



**CDC Coffee Break:
Economic Evaluation: Alternatives to
ROI to Show Societal Benefits**



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National Center for Chronic Disease Prevention and Health Promotion



MODERATOR:

Welcome to today's Coffee Break presented by the Applied Research and Evaluation Branch in the Division for Heart Disease and Stroke Prevention at the Centers for Disease Control and Prevention.

We are fortunate to have **Jack Chapel** as today's presenter. **Jack** is from the CDC's Division for Heart Disease and Stroke Prevention and is an ORISE fellow on the **Evaluation and Program Effectiveness Team**.

My name is **Nikki Hawkins** and I am today's moderator. I am a behavioral scientist within the **Applied Research and Evaluation Branch**.

Before we begin

All phones have been placed in **SILENT** mode.



MODERATOR: Before we begin we have a few housekeeping items.

All phones have been placed in silent mode for this presentation, which will last about 12 minutes. If you have a question, please enter it on the Q & A or conversation box on your screen. As time permits, we'll address your questions at the end of the session.

Since this is a training series on evaluation, we do hope you will complete the poll and provide us with your feedback.

Disclaimer: The information presented here is for training purposes and reflects the views of the presenters. It does not necessarily represent the official position of the Centers for Disease Control and Prevention.

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So, without further delay. Let's get started. Jack, the floor is yours.



TYPES OF ANALYSIS AND METHODS FOR VALUATION OF SOCIETAL BENEFITS

Thank you Nikki.

Hi, I'm Jack Chapel and today I'll be talking about economic evaluation and how it can be used to show not just the direct financial benefits, but also the societal benefits of public health interventions.

Evaluators commonly think of Return-on-Investment (ROI) as the go-to analysis needed to demonstrate an intervention's value, but many are unaware that there are other methods that may be better suited for their needs in showing the societal benefits public health interventions can produce.

Overview

- ❑ ROI
- ❑ Cost-Benefit Analysis
- ❑ Cost-Effectiveness Analysis
- ❑ Compare all three
- ❑ Examples of putting monetary value to social benefits

In this presentation, I'll go over three of the fundamental types of economic analysis and point out their strengths and weaknesses when being applied to public health. I'll first talk about ROI and its importance in providing a business case for an intervention. Then I'll go over cost-benefit analysis and cost-effectiveness analysis and how they can be used to show benefits that may not be captured in an ROI. Finally, I'll go over a few examples of methods that can be used to put value to societal benefits in an economic analysis.

Return On Investment (ROI)

- ❑ **Originates from commercial business context**
- ❑ **Used to show direct financial return resulting from an investment, from the perspective of the investor**

$$\frac{\$ \text{ Gained} - \$ \text{ Cost of Investment}}{\$ \text{ Cost of Investment}} = \text{ROI}$$

- ❑ **Example: \$200 investment, \$300 return**
 - $(\$300 - \$200)/\$200 = 50\%$
 - Added 50% return on original \$200 investment

Return on Investment analysis originates from a commercial, business context to assess the performance of financial investments. It's useful for understanding the potential financial benefits of an investment from the perspective of the investor. Its focus is the direct financial return that an investor receives from their own financial investment.

The formula for calculating ROI is the net gain – or the direct financial gain from an investment minus the cost of the investment – divided by the cost of the investment. This gives the return on investment, often shown as a percentage. For example, an investment which costs \$200 and results in a \$300 gain would give an additional 50% return on the \$200 investment.

In calculating ROI, or any economic analysis, it is crucial to define what counts as a cost or a benefit by defining the perspective.

Side Note About Perspective

Cost	Perspective			
	Individual /Patient	Insurer/ Payer	Employer	Society
Direct Medical (e.g. hospital costs, prescriptions)	Yes	Yes	Yes	Yes
Direct Non-Medical (e.g. transportation, daycare while sick)	Yes	No	No	Yes
Indirect (e.g. lost time from work)	Yes	No	Yes	Yes
Intangible (e.g. lost quality of life, pain)	Yes	No	No	Yes

To understand differences in perspective let's look at an example of healthcare related costs from four different perspectives – the individual, the insurer or payer, an employer, and from the perspective of society as a whole.

In the first row are medical costs – such as clinical costs and medications. These costs would be counted no matter which perspective was used in a study.

In the second row are non-medical direct costs like transportation or child care expenses incurred because of an illness. Because a health insurance company or an employer wouldn't pay for these costs, they would not be counted as costs in a study that took those perspectives.

Indirect costs like time lost from work would not be included in a study from the perspective of the insurer. However, an employee's lost time from work would be counted as a cost to the employer whose workforce is impacted, and, again, to the individual and society as a whole

In the last row are intangible costs such as pain and suffering. Although these are often difficult to measure, they represent a cost to the patient and a cost to society, often in terms of quality of life.

Perspective doesn't just apply to costs, it also applies to benefits. Intangible benefits like improved quality of life may not be counted from the perspective of an insurer but they would be counted from the perspective of society.

The important point to understand from this chart is that the perspective taken in an economic analysis can have an important influence in how an intervention is assessed and

the results obtained and interpreted.

Return on Investment (cont.)

- ❑ **Typically only takes the perspective of the entity directly paying for the intervention**
 - Relies on short-term returns
 - Often ignores health of beneficiaries
- ❑ **Example: employer sponsored wellness program**
 - Costs incurred by the employer to implement the program
 - Benefits are financial benefits resulting from the program
 - Higher productivity from reduced absenteeism, healthcare utilization money saved
- ❑ **However, most public health programs are implemented because of their non-financial benefits to society**
 - Only considering financial benefits may portray the intervention as not worth the cost

Lets look at ROI again. ROI typically only takes the perspective of the entity paying for the intervention, rather than assessing the benefits and costs of the intervention from the societal perspective. As a result, return-on-investment analysis usually relies on short-term returns and often ignores the health of beneficiaries. Nonetheless, return-on-investment analyses are still important because they show the business case for an intervention from the payer's perspective.

An example could be an employer implementing a workplace health promotion program. From the payer's perspective, the costs of this would be the costs incurred by the employer to implement the program, and the benefits would be the financial gains that result from it – like money saved from less utilization of employer provided health insurance. However, it would not count benefits like improved health and quality of life for the employee.

While ROI is important for showing the business case for an intervention, it has limitations. The interests of investors in a public health programs are different than those who invest for the primary purpose of generating profits. Most public health programs are implemented because of their nonfinancial benefits. These programs' benefits accrue to patients, communities, and society as a whole. Without taking into account all these benefits and focusing only on financial gains, the intervention may look as though it's not worth the cost.

It's usually clearer to think about societal ROI in terms of **cost-benefit analysis (CBA)** or **cost effectiveness analysis (CEA)**, as described below.

Cost-Benefit Analysis (CBA)

- ❑ **Also commonly called Benefit-Cost Analysis**
- ❑ **Like an ROI from a societal perspective**
- ❑ **Attaches dollar values to all costs and benefits**
 - Costs can include indirect costs
 - Benefits can include indirect and intangible benefits like quality of life
- ❑ **Allows consideration of all costs and benefits over long period of time**

A cost-benefit analysis can be thought of like an ROI from a societal perspective and can assess whether the program's total societal benefits justify its costs.

A cost-benefit analysis attaches dollar values to all costs and benefits of a program, not just the financial ones. In addition to direct costs, costs can include indirect and intangible costs. Benefits, especially in the case of health interventions, include not just the program's financial outputs, but, often more importantly, its non-financial, health and social benefits. In a cost-benefit analysis, all nonmonetary costs and benefits, including these social impacts, are assigned a monetary value.

As is often the case with preventive interventions, the costs of the intervention occur in the immediate future and benefits occur in the distant future. With cost-benefit analysis, costs and benefits, regardless of when they occur, can be included in the analysis.

Cost-Benefit Analysis (cont.)

- Two common measures
- Benefit-Cost ratio

$$\frac{\$ \text{ Value of all benefits}}{\$ \text{ Value of all costs}} = \text{Benefit-Cost ratio}$$

- Easy to manipulate

- Net benefit

$$\$ \text{ Value of all benefits} - \$ \text{ Value of all costs} = \text{Net benefit}$$

There are two common measures used in a cost-benefit analysis.

Similar to ROI, the first is a benefit-cost ratio. To find this ratio, divide the program's net benefits by its net costs. This type of summary measure is popular with policy makers because it's easy to understand. If the benefit-cost ratio is greater than \$1, it implies that the program or intervention produces more benefit than it costs. However, it can be easy to manipulate this ratio by changing how costs and benefits are described to get the ratio you want.

A better summary measure for cost-benefit analysis is net benefits, derived by subtracting net costs from net benefits. In this way, programs show a positive societal return on investment if net benefits are greater than zero.

Side Note About Discounting

- ❑ **Important when studying costs that occur over long periods of time**
- ❑ **Discounting allows costs and benefits that occur in different time periods to be compared by expressing their values in present terms**
- ❑ **Net present value**
 - How much future costs and benefits are worth in today's terms

One important consideration to note is the concept of discounting.

Since cost-benefit analyses often take into account costs and benefits that occur across a longer span of time, it's important to adjust them to keep all values in the same time period's terms so they're comparable. A common way to do this is by finding the net present value of all costs. This is done by multiplying future values by a discounting factor, which takes into account time, to express those future values in today's terms. We won't go further into the various calculations and methodology that is involved when discounting today, but it is an important concept to keep in mind.

Cost-Effectiveness Analysis (CEA)

- ❑ **Compares cost of intervention to its effectiveness as measured in health outcomes**
- ❑ **Results expressed as cost per health outcome**
 - E.g. cost per case prevented

$$\frac{\$ \text{ Net Costs}}{\text{Net Effects}} = \text{CE in \$ per health outcome}$$

- Does not require monetary value to be assigned to outcomes
- ❑ **Helps planners choose between different approaches to achieving desired health outcome**

Cost effectiveness analysis helps planners choose among different approaches to achieving a desired outcome by quantifying the value each proposed intervention is likely to produce. CEA compares the cost of an intervention to its effectiveness as measured in health outcomes. Contrary to cost-benefit, the results of a CEA are expressed in cost per health outcome – like cost per case prevented – and doesn't require monetary values to be assigned to these outcomes.

Though some programs and policies save money, many do not. The question is whether those programs and policies are worth the investment. When a set of programs do not necessarily save money but do produce positive health outcomes, cost-effectiveness analysis can help determine the best value by finding which one produces the most health benefit for its cost.

Cost-Utility Analysis

- **Form of CEA used to compare interventions with different health outcomes**
 - Expressed in cost per quality-adjusted life year (QALY) gained

$$\frac{\$ \text{ Net Costs}}{\text{Net Effects}} = \$/\text{QUALY}$$

CEA is often expressed as a cost per quality-adjusted life year (QALY) gained, where QALYs are a combination of improved quality of life and number of years of survival gained. This is called a cost utility analysis and allows the comparison of different health outcomes.

Compare

Type of Analysis	Typical Costs	Typical Outcomes	Metric	Typical Use	
Return on Investment (ROI)	A financial analysis from the perspective of the investor	Dollars invested	Dollars saved	Net financial cost/dollars invested	To assess financial return
Cost-Benefit Analysis (CBA)	An economic evaluation that assesses the dollar value of all resources used and benefits achieved from the perspective of society	Dollar value of all resources used	Dollar value of all health and non-health benefits	Net cost (dollars)	To compare the value of policies and programs with different outcomes, particularly when there are both health and non-health effects
Cost-Effectiveness Analysis (CEA)	An economic analysis that assesses the net cost of an intervention compared to the health outcomes achieved (perspective must be specified)	Dollar value of resources used	Health benefits (e.g. deaths averted, QALY)	Cost per health benefit (e.g. cost per life year gained, cost per QALY)	To compare the value of policies and programs with the same health outcome

Teutsch et al, Practical Playbook: 6.8 ROI

Now that we have a basic understanding of all three of these types of economic analysis, let's compare them to highlight some of the key differences.

One notable difference is that while they can be measuring similar things, cost-benefit analysis puts all benefits and costs in monetary terms and cost effectiveness measures effects in terms of health outcomes.

Comparing ROI to cost-benefit, although they both are measuring costs and benefits in monetary terms, the most striking difference comes from what is included as a cost and a benefit. Since ROI is usually limited to the perspective of the investor and focuses on financial investment and returns, some health outcomes or other social benefits of an intervention may not be captured as they would in a CBA. For example, while an ROI may capture some of the value of improved health in the form of saved hospital costs, typically it would not capture other aspects like improved quality of life.

Valuation of Indirect/Intangible Benefits

- ❑ Human capital approach
- ❑ Revealed preference
- ❑ Stated preference

- ❑ **Following slides from DHDSP Five-Part Webcast on Economic Evaluation**
 - Found on DHDSP website's "Evaluation Resources" page
 - http://www.cdc.gov/dhdsp/programs/spha/economic_evaluation/index.htm

Since one of the biggest differences between ROI and CBA is accounting for non-financial social benefits, let's look at some examples of how you can put value to these benefits.

There are many ways to put monetary value to indirect or intangible benefits. Here we'll go over three common methods – the human capital approach, revealed preference, and stated preference.

The following slides are adapted from a previously developed five-part webcast on economic evaluation. The full five-part webcast can be found on the DHDSP website on the "Evaluation Resources" page and I encourage you to look at that as well if you would like more in depth descriptions and examples of everything presented today.

Human Capital Approach

- **Theory of investment:**
 - Views the human being as a capital investment.
 - A person's sole purpose is economically productive output.
 - Value is measured by earnings generated and value of household productivity.
- **Assumes worker's value equals earnings**
- **Lost productivity = lost earnings.**
- **Valuation is simplest when an intervention affects mortality.**

The human capital approach for valuing indirect benefits is based on the theory of investment. People are viewed as capital investments whose sole purpose is to produce for society at large.

The value of their production potential in society is based on the wages and benefits they earn, with some adjustments for their production potential within the household as well.

If a disease, injury, or illness affects a person's productivity, the cost to society is valued in terms of lost earnings. Thus, the human capital approach is fairly straightforward when valuing a death associated with a disease.

Human Capital Approach: Example

Estimating benefits of a hypertension health promotion program:

- ❑ **Before program, participants missed 20 days of work per year on average.**
- ❑ **After program, missed 7 days of work per year.**
- ❑ **Average income = \$40,000 + \$10,000 benefits.**
- ❑ **Average earnings = \$200/day.**
- ❑ **13 days of productivity gained X \$200 = \$2,600.**

Here's an example of how you would estimate the indirect benefits associated with a hypertension prevention program that increased productivity.

If annual income is 40,000 dollars and the fringe rate is 25 percent, then total earnings are 50,000 dollars.

If you assume 250 working days in the year, then the average total earnings, including fringe benefits, is 200 dollars per day.

Before the program, participants missed an average of 20 days of work per year, but after the program, the average was only 7 days.

Thus, the program gained 13 days of productivity potential per year. The value of this benefit is 2,600 dollars.

Revealed Preference

- ❑ **Infers value of non-market attributes from real-world decisions.**
- ❑ **Based on consumer choices involving health vs. money.**
- ❑ **Challenge is finding markets where people purchase risk reductions or take compensation for extra risk.**

An alternative to the human capital approach is the revealed preference approach.

In this approach, you assess market goods to infer a value for non-market goods. The approach is based on real consumer choices for goods that may be similar to the non-market good under consideration, such as a reduction in mortality risk.

Revealed Preference: Example

- **Job A**
 - Income = \$40,000.
 - Risk of death = 0.
- **Job B**
 - Income = \$42,000.
 - Risk of death = 1 in 1,000 (0.001).
- **Calculate value of statistical life.**

For example, we could look to the labor market to see how much people are willing to accept in extra compensation to have an increased risk of on-the-job fatality. This will help us infer how much they're willing to pay for a statistical life.

Suppose a person is willing to trade Job A that pays 40,000 dollars with no risk of death for Job B that pays 42,000 dollars with a 1 in 1,000 risk of death.

That person is willing to accept 2,000 dollars to take a .001 risk of death. Therefore, society, which is defined as 1,000 people, values one statistical death as 2 million dollars.

The problem with this approach is that the compensation people are willing to take for increased mortality risk varies widely, based on the context of the occupation. Many other factors may influence these decisions or there may be a limited ability to understand occupational risks.

Stated Preference

- ❑ **Survey to elicit preferences for goods or services by finding out what people would be willing to pay.**
- ❑ **Give respondents hypothetical scenarios and ask the maximum they would pay, or amount they would take for the program not to occur.**
- ❑ **Values depend on the hypothetical market described to the respondent (contingent valuation).**

Another alternative to valuing benefits in a cost-benefit analysis is simply to ask people to state how much they are willing to pay.

This is accomplished through sophisticated survey methodology. Respondents are presented with a hypothetical scenario, such as a risk of cardiovascular disease, and asked how much they would pay for a risk reduction in that scenario or how much they would have to be paid to take an increased risk.

Stated preference, although used extensively in valuing non-market goods in environmental health, has not been widely applied in the field of public health, particularly in the field of cardiovascular disease.

Summary

- ❑ **Important to define study perspective to define what counts as costs and benefits**
- ❑ **ROI is good for showing the business case for an intervention**
 - But sometimes the business case – short term direct financial returns – do not appear to justify the costs
- ❑ **CBA or CEA better for showing societal health benefits in addition to direct financial returns**
- ❑ **Went over three common methods to put social/health benefits in monetary terms:**
 - Human capital approach, friction cost method, revealed preference, stated preference

To conclude, here are a few key takeaway points.

In deciding to use any type of analysis for an economic evaluation of a public health intervention, it's crucial to define what study perspective you want to use in order to define what will count as costs and benefits in the study.

Return on investment is good for showing the business case for an intervention because it usually takes the perspective of the investor and shows the direct financial returns they will gain from the intervention. However, since most public health interventions are focused on producing non-financial outputs, an ROI analysis may not capture the true value of these benefits and can end up appearing negative if just the financial returns do not outweigh the costs.

Cost-benefit analysis or cost-effectiveness analysis is usually better suited to show the full value of the health benefits that public health interventions produce. Cost-benefit analysis usually takes all costs and benefits from the perspective of society as a whole and assigns a monetary value to them all. Cost-effectiveness analysis leaves the outputs in terms of the health benefits and compares the value of different interventions by showing which ones produce the same health benefit for the cheapest cost.

In order to show this social value in monetary terms for a cost-benefit analysis, we went

over three common methods – human capital approach, revealed preference, and stated preference. These can be used to show the societal value of a public health intervention.

Resources

- ❑ Haddix A, Teutsch SM, Corso PS. *Prevention Effectiveness: A Guide to Decision Analysis 215 and Economic Evaluation*, 2nd ed. Oxford University Press, New York, 2003.
- ❑ **DHDSP Five-Part Webcast on Economic Evaluation.**
http://www.cdc.gov/dhdsp/programs/spha/economic_evaluation/index.htm
- ❑ **The Practical Playbook: ROI**
<https://www.practicalplaybook.org/further-guidance/return-investment-integrative-projects>

This slide has links to additional resources that may be beneficial to understanding return on investment analysis.

Any Questions?



MODERATOR: At this time, we'll take any questions that the audience may have. You may submit questions through the Q&A tab.

Here we have a few questions.

Should cost-benefit or cost-effectiveness analysis always be used instead of ROI in public health? Because it sounds like you are saying ROI is the worst choice for evaluating public health interventions.

No, ROI certainly does have value in public health in certain situations. In cases where an intervention will produce positive financial gains in the relatively short term, ROI can be very useful to show an investor or payer of an intervention the direct financial return they stand to gain from paying for that intervention. However, this frequently may not be the case in public health, where much of the return will not be directly financial back to the investor and is instead indirect and benefits society as a whole. In these cases it could be more helpful to show the full societal value when just the financial investor returns do not outweigh the investment costs.

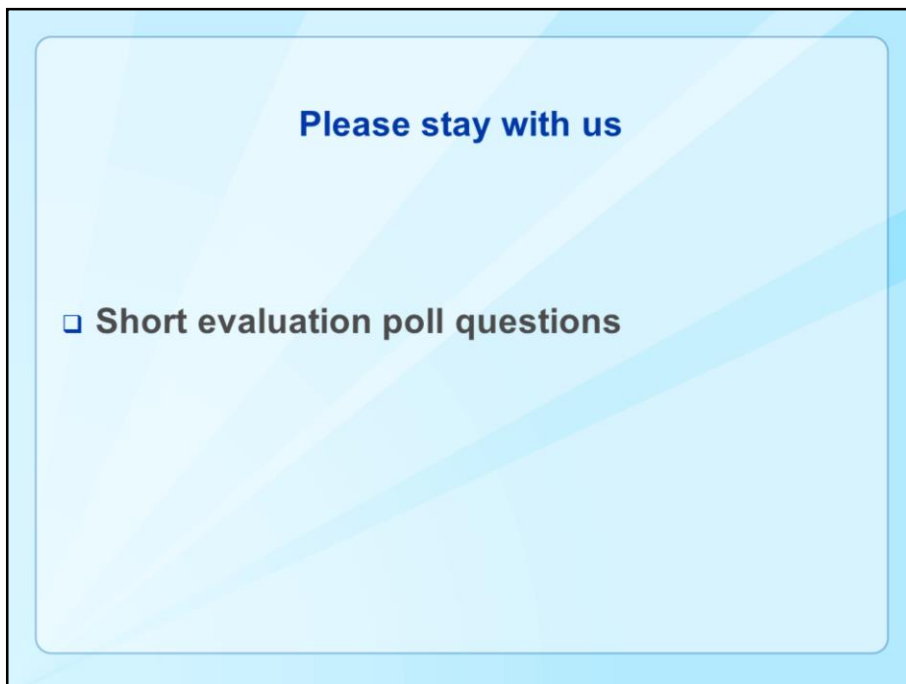
How do you calculate a QALY, or quality-adjusted life year, for a cost-utility analysis?

QALYs are calculated by assigning a weight to a year of life depending on the disease state's affect on the quality of that year of life. The weight is between 0 and 1, where 1 is a year of

life in perfect health. So 10 years of life in perfect health equals 10 QALYS, but 10 years in a state of imperfect health defined by a weight of .5 would only equal 5 QALYs. There are a number of methods that can be used to define the weight assigned for quality of life states from different diseases, you can do a literature search to find studies which define the weights. One common one is EuroQuol Group's EQ-5D questionnaire.

You mentioned that the benefit-cost ratio is easy to manipulate and the net benefits is not. How is the ratio easy to manipulate?

Sometimes costs and benefits can be described inversely as a negative cost or negative benefit. So with the ratio, you could describe certain costs as negative benefits instead of as a cost, or vice versa, and change the resulting ratio of net costs over net benefits. But if you use overall net benefit instead of the ratio, no matter how you describe the costs, whether as costs or negative benefits, it will end up with the same resulting net benefit.



MODERATOR: Please stay with us for a few poll questions.

NOTE (don't read) Pull up on lync and pause for 15 seconds after each poll question.

This presentation helped further my understanding of the different types of economic analysis presented and the differences between them.

I have a much better understanding of the different types of economic analysis presented here

I have a somewhat better understanding

I have the same level of understanding as before

I have a worse understanding/am more confused than before

After hearing today's presentation, will you be more likely to consider including economic analysis in your public health work?

Yes, more likely

Equally as likely as I was before the presentation

No, I still am not likely to consider including economic analysis in my work

This coffee break was worthwhile for me.

Yes, very worthwhile

Somewhat
A little
No, not at all

Reminders!

All sessions are archived and
the slides and script can be accessed at:

<http://www.cdc.gov/dhdsp/pubs/podcasts.htm>

If you have any questions, comments, or topic
ideas send an email to:

AREBheartinfo@cdc.gov

MODERATOR:

All sessions are archived and the slides and script can be accessed at our Division website. Today's slides will be available in 2-3 weeks.

If you have any ideas for future topics or have any questions, please contact us at the listed email address on this slide.

Next Coffee Break

When: April 12, 2016

Topic: Community-Clinical Linkages: A Practitioner's Guide

Presenter: Nicole Flowers & Magon Saunders



Division for Heart Disease and Stroke Prevention
National Center for Chronic Disease Prevention and Health Promotion



MODERATOR:

Our next Coffee Break is scheduled for Tuesday, April 12th, 2016 and is entitled “Community-Clinical Linkages: A Practitioner’s Guide”.

Thank you for joining us. Have a terrific day everyone. This concludes today’s call.