

**COFFEE BREAKS 2019:**  
**CONDUCTING COST ANALYSES: A FIRST  
STEP TO ASSESS COST-EFFECTIVENESS OF  
PUBLIC HEALTH PROGRAMS**

CENTERS FOR DISEASE CONTROL AND PREVENTION



Jack Chapel, BS | Evaluation and Program Effectiveness Team  
March 12, 2019

NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION

DIVISION FOR HEART DISEASE AND STROKE PREVENTION



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. He is an ORISE Fellow from the CDC's Division for Heart Disease and Stroke Prevention and sits on the **Evaluation and Program Effectiveness Team**.

My name is **Julia Jordan** and I am today's moderator. I am also on the Evaluation and Program Effectiveness team within the **Applied Research and Evaluation Branch**.

## 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.

MODERATOR:

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.

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

---

# **COST-EFFECTIVENESS IN PROGRAM EVALUATION**

HOW TO CONDUCT A COST ANALYSIS AND ASSESS COST-EFFECTIVENESS IN THE  
CONTEXT OF A PROGRAM EVALUATION



## INTRODUCTION

- Economic evaluations provide valuable information for resource allocation decisions and planning
  - Economic information increasingly requested by decision makers
  - Cost-effectiveness one of most common types of economic evaluation in public health
    - Compares programs that address same health issue
    - Cost-utility analysis – special type of CEA, can address different health issues as health utility
    - Cost-benefit analysis – monetizes health outcomes, can address different health issues
- This presentation: conducting cost-effectiveness analysis in program evaluation
  - Will focus on cost component
  - Builds on previous Coffee Breaks

Economic evaluations, such as cost-effectiveness analysis, can provide valuable information for resource allocation decisions and planning, and these types of analyses are increasingly requested by decision makers. Cost-effectiveness analysis compares the value of programs that address the same health topic. Cost-utility analysis is a special type of CEA that can address different health issues by converting outcomes to general health utilities. Cost-benefit analysis takes one step further and monetizes health outcomes, which can be used to address different health issues.

This presentation will focus on conducting the cost analysis to be used in the cost-effectiveness analysis in program evaluation, although similar cost analyses are usually required for other types of economic evaluation as well. While this information is presented in the context of conducting a broader evaluation, for this presentation I will focus primarily on the cost component. Previous Coffee Breaks have given overviews of economic evaluation or specific data collections, but today I will go into more detail on an overall framework of assessing costs in program evaluation.

## POLL QUESTION

- How familiar are you with conducting economic evaluations (e.g., cost analysis, cost-effectiveness analysis)?
  - Familiar, I've conducted my own economic evaluation or been involved in conducting one.
  - Somewhat familiar, I haven't been involved in conducting an economic evaluation but I have read a number of studies
  - Not familiar, I know of economic evaluation and might know some of the basic terms, but I have not gotten beyond that point.

Before we get started, I want to do a quick poll to get a sense of how familiar you are with economic evaluation.

## PRESENTATION OUTLINE

- Background and key concepts
- 1. Framing the cost study
- 2. Estimating direct program costs
- 3. Other perspectives costs
- 4. Connecting to outcomes for cost-effectiveness
- Wrap-up and available resources

I'll first briefly review a few key concepts and terms. I'll then go through the steps of conducting a cost and cost-effectiveness analysis. After each step, I will show how they are applied by going through an example based on a real world study currently being conducted. Finally, we'll wrap up with some discussion of available resources for further learning.

## KEY TERMS

- **Opportunity cost**
  - Cost of forgoing the next best alternative use
  - Includes all resources used, even if no monetary payment made
- **Start-up, fixed, variable costs**
  - Start-up – initial costs associated with beginning a program, which are not expected to continue during ongoing operation
  - Fixed costs – do not vary with changes in output (in the short-run)
  - Variable costs – do vary with changes in output
- **Perspective – “costs to whom?”**
  - Determines what costs included
  - Common perspectives: program, government agency, healthcare sector, society

There are a few key terms to know when discussing costs. When discussing costs, economists usually refer to opportunity costs. Opportunity cost is the cost of forgoing the next best alternative use of a resource, which includes direct financial outlays, but also the value of resources for which no money was spent, such as volunteer time.

Program costs can consist of fixed costs and variable costs. Fixed costs do not depend on the quantity of output produced, while variable costs do depend on the quantity of output. For example, a screening clinic’s rent and utilities do not change based on how many patients are seen that week and so they are fixed. But the amount of screening supplies used do depend on how many patients are screened, and are thus variable. Program costs can also be classified as start-up and operational costs. Start-up costs are the up front, non-recurrent costs required to set up the program in preparation for full operation.

The perspective of a cost study answers the question, “The cost to whom?,” and determines what costs are measured. The costs that are considered will depend on the perspective. For example, travel to a screening program site is a cost from the perspective of the patient and society, but not from the screening program provider’s perspective.

## COST-EFFECTIVENESS ANALYSIS (CEA)

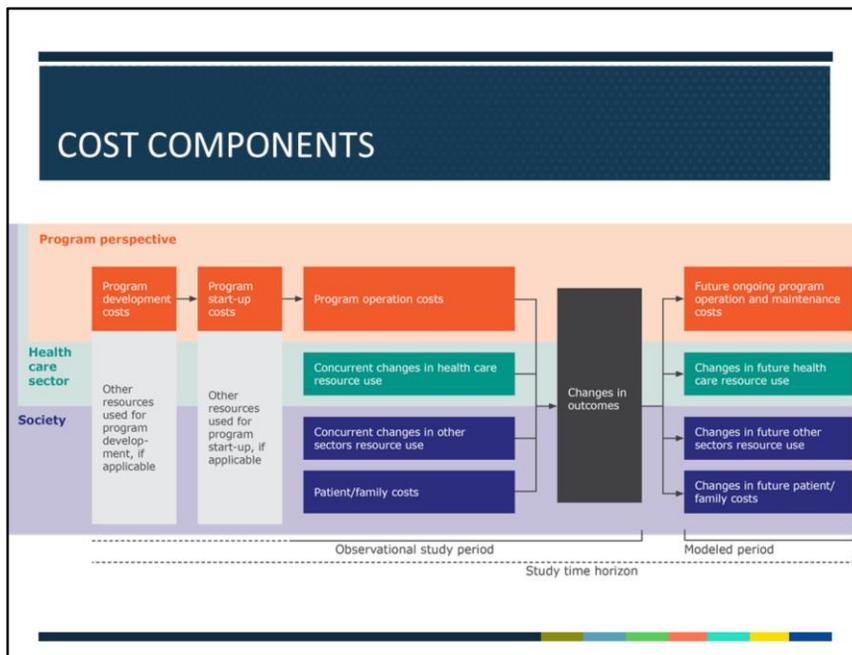
- Compares costs to achieved outcomes
  - Incremental costs and benefits vs. a comparator (e.g., usual care scenario, other program)

### Incremental cost-effectiveness ratio

$$= \frac{\text{Cost of program} - \text{cost of comparator}}{\text{Outcome in program} - \text{outcome in comparator}}$$

The most common type of analysis in public health is cost-effectiveness analysis. In a cost-effectiveness analysis, the outcomes achieved from the program are compared to the net cost. Typically, a CEA compares the costs and outcomes of a program to a comparator, such as other program options or usual care, in order to determine which option will provide the most health benefit for the least cost.

*The end result of a CEA is usually presented as an incremental cost-effectiveness ratio (ICER), which is calculated as the incremental cost of the intervention divided by the incremental benefit.*



Lets look at a conceptual model of the potential cost components that could be included in the cost-effectiveness analysis. In a public health program, there are direct costs of operating the program and there could be concurrent and future costs resulting from the program, such as changes in program participants' healthcare utilization.

To give a brief example, consider a cholesterol screening and referral program. The costs from the program perspective could include the wages for nurses delivering screenings, the cost of the screening supplies, and the rent for the space used. As a result of a patient participating in the screening, they might begin taking medication that they would not have otherwise done or avoid an adverse event. Although this would not represent a cost or savings to the screening program, the use of these additional medical resources is a cost from the perspective of the healthcare sector as a whole. Similarly, the patient's time traveling to the screening site does not represent a cost to the program or the healthcare sector, but it is a cost to the patient and thus society as a whole.

Furthermore, as a result of participating in the screening, perhaps a simulation model predicts the patient will avoid a future heart attack and thus avoid expensive use of

hospital resources. This would not represent a future savings to the program, but it is a savings to the healthcare sector and society.

## 1. FRAMING THE COST-EFFECTIVENESS ANALYSIS

- What is the purpose of the study?
  - E.g., inform program operations or replication, compare to other programs for relative value
- What is the appropriate perspective?
  - E.g., program perspective, healthcare sector or societal perspective
  - Important to clearly define
- What is the appropriate time horizon?
  - E.g., short-term (1-5 years), long-term (10-20 years, lifetime)

The first step in conducting an economic evaluation is framing the study. What is the purpose of the study?

What is the appropriate study perspective? If the intent is to inform program operation or replication, perhaps a more limited program perspective is sufficient. If the intent is to allow comparison with other programs in the literature, maybe a healthcare sector or societal perspective is needed.

Similarly, what is the appropriate time horizon? A shorter time horizon might be helpful for program administrators to assess how the program is operating. A longer time horizon could be better if the intent is to recommend what types of programs society should be investing in.

## EXAMPLE STUDY: STEP 1

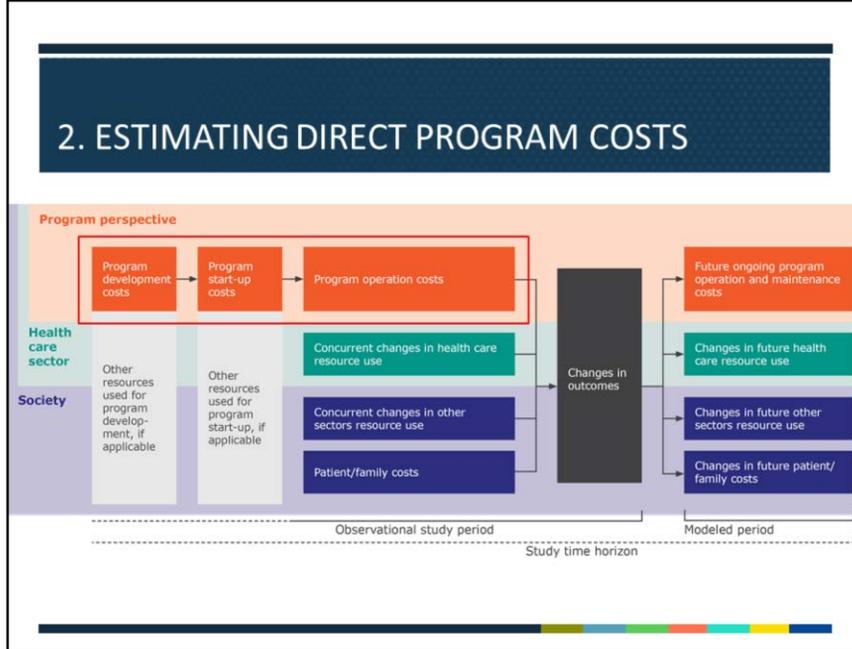
- **Hypertension Management Program**
- 3 main program components
  1. Hypertension management visits
  2. Hypertension registry and outreach
  3. Promote use of home blood pressure monitors
- Conducting cost-effectiveness analysis from a healthcare sector perspective
- 1 year study time horizon

To illustrate, let's look at a hypothetical example based on a real world study. The program being studied is a hypertension management program implemented in a rural health system. The program has 3 main components.

1. The hypertension management visit, where the hypertensive patient comes in for a visit focused on assessing their hypertension and providing education and self-management instructions.
2. The health system created a hypertension registry to track hypertensive patients and conduct patient outreach.
3. The program promotes the use of self-measured blood pressure monitoring and provides home blood pressure monitors at each participant's first hypertension management visit.

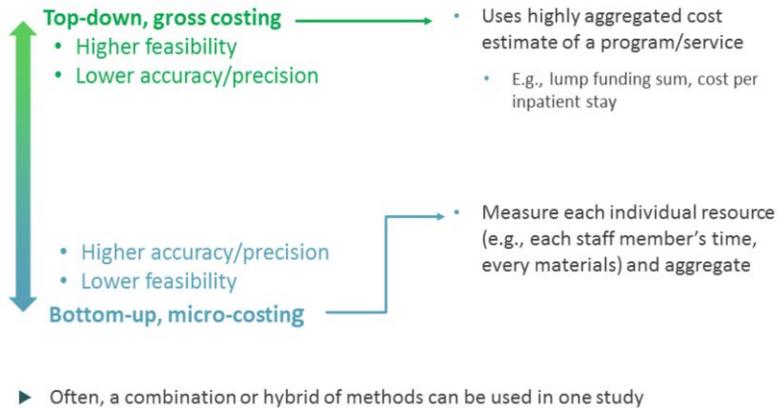
The cost effectiveness analysis is conducted from the healthcare perspective and is studied for 1 year of observation to inform replication in other health systems.

## 2. ESTIMATING DIRECT PROGRAM COSTS



In the context of program evaluation, no matter what study perspective is chosen, the direct costs from the program perspective will likely be included. For this section, we'll talk about how to estimate the program costs during your evaluation's observational period.

## 2. ESTIMATING DIRECT PROGRAM COSTS: COST ESTIMATION METHODS



The options available for estimating program costs fall on a spectrum. On one end there is top-down gross costing. This refers to using highly aggregated cost estimates of a program or related services. For example, the lump sum of program funding.

On the other end is bottom-up micro-costing. This refers to a process of enumerating each individual resource used and aggregating up the costs. This can provide a much more accurate and detailed description of the cost, but it can be time consuming.

In a single study, a combination or hybrid of methods on this spectrum can be used.

## 2. ESTIMATING DIRECT PROGRAM COSTS: MICRO-COSTING

- **Micro-costing steps**
  1. Define program processes and identify inputs (resources used)
  2. Measure unit quantity of each input
  3. Assign unit cost values to inputs and aggregate
- **Activity-based costing**
  - Micro-costing for each of a set of program activities
  - Describes how costs are allocated across activities and identifies cost driving activities
- **Micro-costing details presented in July 2018 Coffee Break**
- **Common cost categories**
  - Labor
  - Supplies and materials
  - Equipment
  - Training
  - Facilities

Micro-costing is the recommended most accurate method to derive direct program costs. Previous coffee breaks have described the micro-costing practice in more detail. Briefly, it involves 3 main steps.

The first involves describing the program processes and identifying each of the resources that are used.

Second, measure the quantity of each identified resource used.

Third, assign a unit cost value to each resources and aggregate to find total costs.

## 2. ESTIMATING DIRECT PROGRAM COSTS: MICRO-COSTING LABOR COSTS

- Labor Costs tend to be the largest cost of chronic disease prevention programs

### Options for measuring (can use more than one)

- Routinely collected data, if available
- Prospective activity logs
  - Throughout study period, periodic or one-time sample
- Retrospective surveys
  - One-time or periodic
  - Staff estimated or supervisor estimated

Labor tends to be the largest cost in chronic disease prevention programs. There are a number of methods that could be used to estimate labor time.

Sometimes, routinely collected data, such as routine staff time reporting, is available. If this type of data is precise and accurate enough, then it is the most feasible option. But it is rare for time data to be routinely already collected with enough specificity to assess time spent on a specific program.

## 2. ESTIMATING DIRECT PROGRAM COSTS: MICRO-COSTING LABOR COSTS

Options for measuring (can use more than one)

- Routinely collected data, if available
- **Prospective activity logs**
  - Throughout study period, periodic or one-time sample
- Retrospective surveys
  - One-time or periodic
  - Staff estimated or supervisor estimated

Staff title: \_\_\_\_\_ Date: \_\_\_\_\_

Description	Program related (check one)	Start time	End time
	<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Yes <input type="checkbox"/> No		

Staff title: \_\_\_\_\_ Date: \_\_\_\_\_

Time	Activity (check one)				
	Program activity 1	Program activity 2	Program activity 3	Non-program activities	Research/evaluation
8:00am—8:15am					
8:15am—8:30am					
8:30am—8:45am					
8:45am—9:00am					
9:00am—9:15am					
9:15am—9:30am					
9:30am—9:45am					
9:45am—10:00am					

A second, fairly rigorous option is to use staff activity logs, such as the examples shown here. Activity logs are forms that are carried by staff during a program in which they prospectively record their time spent on the program, for example by checking off an activity that best represents how each 30-minute increment of their day was spent.

## 2. ESTIMATING DIRECT PROGRAM COSTS: MICRO-COSTING LABOR COSTS

Options for measuring (can use more than one)

- Routinely collected data, if available
- Prospective activity logs
  - Throughout study period, periodic or one-time sample
- **Retrospective surveys**
  - One-time or periodic
  - Staff estimated or supervisor estimated

Staff title	Annual staff salary (including fringe benefits)	# months worked on program	% FTE working dedicated to program
Intervention nurse 1	\$75,000	12	100%
Intervention nurse 2	\$80,000	12	100%
Intervention nurse 3	\$73,000	6	100%
Pharmacist	\$97,000	12	30%
CHW 1	\$55,000	4	60%
CHW 2	\$53,000	8	55%
Medical director	\$150,000	12	10%
Data admin	\$83,000	12	15%

A less burdensome option can be to use retrospective staff surveys. These surveys could be sent to each staff member or a sample of staff members for them to enter an estimated percentage of their time or amount of hours spent on the program. Or they could be sent just to a manager who could estimate how much time each of their staff spent.

## 2. ESTIMATING DIRECT PROGRAM COSTS: MICRO-COSTING MATERIALS, SUPPLIES

### Example options for measuring

- Routinely collected data
  - E.g., financial records
- Activity logs
- Manager surveys

For program materials and supplies, there are often routine records, such as receipts and purchase forms, which can be used to identify the number of resources used.

However, in cases where these data are not available or not specific enough to the program, options similar to those for estimating labor time can be used. Staff could track each type of resource that they used during their day in an activity log. Or a manager could be surveyed.

## 2. ESTIMATING DIRECT PROGRAM COSTS: MICRO-COSTING FACILITIES AND EQUIPMENT

- Often shared across multiple purposes → need to allocate portion to program
- Allocation
  - Square footage of space
  - Proportion of patients participating in program (out of total patients)
  - Proportion of staff time for program activities (out of total staff time)

It's often the case that space or equipment is used for multiple programs and operations. If a program is operated in a shared space, the rent of the space could be allocated to the program based on some proxy proportion, such as the proportion of the patients or proportion of total staff time.

## 2. ESTIMATING DIRECT PROGRAM COSTS: ASSIGNING COST VALUES

- Commonly use actual expenditures made, when applicable
  - Actual staff salaries (include benefits)
  - Actual expenditure receipts
  - Actual rent paid
- If actual cost values are unavailable or not applicable, other data sources can be used to impute value, such as:
  - Labor – BLS occupational wage data
  - Supplies, materials – Google, Amazon, estimate
  - Facilities – commercial prices for the area, such as Zillow

Once the amount of each resource has been measured, a cost value must be assigned to them. Usually, the actual expenditure amount for the resource can be used, such as the staff's actual salaries. *Note that when using salaries as the cost of labor, it is important to include not only their wages but also their benefits, as this is their total compensation.*

If actual cost values are not available for some resources, or there are no actual expenditures for example for volunteered time, other sources can be used to impute a cost value such as the sources listed here.

## EXAMPLE STUDY: STEP 2

- Component 1: hypertension management visit
  - New code in EHR tracks provider time for each visit
  - Actual salary used to impute cost per minute
- Component 2: home blood pressure monitors
  - Each program participant provided blood pressure monitor
  - Price from Amazon
- Component 3: registry and outreach
  - Questionnaire asked time spent creating registry
  - Outreach staff recorded number and time of each outreach call in electronic activity log
- Facilities
  - Rent/utilities allocated to program based on proportion of total patient visits for hypertension management visits

In our example study, the labor and supplies costs for each program component were measured differently. For component 1, the health system created a new code in its EHR specifically for the hypertension management visits, which included a time stamp for the beginning and end of the visit. We used the number of hours of provider time from these visits combined with actual salary information to estimate labor cost for this component.

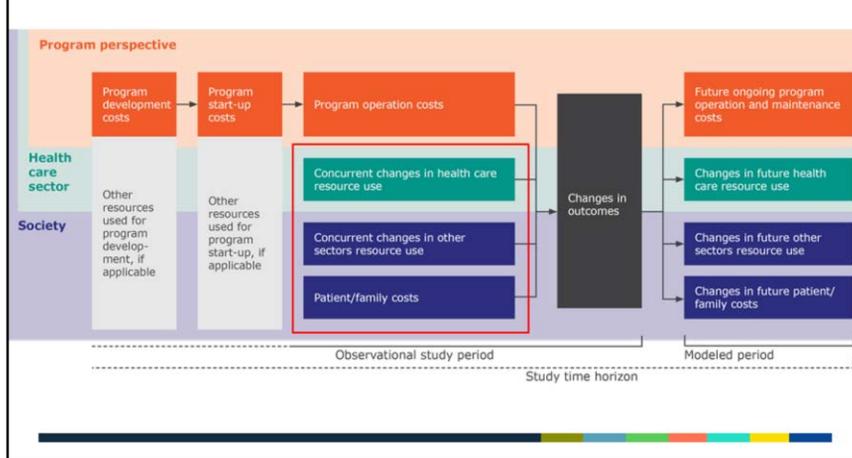
Each program participant received a home blood pressure monitor at their first hypertension management visit. We looked up the type of monitor that was being provided on Amazon to find the associated cost and multiplied the number of program participants by this cost to find the total cost for component 2.

For component 3, we created a short questionnaire asking IT staff to estimate the amount of time they spent creating the registry and multiplied this time by actual IT staff salaries. For outreach, staff maintained an activity log to track the number and length of each outreach call made.

To account for the cost of facilities, we allocated a proportion of the total clinic rent in proportion to the percentage of total patient visits that were for hypertension

management visits.

### 3. OTHER PERSPECTIVES COSTS



We'll now discuss the costs from other perspectives. These are costs that are associated with the program but which are not directly required in its operation and delivery from the program perspective.

### 3. OTHER PERSPECTIVES COSTS: OTHER HEALTH SECTOR COSTS

- Directly track program participant health care costs
  - Ideal option, tracking costs alongside evaluation outcomes
  - Not always feasible, good data sources not always available
- Estimate differences in costs based on evaluation outcomes
  - Sources from the literature
- Cost vs charges
  - Charges – list price of healthcare services
  - Costs – actual cost or reimbursement for healthcare services
  - Charges much higher than actual cost

There are numerous methods to attempt to account for these costs, and I'll describe two general common methods.

In an ideal scenario, the total healthcare costs of program participants could be tracked alongside the evaluation. While this option is ideal, it's not always feasible in public health because it requires the collection of all patients actual healthcare utilization.

Another option could be to take evaluation outcomes and assign cost estimates from the literature to those outcomes. *For example, if an evaluation of a heart failure management program found that program participants had fewer inpatient admissions than a comparison group, the evaluator could find an estimated cost of a heart failure inpatient admission from the literature or other sources such as Medicare data and assign it to the number of readmissions in both groups, taking the difference to find the savings associated with the program.*

### 3. OTHER PERSPECTIVES COSTS: OTHER SOCIETAL COSTS

- Does the program change participants' use of services in other sectors, such as other social services?
- Could also include changes in productivity (e.g., work days missed)
- Can have similar estimation options as other health sector costs component (previous slide)
  - Directly track use of other services, impute value for each service
- Usually not feasible to account for every single resource use change from a societal perspective
  - Think about what are the most important, largest impact

Similar to the other healthcare sector costs, programs could result in differences in resources used in other sectors, such as other social services. Depending on the context and circumstances, there could be ways to directly track these resources. But it is highly dependent on the context and there is not a standard method.

*Ultimately, it is not usually feasible to account for every single difference in all societal resources used. Therefore, it is important to think about whether the program is making any major impacts in the use of other resources to determine what, if any, are most important to try to account for.*

### 3. OTHER PERSPECTIVES COSTS: PATIENT/FAMILY COSTS

- Patient and informal caregivers' time
- Patient and informal caregivers' out of pocket costs
- Can track or measure directly
  - Patient/caregiver cost diaries (similar to activity logs)
  - Patient/caregiver questionnaire

Finally, there can be patient and caregiver costs that we have not already accounted for, such as time traveling to the program or out-of-pocket costs. *It could also include differences in the amount of patient or caregiving time that is required for the patients' own care self-management.*

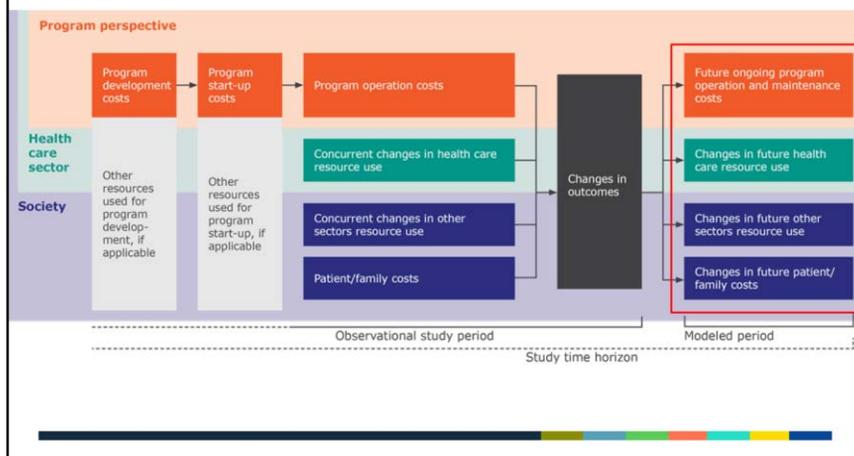
The best and most common option to account for these costs is to measure them directly using similar micro-costing methods, although other options may be available depending on the context. Patients or caregivers could be given cost diaries, similar to activity logs, or a questionnaire could be used.

### EXAMPLE STUDY: STEP 3

- Using the site's EHR, tracked all-cause healthcare utilization (e.g., outpatient visit, inpatient visit, prescriptions), excluding hypertension management visits
  - Tracked for program participants and comparison group
  - Tracked for duration of 1 year study period
- Used actual reimbursed amounts for services, which was included in EHR data
- Program participant's all-cause costs minus comparison group's costs = program associated healthcare utilization

Going back to our example study, we accounted for other, non-program healthcare costs using the health system EHR data. We assumed the health system was the primary source of care for all study patients, which was a reasonable assumption in this community. The health system EHR contained data on all health services used by each patient in the health system and the actual reimbursement paid for those services, including medication costs. We used these data to track the healthcare utilization and medication costs of program participants and a comparison group during the study year. At the end of the study, we took the difference in healthcare costs between participants and the comparison group, which represented the non-program healthcare costs associated the program.

### 3.1 FUTURE COSTS



When taking a long term time horizon, future costs beyond the study period can be considered as well. In chronic disease prevention, the long term benefits are usually not seen until well beyond the shorter observational study periods commonly used. Simulation modeling techniques can be used to project the long term benefits based on the short term outcomes. We do not have time to go over all the details of various modeling methods here, but I wanted to mention it as a consideration.

## 4. CONNECT TO OUTCOMES

- Connect cost of program to evaluation measures
- Measures usually decided before study begins
  - Can include short-term measures (e.g., patients screened, patients achieving blood pressure control) to long-term outcomes (e.g., life-years saved)
- Divide incremental costs by incremental benefits

Once the costs of the program have been assessed, they can be connected to various measures from the evaluation to derive cost-effectiveness ratios. The choice of measures is usually considered at the beginning of the study, and they could range from short-term to long-term measures.

## EXAMPLE STUDY: STEP 4

- Cost-effectiveness ratio = cost per person achieving blood pressure control
  - Costs = program operation costs + (all-cause healthcare costs of participants – all-cause healthcare costs of comparison group)
  - Effectiveness = number of program participants who had their blood pressure controlled at the end of the study

In our study, the cost-effectiveness measure was cost per person achieving blood pressure control. We divided the total cost of the program, including both the direct program operation costs and the non-program healthcare costs attributable to the program, by the number of program participants who had their blood pressure controlled at the end of the study period. Because not all participants successfully controlled their blood pressure within the year, this cost was slightly higher than just the cost per patient served.

## RESOURCES FOR FURTHER LEARNING

- DHDSP's Five-Part Webcast on Economic Evaluation  
[https://www.cdc.gov/dhdsp/evaluation\\_resources/economic\\_evaluation/index.htm](https://www.cdc.gov/dhdsp/evaluation_resources/economic_evaluation/index.htm)
- NCEH's Learning and Growing Through Evaluation guide, Module 6: Economic Evaluation for State Asthma Programs  
[https://www.cdc.gov/asthma/program\\_eval/asthmaprogramguide\\_mod6.pdf](https://www.cdc.gov/asthma/program_eval/asthmaprogramguide_mod6.pdf)
- VA's Health Economics Resource Center webinars: *Estimating the Cost of an Intervention* by Todd Wagner  
[https://www.hsrd.research.va.gov/for\\_researchers/cyber\\_seminars/archives/video\\_archive.cfm?SessionID=2398](https://www.hsrd.research.va.gov/for_researchers/cyber_seminars/archives/video_archive.cfm?SessionID=2398)
- Books
  - *Cost-Effectiveness in Health and Medicine*, 2<sup>nd</sup> Edition by Neumann, Sanders, Russell, Siegel, & Ganiats
  - *Methods for the Economic Evaluation of Health Care Programmes*, 4<sup>th</sup> Edition by Drummon, Sculpher, Claxton, Stoddart, & Torrance
  - *Prevention Effectiveness: A Guide to Decision Analysis and Economic Evaluation* by Haddix, Teutsch, & Corso

To conclude this presentation, I want to provide some additional resources you might find helpful. While I hope this presentation has given you a quick and helpful overview of the steps involved in estimating intervention costs, you may wish to seek out some more detailed information before conducting a cost analysis yourself. The first three resources listed here are available for free online and can provide some additional detail about estimating costs and economic evaluation in general. And if you'd like to get more in the weeds, I'd recommend any of the three books listed here which contain much more information on conducting economic evaluations.

## RESOURCES FOR FURTHER LEARNING

Franklin et al. An educational review about using cost data for the purpose of cost-effectiveness analysis. *Pharmacoeconomics*. 2019;e-pub.

<https://www.ncbi.nlm.nih.gov/pubmed/30746613>

Barnett PG. An improved set of standards for finding cost for cost-effectiveness analysis. *Med Care*. 2009;47(7 Suppl 1):S82-8.

<https://www.ncbi.nlm.nih.gov/pubmed/19536018>

Smith MW & Barnett PG. Direct measurement of health care costs. *Med Care Res Rev*. 2003;60(3 Suppl):S74-91. <https://www.ncbi.nlm.nih.gov/pubmed/15095547>

Foster EM et al. Estimating the costs of preventive interventions. *Eval Rev*. 2007;31(3):261-86. <https://www.ncbi.nlm.nih.gov/pubmed/17478629>

Frick KD. Microcosting quantity data collection methods. *Med Care*. 2009;47(7 Suppl 1):S76-81. <https://www.ncbi.nlm.nih.gov/pubmed/19536026>

Additionally, there are a number of peer-reviewed publications that contain instructional and educational information on conducting micro-costing studies and cost-effectiveness analysis in general.

---



# THANK YOU

JACK CHAPEL, BS  
[JCHAPEL@CDC.GOV](mailto:JCHAPEL@CDC.GOV)

NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION



DIVISION FOR HEART DISEASE AND STROKE PREVENTION

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

---

Thank you everyone for your input during the discussion phase, it sounds like there are emerging topics to explore, and continual support to improve stroke systems of care through law. I am joined by Colleen Barbero, who was the project lead of the assessments to answer any questions. Additionally, her email is available above if you have any questions.

## REMINDERS!

- All sessions are archived and the slides and script can be accessed at <https://www.cdc.gov/dhdsp/pubs/webcasts.htm>
- If you have any questions, comments, or topic ideas send an email to [AREBheartinfo@cdc.gov](mailto:AREBheartinfo@cdc.gov)

Thank you for your participation!

As a reminder, all sessions are archived and the slides and script can be accessed at our Division website at the link shown. Today's slides will be available in about 3 weeks.

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

## NEXT COFFEE BREAK

- **When:** Tuesday, April 9, 2019
- **Topic:** Improving the CDC Healthcare Systems Scorecard
- **Presenter:** Joanna Elmi, MPH



MODERATOR:

Our next Coffee Break is scheduled for Tuesday, April 9<sup>th</sup> and is entitled Improving the CDC Healthcare Systems Scorecard.

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