COST-BENEFIT ANALYSIS

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INTRODUCTION

In a **cost-benefit analysis (CBA)** the outcomes of the two alternatives are measured using monetary values, that is, the monetary value attached to the health states produced by the two interventions.

The value may be attached by

- *Patients*
- *Health professionals*
- *The general population* (is preferred)

ADVANTAGES AND DISADVANTAGES OF COST-BENEFIT ANALYSIS

An advantage of this type of analysis is that many different outcomes can be compared as long as the outcomes measures are valued in monetary units.

The **disadvantage** is that placing economic values on medical outcomes is not an easy task and there is **no universal agreement** on one standard method for accomplishing this.

ADVANTAGES AND DISADVANTAGES OF COST-BENEFIT ANALYSIS

To illustrate the advantage of CBA compared with cost-effectiveness analysis (CEA), Table 7.1 shows examples of various programs and interventions and their corresponding cost-effectiveness and cost-benefit ratios (CBA ratios are expressed as benefit-to-cost ratios, where the higher the number, the more cost-beneficial).

TABLE 7.1. COMPARISON OF COST-EFFECTIVENESS RATIOS AND BENEFIT-TO-COST RATIOS*

Program or Intervention	*Cost-Effectiveness Ratio*	*Benefit-to-Cost Ratio*
AIDS prevention and awareness program	$230,000/case prevented	8.4:1
Vaccination program for children	$104,000/case prevented	0.3:1
Smoking cessation intervention	$3700/quit	6.7:1
Diabetes medication adherence program	$67/normoglycemic patient	15.1:1
Breast cancer screening program	$50,000/life year saved	2.4:1

ADVANTAGES AND DISADVANTAGES OF COST-BENEFIT ANALYSIS

Assume you are a decision maker and you must choose one program from Table 7.1 to implement in your organization.

Assume that you only had **cost-effectiveness ratios** available to help make the choice. How would you choose?

One can quickly see that it would be difficult to compare the programs using only cost-effectiveness ratios because of the **varying outcomes** (e.g., case prevented, life years saved).

ADVANTAGES AND DISADVANTAGES OF COST-BENEFIT ANALYSIS

On the other hand, the **benefit-to-cost ratios** can be ranked, and programs with similar, as well as dissimilar, outcomes can be compared.

If only the cost-effectiveness ratios were available, it would be more difficult to compare the value of the various interventions

ADVANTAGES AND DISADVANTAGES OF COST-BENEFIT ANALYSIS

As the cost of health care continues to increase, many decision makers must make choices regarding which programs will be implemented.

The **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

CONDUCTING A COST-BENEFIT ANALYSIS

The first step in a CBA is to determine the type of program or intervention to be considered.

The second step is to identify alternatives. In many cases, the alternative is to "do nothing."

In other cases, the alternative could be to implement a similar program that is **smaller** or **larger** in scale or to implement a different program.

CONDUCTING A COST-BENEFIT ANALYSIS

For example, a clinical pharmacist would like to start an asthma clinic.

The alternative could be to compare the costs and benefits of having an asthma clinic with not having an asthma clinic.

Another alternative could be to compare implementing an asthma clinic for all persons who had an asthma-related emergency department visit.

A third alternative could be to compare implementing an asthma clinic with implementing a diabetes clinic.

CONDUCTING A COST-BENEFIT ANALYSIS

To illustrate the components of a CBA, we will use the example of an asthma clinic.

The clinic will focus on people with asthma who have had an asthma-related emergency department visit.

These people would automatically be referred to a clinical pharmacist, who would provide education on managing asthma.

CONDUCTING A COST-BENEFIT ANALYSIS

These clinical pharmacy services could include education on triggers, medication adherence, and the use of peak flow meters and inhalers.

In this example, the alternative will be **no asthma clinic**.

After the program or intervention and alternatives are identified, the next step is to identify the **costs** and **benefits**.

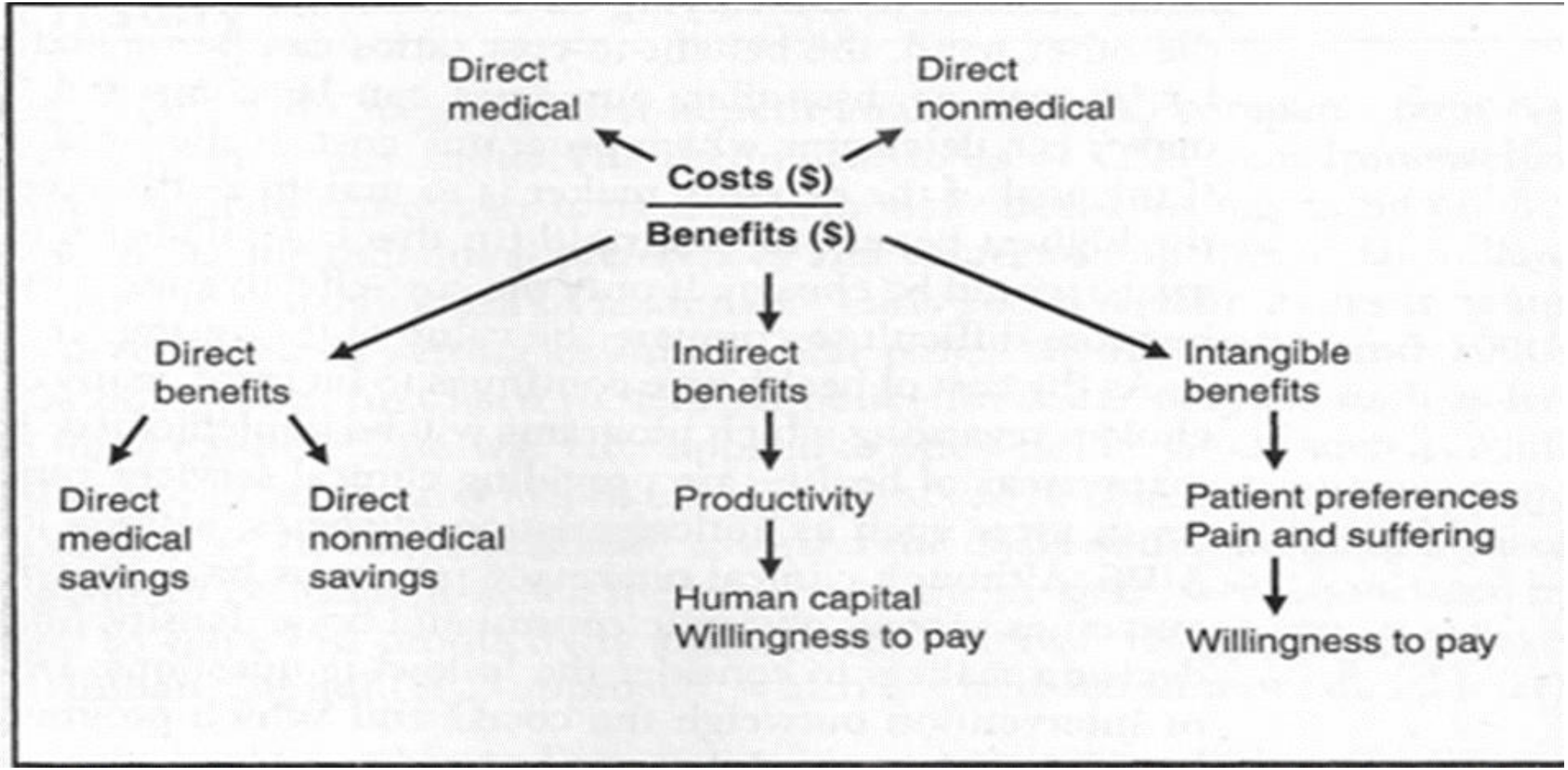

Figure 7.1. Components of cost-benefit analysis (CBA). This schematic represents the types of costs measured when conducting a CBA. Input costs (the numerator) usually consist of direct medical and direct nonmedical costs. The benefits of alternatives can include measures of direct medical and nonmedical costs avoided, indirect costs avoided (measured by human capital [HC] or willingness-to-pay [WTP] methods) and intangible costs avoided (measured by patient preferences or WTP methods).

CONDUCTING A COST-BENEFIT ANALYSIS

Figure 7.1 shows the basic components of CBA. As shown, there are two categories of costs,

1. direct medical
2. direct nonmedical

There are three categories of benefits,

1. direct benefits (both medical and nonmedical)
2. indirect benefits (productivity)
3. intangible benefits

CBA can incorporate as few as one category of benefits or as many as all three of the benefit categories.

CONDUCTING A COST-BENEFIT ANALYSIS

Before starting any pharmacoeconomics analysis, it is important to determine the perspective of the study.

Because of its focus on social welfare and policy and the incorporation of indirect (productivity) or intangible benefits, economists recommend that CBAs should be conducted from the societal perspective.

DIFFERENCE BETWEEN COSTS VERSUS BENEFITS

In CBA, both costs and benefits are measured in dollar values.

For example, in the asthma program, a cost to the program could be an increase in medical costs related to visits to the pharmacy.

A "cost saving" or benefit as a result of the program could be a reduction in medical costs for asthma-related emergency department visits.

MEASURING INDIRECT AND INTANGIBLE BENEFITS

Various methods have been developed to estimate the monetary value of health benefits.

The two most common methods seen in the pharmacoeconomics literature are

- ***the human capital (HC) approach***
- ***the willingness-to-pay (WTP) approach***

HUMAN CAPITAL METHOD

As indicated previously, indirect benefits are increases in productivity or earnings because of a program or intervention.

The HC approach is one way to measure indirect benefits. HC estimates wage and productivity losses because of illness, disability, or death.

The HC approach assumes that the value of health benefits equals the economic productivity that they permit.

HUMAN CAPITAL METHOD

There are two basic components to calculating HC:

- **wage rate**
- **missed time (days or years) because of illness**

Because the HC approach is based on wages, it is necessary to have some estimate of income.

Income estimates can be obtained from several sources (self-report; or any other data source that provides income estimates based).

Missed time (days or years) because of illness can be obtained by self-report.

WAGE RATE CALCULATIONS

Depending on the type of study, a yearly wage rate or a daily wage rate can be calculated.

A yearly wage rate (income per year) would be calculated 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 would be appropriate to use a yearly wage rate and assess the value of the number of years saved because of the intervention.

WAGE RATE CALCULATIONS

A daily wage rate (income per year ÷ by number of days worked per year) may be calculated for a program or intervention targeted at an acute or chronic illness with short-term disability.

A person may not be adversely affected by the disease state on a continual basis, but he or she may have short-term periodic disability.

For example, asthma, a chronic disease state, may include episodic asthma attacks.

WAGE RATE CALCULATIONS

Thus, a person may only experience problems with the disease state on a periodic basis.

For this type of disease state, a daily wage rate would be calculated.

To calculate a daily wage rate both income and number of days worked per year must be assessed.

WAGE RATE CALCULATIONS

We may assume that the average person works 240 days a year when accounting for weekends, vacation, and sick leave.

A formula to calculate number of days worked per year is:

Number of days in a year (365) — Number of weekend days (104) — Number of vacation days (14) - Number of sick-leave days (7) = 240.

MISSED TIME (DAYS OR YEARS) BECAUSE OF ILLNESS

If a yearly wage rate is calculated, then assessment of the number of years lost because of a disease or illness must be made.

If a daily wage rate is calculated, an assessment of the number of missed days because of illness must be calculated.

MISSED TIME (DAYS OR YEARS) BECAUSE OF ILLNESS

Because many pharmaceutical interventions involve chronic disease states with intermittent episodes, we will use an example calculating the daily wage rate and number of missed days.

Missed days because of illness can fall into **four groups.**

MISSED TIME (DAYS OR YEARS) BECAUSE OF ILLNESS

TABLE 7.2. CATEGORIES OF MISSED DAYS

Categories	*Examples*
Missed work	Days missed from work (for employed)
Missed housekeeping	Days missed from housekeeping (for unemployed)
Restricted activity days	Percent of time during which work or housekeeping was restricted
	Did not miss an entire day of work or housekeeping but not productive for part of the day
Caregiver time	Parent's time spent as a caregiver to a child who has an illness

MISSED TIME (DAYS OR YEARS) BECAUSE OF ILLNESS

Notice that for housekeeping and child care, estimates of productivity loss are estimated (imputed) even though no payments are directly associated with these activities.

MISSED TIME (DAYS OR YEARS) BECAUSE OF ILLNESS

Using the asthma clinic example, we will calculate an indirect benefit.

Assume that the population served by the clinic is made up of adults with an average income of $40,000 and 240 days worked per year.

The daily wage rate (average income/number of days worked per year) would be $40,000/240 = $167/day.

MISSED TIME (DAYS OR YEARS) BECAUSE OF ILLNESS

An average of 20 days a year were missed from work before participating in the asthma clinic.

An average of 7 days a year were missed from work after participating in the asthma clinic.

Multiplying the daily wage rate times the number of missed days results in the value of lost productivity.

MISSED TIME (DAYS OR YEARS) BECAUSE OF ILLNESS

In other words, the value of 20 days lost from work is $3340, and the value of 7 days lost from work is $1169.

The difference between before and after the program is $2171, which is the cost savings or the indirect benefit of the program or intervention (see Table 7.3 for the calculation).

MISSED TIME (DAYS OR YEARS) BECAUSE OF ILLNESS

TABLE 7.3. CALCULATION OF INDIRECT BENEFIT (MISSED WORK)

Daily Wage Rate	*Average Number of Missed Days per Year*	*Average Value of Lost productivity*
Before: $167	20	$3340
After: $167	7	$1169
Indirect benefit per person = $2171 (value of increased productivity)		

ADVANTAGES OF THE HUMAN CAPITAL METHOD

Measuring indirect benefits using the HC approach has several advantages.

It is fairly straightforward and easy to measure.

Income estimates can be obtained or estimated from publicly available sources, and days lost from illness can be readily obtained from the patient or another secondary source.

DISADVANTAGES OF THE HUMAN CAPITAL METHOD

The HC approach also has several disadvantages.

The primary concern with using the HC approach is that it may be biased against specific groups of people, namely unemployed individuals.

It assumes that if a person is not working, he or she has little or no economic benefit.

Children and unemployed elderly individuals are two groups with which **bias** can occur.

ADVANTAGES AND DISADVANTAGES OF THE HUMAN CAPITAL METHOD

The HC assumption that the value of health benefits equals the economic productivity they permit may also be biased.

The earnings for some individuals may not equal the value of their output.

For example, there is a large difference between the daily wage rate of a professional football player compared with that of an elementary school teacher.

DISADVANTAGES OF THE HUMAN CAPITAL METHOD

Some contend that because the underlying goal of using CBA is to measure the effect of an intervention on society, the HC approach is meant to measure the loss of productivity to society.

Thus, wage rates should be based on those of the average population, not the specific patients included in a study.

Although using general wage rates would not represent actual productivity losses or benefits to a specific group of patients, it would decrease some of the limitations of inequity already mentioned.

DISADVANTAGES OF THE HUMAN CAPITAL METHOD

The HC method also does not incorporate values for pain and suffering if these values do not impact productivity.

There may be certain disease states or conditions (e.g., menopause, hair loss) that may not impact productivity but do have an impact on a person's health-related quality of life.

For example, many women experience problems with menopause, including moodiness, hot flashes, and irregular cycles.

DISADVANTAGES OF THE HUMAN CAPITAL METHOD

Although this condition may have a significant impact on quality of life, most women do not miss many days of work because of complications from menopause.

Thus, the HC method would not be sensitive enough to capture the benefits of a pharmacist-provided menopause clinic.

Although biases exist with this method, it is the most commonly used method to measure indirect benefits.

WILLINGNESS-TO-PAY METHOD

The WTP method can value both the indirect and intangible aspects of a disease or condition.

The WTP method determines how much people are willing to pay to reduce the chance of an adverse health outcome.

The WTP method is grounded in welfare economic theory, and it incorporates patient preferences and intangible benefits such as quality of life differences.

WILLINGNESS-TO-PAY METHOD

WTP values can be collected through face-to-face interviews, mail, telephone, or via the Internet.

To elicit WTP values, respondents are presented with a hypothetical market describing the benefits of a particular health care intervention (e.g., program, pharmaceutical, medical device).

Respondents are then asked to value the health care intervention in a dollar amount. Measuring WTP should include 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 (e.g., medication therapy management program, new drug therapy).

The intent, 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.

In addition, the scenario should detail the amount of time the person should expect to spend, as well as the benefit (e.g., percent improvement in the condition) of the intervention.

HYPOTHETICAL SCENARIO

Asthma Clinic Scenario

Patients with asthma have improved their condition by learning more about their disease and by taking their medications as directed.

Pharmacists can help people with asthma understand their condition and the medications used to treat it.

HYPOTHETICAL SCENARIO

In addition, they can:

1. Help you learn how to use a peak flow meter and an inhaler.

2. Help you better manage the medications used to treat asthma.

3. Help you recognize and handle situations when asthma attacks occur.

4. Monitor your asthma by keeping a record on file and following up with you-on a regular basis to assess your progress.

5. Contact your doctor and report any changes in your health.

HYPOTHETICAL SCENARIO

An initial visit with your pharmacist would include an educational program on managing your disease state.

This type of service is available by appointment only and would last approximately 1 hour.

Assume that 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
- a bidding game
- a payment card

OPEN-ENDED QUESTIONS

Open-ended questions simply ask respondents how much— they would be willing to pay for the program or intervention.

This question would immediately follow the hypothetical scenario. Here is an example:

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

OPEN-ENDED QUESTIONS

The respondent would then write in their maximum WTP amount.

This method is used the least because it results in WTP values that vary widely.

Many people do not know how to value health care programs because they do not normally pay the full amount out of pocket.

THANK YOU