoring service, osteoporosis mgt clinic, and HIV/AIDS mgt clinic, etc.
- these are some of possible programs or interventions for evaluation using CBA

2. Identify alternative programs or interventions

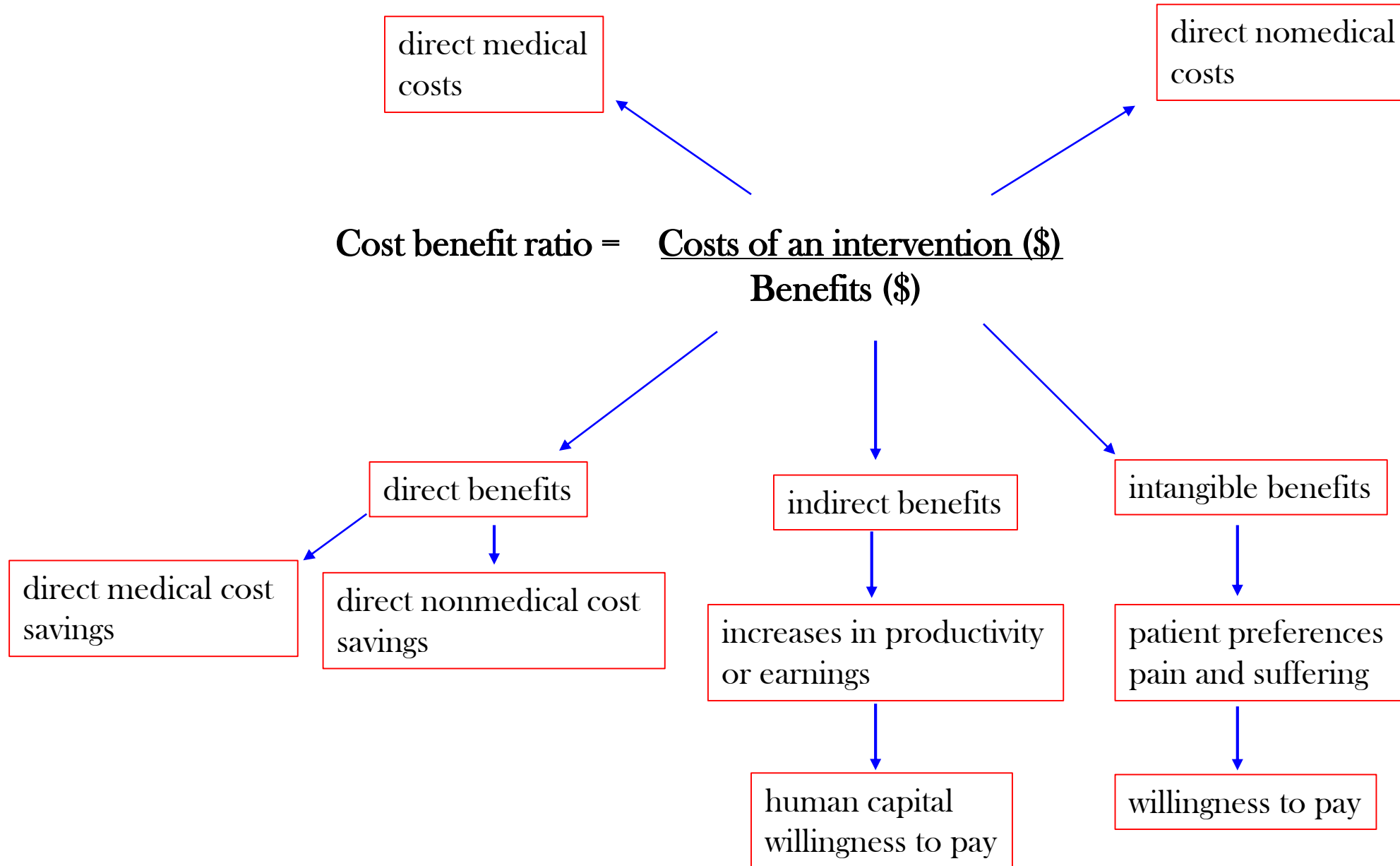
- For example, if a clinical pharmacist would like to start an **asthma clinic**, the alternatives for this service could be:
 - to do nothing (common)
 - E.g. Implementing asthma clinic Vs not having an asthma clinic
 - to implement a similar program that is smaller or larger in scale
 - to implement a different program
 - E.g. implementing an asthma clinic Vs a diabetes clinic

3. Identify the costs and benefits (components of CBA)

- identify the types of costs and benefits included in CBA
 - depends on the perspective of the analysis
- in CBA, both costs and outcomes are measured in **monetary units**
 - it is important to **make the distinction** between the two and to make sure that costs and benefits are properly placed within **the equation**

- difference:
 - costs are inputs/resources consumed to provide the intervention
 - benefits are **costs avoided** or **cost savings** as a result of the intervention
 - benefits are monetary values of health outcomes

- there are two categories of **costs** that are usually included in CBA:
 - direct medical and direct nonmedical costs
- four categories of **benefits** that can be included in CBA are:
 - direct medical benefits (direct medical costs avoided)
 - direct nonmedical benefits (direct nonmedical costs avoided)
 - indirect benefits (indirect costs avoided or increased productivity/earnings)
 - intangible benefits (intangible costs avoided)



- 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 to one point in time

Measuring Indirect and Intangible Benefits

- indirect benefits are **increases in productivity or earnings** as a result of a program or intervention
- intangible benefits are monetary values of reductions in pains and suffering as a result of a program or intervention

1 Monetary Valuation

The analysis estimates that the following **benefits** are worth \$140 billion:

- Direct medical costs averted
- Valuation of quality of life gained due to non-fatal heart attacks averted
- Valuation of life years gained due to fatal heart attacks averted

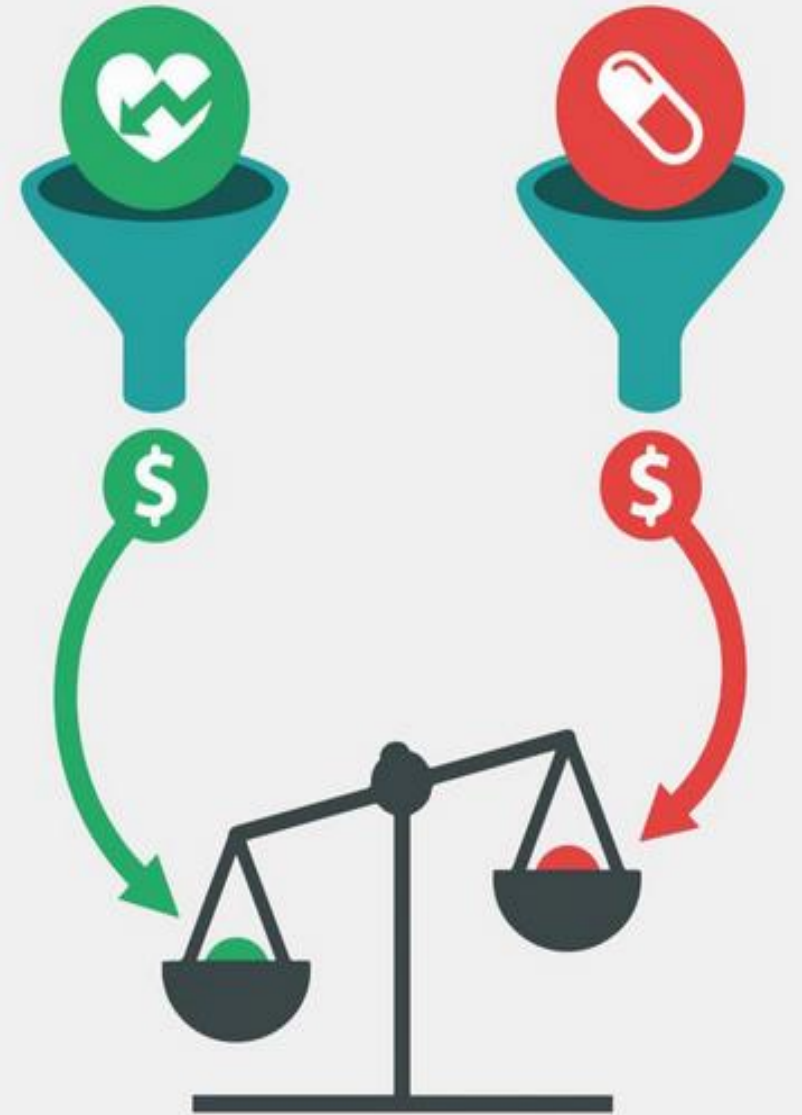
Next, the analysis estimates that **costs** to the industry and consumers are \$6 billion.

2 Calculation of Net Benefits

\$140 billion in benefits

- \$6 billion in costs

\$134 billion in net benefits



Benefits - Costs = Net Benefits

- there are different methods to estimate indirect benefits
- the two most commonly used methods are:
 - the human capital approach and
 - the willingness to pay approach
- intangible benefits are estimated using willingness to pay method

Human Capital Method (HC)

- the HC method is used to estimate morbidity and mortality costs (**wage** and **productivity** losses) based on an individual's earning capacity using standard labor wage rates
- the HC approach assumes that the value of health benefits **equals** the economic productivity that they permit

- there are two basic components to calculate indirect benefits using HC:
 - wage rate and
 - missed time because of illness or death
 - missed time can be days or years

Wage Rate Calculations

- depending on the type of study, a **yearly wage rate** or a **daily wage rate** can be calculated
- yearly wage rate
 - is income per year
 - used for a program or intervention that would reduce **long-term disability or death**

- for example, a pneumococcal vaccination program might result in preventing premature death
 - thus, it is appropriate to use a yearly wage rate
 - the value of the number of years saved because of the intervention will be calculated to determine indirect benefits

- daily wage rate
 - income per year divided by number of days worked per year
 - used for a program or intervention that would reduce **short-term disability**
- a person with a chronic disease may not be adversely affected by the disease state on a continual basis, but he may have **short-term periodic disability**
 - in such cases, daily wage rate is used to determine indirect benefits

- for example, asthma, a chronic disease state, may include episodic asthma attacks
 - a person may only experience problems with the disease state on a **periodic basis**
 - in such cases, daily wage rate is used to determine indirect benefits
- to calculate a daily wage rate both income and number of days worked per year must be determined

- number of days worked per year is calculated as follows:

$$\begin{aligned} \text{average work days per year} &= \text{number of days in a year} - \text{number of weekend days} - \text{number of vacation days} - \text{number of sick-leave days} \\ &= 365 - 104 - 21 - 7 \\ &= 233 \text{ days} \end{aligned}$$

Missed Time Because of Illness

- to calculate indirect benefits using yearly wage rate, the number of years missed/lost because of illness or premature death must be determined
- to calculate indirect benefits using daily wage rate, the number of missed days because of illness must be determined

- Missed days because of illness can be categorized as follows:

Categories of missed days	Examples
Missed work	<ul style="list-style-type: none">• Days missed from work
Restricted activity days	<ul style="list-style-type: none">• Proportion of time during which work was restricted• Did not miss an entire day of work but not productive for part of the day

- Example 1: assume that the population served by an asthma clinic is made up of adults with an average annual income of \$4,660 and 233 days worked per year. An average of 40 days a year were missed from work before participating in the asthma clinic, and an average of 10 days a year were missed from work after participating in the asthma clinic.
- Determine:
 - a. the value of lost productivity before participating in the asthma clinic
 - b. the value of lost productivity after participating in the asthma clinic
 - c. the indirect benefit or the cost savings per person of the asthma clinic service

- since asthma has short-term periodic disability, We use daily wage rate rather than yearly wage rate to determine the value of lost productivity

$$\text{daily wage rate} = \frac{\text{average yearly income}}{\text{number of days worked per year}}$$

$$= \$4,660/233 \text{ days} = \underline{\$20/\text{day}}$$

Daily Wage Rate	Average Number of Missed Days per Year
Before: \$20	40
After: \$20	10

a. lost productivity **before** participating in the asthma clinic
= daily wage rate x number of missed days **before** participating
= \$20/day x 40 days = \$800

the value of 40 days lost from work is \$800

- b. lost productivity **after** participating in the asthma clinic
= daily wage rate x number of missed days
= \$20/day x 10 days = \$200

the value of 10 days lost from work is \$200

c. cost savings/indirect benefit from the service = the value of 40 days lost from work - the value of 10 days lost from work
= \$800 - \$200 = \$600

Indirect benefit per person = \$600

🍏 this is the monetary value of increased productivity

Daily Wage Rate	Average Number of Missed Days per Year	Average Value of Lost Productivity (\$)
Before: \$20	40	800
After: \$20	10	200

Willingness-to-Pay Method (WTP)

- the WTP method can be used to estimate the monetary value of both the **indirect** and **intangible** aspects of a disease or condition
- a technique which aims to assign a value to health benefits by directly eliciting individual preferences in the views of samples of the general public who are asked how much they would be prepared to pay to accrue a benefit or to avoid certain events
- this method determines **how much people are willing to pay** for a given health outcome

- in this method, the respondent is asked to value a contingent or hypothetical market
- to estimate WTP values, respondents are:
 - presented with a hypothetical market describing **the benefits** of a particular intervention
 - then asked to **value** the intervention in a monetary amount
- the WTP includes two general elements:
 - a hypothetical scenario and
 - a bidding vehicle

Hypothetical Scenario

- the hypothetical scenario should include a **description** of the health care program or intervention
- the purpose of the scenario is to provide the respondent with an **accurate description** of the good or service that he or she is being asked to value

- the hypothetical scenario should detail
 - the benefit of the intervention
 - the amount of time the person should expect to spend
- an example of a hypothetical scenario for asthma clinic is presented in the next slide:

Asthma Clinic Hypothetical Scenario

- patients with asthma have improved their condition by **learning more about their disease** and by **taking their medications as directed**
- pharmacists can help you understand your **condition** and the **medications** used to treat it

Asthma Clinic hypothetical Scenario...cont'd

- in addition, pharmacists can:
 - help you learn **how to use** a peak flow meter and an inhaler
 - help you **better manage** the medications used to treat asthma
 - help you **recognize and handle** situations when asthma attacks occur
 - monitor your asthma by keeping a record and a regular follow up to **assess your progress**
- this type of service would last approximately **1 hour**
- the program would result in a **50% improvement** in your asthma

Bidding Vehicles

- after the program or intervention has **been adequately described**, respondents are then asked to “bid,” or place a value on the program or intervention
- bids can be obtained through a variety of formats, such as open-ended questions, closed-ended questions, or a payment card

- open-ended questions
 - Example: what is the maximum amount that you would be willing to pay for a 1-hour consultation with a pharmacist? _____
- close ended questions
 - Example: would you be willing to pay \$60 for a 1-hour consultation with a pharmacist? Yes No

- **Payment Card**

- the payment card method provides the respondent with a list of possible WTP amounts to choose from

- 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

- Disadvantage of the willingness to pay method is that the values obtained through this method can be **unreliable** because of the substantial differences in valuations of life that result from the **subjective** nature of this approach

4. 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
- results of CBA can be presented in the following two formats:
 - net benefit
 - benefit to cost ratios

Net Benefit Calculations

- The net benefit calculation presents the difference between the total costs and benefits

Net benefit = total benefits – total costs

🍏 interventions are cost-beneficial if:

- Net benefit > 0

Benefit to Cost Ratio Calculations

- CBA results can also be presented as a benefit-to-cost ratio

Benefit-to-cost ratio = total benefits/total costs

🍏 interventions are cost-beneficial if:

- Benefit-to-cost ratio > 1

- Example 1: Suppose you are interested in determining whether a pharmacokinetic monitoring service is economically beneficial to your organization. One year after the service was implemented, a CBA was performed, and result of the costs and benefits of the service over the first year is shown in the next slide.

Cost categories	Amount of cost (\$)	Health outcome	Benefit/monetary value of health outcome (\$)
Salaries	90,000	Reduction in length of stay	250,000
Office supplies	10,000	Fewer days of IV therapy, including IV supplies	50,000
Total	100,000		300,000

- a. calculate the net benefit of the pharmacokinetic service
- b. calculate the benefit to cost ratio of the pharmacokinetic service
- c. how would you interpret the cost/benefit ratio calculation result?
- d. is the pharmacokinetic service cost beneficial?

a. Net benefit = total benefit - total cost

$$= \$300,000 - \$100,000 = \underline{\$200,000}$$

b. Benefit- to- cost ratio = total benefit/total cost

$$= \$300,000/\$100,000 = \underline{3:1}$$

c. Interpretation of benefit to cost ratio result (3:1):

For every 1 dollar spent, the pharmacokinetic service has a return of 3 dollars

- **Example 2:** Suppose a decision maker had to choose between two proposals for implementation.
 - proposal A: Cost = \$1,000; Benefit = \$2,000
 - proposal B: Cost = \$5,000; Benefit = \$7,500
- a. compare the two proposals using net and ratio calculations
- b. how much would be the return from each project?

a. Net benefit from Proposal A = $\$02,00 - \$1,000 = \underline{\$1,000}$

Net benefit from Proposal B = $\$7,500 - \$5,000 = \underline{\$2,500}$

b. Benefit to cost ratio of proposal A = $\$2,000/\$1,000 = \underline{2:1}$

Benefit to cost ratio of proposal B = $\$7,500/\$5,000 = \underline{1.5:1}$

c. the return from project A would be $\$2$ for every $\$1$ invested

the return from project B would be $\$1.5$ for every $\$1$ invested

Advantages of cost benefit analysis

- avoids the need for deciding on acceptable costs or threshold
 - it uses summary measure such as net benefit or benefit/cost ratio which includes all benefits and costs in **monetary terms**
- **allows comparison of health program with non health program,** because all benefits are converted into monetary units
- can be used when comparing programs with different **objectives** (different types of outcomes), because all benefits are converted into common monetary units

Disadvantage of cost benefit analysis

- placing **economic values** on medical outcomes is difficult

Choice of pharmacoeconomic evaluation methods

