Facilitator Skills Assessment: Using Economic Analysis in Public Health

LEARNING OBJECTIVES

- Describe the types of economic analyses
- List the components of a cost-benefit analysis (CBA)
- Use results of CBAs to inform decisions about implementing public health interventions
- Calculate the cost-effectiveness ratio and interpret the findings

INSTRUCTIONS

Read the scenarios and answer the questions that follow. When you have completed the assignment, email your written answers to your mentor. Check with your mentor for the assignment deadline.

ESTIMATED COMPLETION TIME

1 hour, 15 minutes

REFERENCES

The scenario for this exercise is based on the following articles with some modifications:

Rajgopal R, Cox RH, Lambur M, Lewis CS. Cost-benefit analysis indicates the positive economic benefits of the expanded food and nutrition education program related to chronic disease prevention. J Nutri Educ Behav. 2002;34(1)26-37.

Ginsberg GM, Lauer JA, Zelle S, Baeten S, Baltussen R. Cost-effectiveness of strategies to combat breast, cervical, and colorectal cancer in sub-Saharan Africa and South East Asia: mathematical modeling study. BMJ. 2012;344:1-18.

Scenario 1:

Scenario

You are part of a nongovernmental organization that creates partnerships in the community to facilitate chronic disease prevention measures. Your organization spends time and resources helping community groups, hospitals, schools, local government agencies, and other local groups establish education programs. You have recently become aware of a state-sponsored nutrition education program in a neighboring district, District X. After researching the program, your organization became convinced the District X nutrition education activities are worthwhile and began advocating the program to decision-makers and stakeholders in your own district. While there is some interest, the program would have to be funded with district resources, and the lead decision-maker informs you that such a program cannot be funded without evidence that it is financially worthwhile.

The District X program focuses on educating homemakers and family members through various means to achieve the knowledge, skills, attitudes, and habits needed to attain a sound, healthy diet. The long-term goal is improved health status of the population and decreased incidence of chronic diseases.

Your group decides to undertake an economic analysis of the District X program in terms of costs saved or averted because of good nutrition practices taught in the program.

1. Write a primary objective for this economic analysis.

Suggested answer:
To calculate the economic benefits of the nutrition education program. One potential economic benefit of the program is a reduction in future healthcare costs. Other potential benefits include increased academic success, improvements in social behavior, increased physical activity, and lower obesity rates.

2. You mention your planned economic study to a few stakeholders. One of them informs you that the current administration in the district is highly focused on the budget and likes to see all plans and expected benefits in monetary terms. Considering the decision-makers that you wish to influence, what type of economic analysis should you use? Why is this the most appropriate analysis?

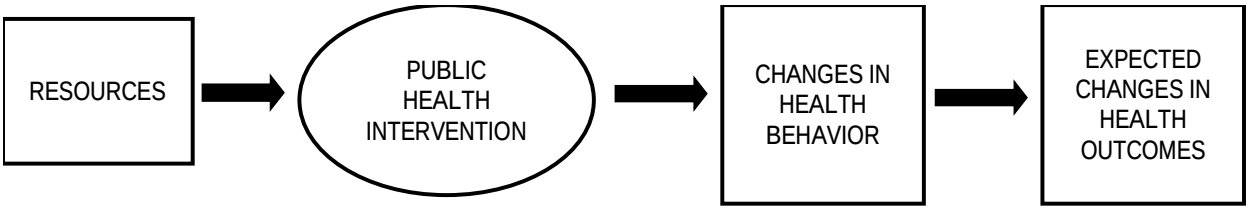
Suggested answer:
A CBA expresses the impact of the program in dollars, and can compare them to the program costs using a ratio. (e.g., Y dollars of benefit is derived from X dollars of expenditure). This is probably the most effective means of communicating the value of the program to these decision makers.
A cost-effectiveness analysis (CEA) would relate program costs to natural units of benefit such as blood-glucose level decrease or pounds lost or years of life saved. This method shows the benefit but the economic impact is not clear. A special form of cost effectiveness analysis, a cost-utility analysis (CUA) would relate program costs to a measure of years of life saved in full health (e.g., Quality Adjusted Life Years) which may be a difficult concept to understand for those who are not used to it. For a given problem there may be multiple outcomes of interest. Utility is a nonmonetary measure of value. CUA measures cost per QALY (DALY) saved, CEA measures cost per life (or

case) saved (averted). Measuring QALY can be difficult and imprecise. While CEA allows comparison of strategies that have the same health outcomes, CUA allows comparability over different health outcomes.
CEA – natural units of benefit
CUA – utility measure

Scenario Update I:

Scenario Update
You work closely with District X program staff to conduct the analysis. District X officials are also interested in the results of the analysis but do not have the expertise to conduct it themselves. Your first task is to list diseases and health conditions that your group has decided are the most impacted by nutritional intake. The list of diseases and conditions is as follows:
Diseases or conditions that could be delayed or avoided by adopting nutrition behaviors taught in the education program

- Stroke
- Hypertension
- Colorectal cancer
- Heart disease
- Osteoporosis
- Foodborne illness
- Type 2 diabetes
- Obesity



3. Consider this diagram and identify the anticipated resources (inputs) and changes in health behaviors (outputs) and health outcomes of the nutrition education program. An example in each category has been completed for you.

Resources:

1. Printed Materials
2. _____
3. _____
4. _____
5. _____

6. _____

Changes in Health Behavior:

1. Increased intake of fruits and vegetables
2. _____
3. _____
4. _____
5. _____
6. _____

Expected Changes in Health Outcomes:

1. Case of disease prevented
2. _____
3. _____
4. _____
5. _____
6. _____

Suggested answers:
Answers may vary. Example resources include: salaries, fringe benefits, office space, utilities, equipment, educational and office supplies, special training expenses, and travel costs.
For example behaviors, see Table 1. Example health outcomes include: cases of disease prevented, disability averted, years of life saved.

Scenario Update II:

Scenario Update
Your team makes an exhaustive inventory of specific inputs and outcomes similar to the list above. Next, you put monetary values on each of the inputs according to market prices. Then, team subject matter experts quantify typical yearly treatment causes for the Type A and Type B diseases, and identify specific behaviors taught by the program that, if undertaken, would impact each one. Example results of this effort are shown in the table below. The team then undertakes a thorough literature search to assess the population-level impact that each behavior is likely to have on the disease or condition, and develops a set of "optimal nutritional behaviors" that collectively would be anticipated to have the most impact on health.

Table1. Disease-specific yearly treatment costs and associated behaviors taught by the nutritional education program in District X, 2011

Disease / Health Condition	Yearly Treatment Cost (USD)	Associated behaviors
Stroke	$22,000	- Prepare/serve food with less salt - Using food labels to select food - Meal planning around dietary guidelines - Reduce/control weight - Increased physical activity
Hypertension	$348	- Same as stroke
Colorectal cancer	$28,000	- Increased intake of fiber, complex carbohydrates, vegetables and fruits, vitamins A and C, and calcium - Decreased fat intake - Meal planning around dietary guidelines - Food selection and preparation (to reduce fat and carcinogens)
Heart disease	Bypass surgery: $30,000 Other treatments: $3676	- Decreased intake of sodium/salt - Prepare food with less fat, less salt -Decreased fat intake - Increased intake of complex carbohydrates, fiber, fruits and vegetables - Using food labels to select food - Meal planning around dietary guidelines - Reduce/control weight - Increased physical activity
Type 2 Diabetes	$6182	- Increased intake: fiber, vegetables, and fruits - Decreased intake of fats and sweets group - Weight control increased physical activity - Plan foods around dietary guidelines (based

Disease / Health Condition	Yearly Treatment Cost (USD)	Associated behaviors
		on instructions of physician/registered dietitian) - Using food labels to select food
Obesity	$625 (includes only costs for weight-control programs or special products purchased for weight control)	- Increase intake of fiber, complex carbohydrate, fruits and vegetables - Decreased caloric intake - Increased physical activity - Decreased intake of fats and sweets group - Food preparation to reduce fat and calories - Using food labels to select food - Use of other sound weight control methods

4. Table 1 shows direct costs of treatment. What is the perspective of this study? Should intangible costs and benefits be included in this analysis? Why or why not?

Suggested answer:
The perspective of the study was that of program sponsors. Intangible costs and benefits probably do not need to be included. The objective of the analysis is to calculate monetized savings. Although there are intangible costs associated with having the conditions listed, most of these costs would not be borne by the program sponsors.

Your team assembles data on 3100 program participants in a given year. District X kept detailed records and follow-up information about participation in the education program and behaviors adopted. The tangible effects of the nutrition education program are calculated as follows:
Formula: [A] × [B] × [C] × [D] × [E] = F.
When
[A] Annual number of nutrition program graduates having entry and exit data (3100);

[B] Disease/condition incidence rate for the population (as reported in the literature), with the disease rates for the target population used if available; otherwise, incidence rates for the general population were used;

[C] Population Attributable Fraction: the portion of the disease/condition believed to be related to diet, which was the estimated percentage of those who would normally get the disease but who might avoid or delay its onset by adopting recommended nutrition behaviors;

[D] Percentage of graduates with optimal nutritional behaviors related to avoiding or delaying the disease/condition;

[E] Present value of those monetary benefits;

[F] Total benefit for all of the diseases/conditions, based on the potential delay or avoidance of disease treatment costs among the 3100 program graduates during the study year.

5. Using the formula presented above ([A] × [B] × [C] × [D] × [E] = F) and the information in Table 2 below, calculate the total direct benefits of the nutritional education program in District X.

Note: Total direct benefits cannot be calculated for stroke, osteoporosis, and common infant diseases with the information provided.

Answers:

Disease/Condition	**Total Direct Benefit (USD)**
Stroke	*
Colorectal cancer	*50,789*
Hypertension	*34,225*
Heart disease	*1,914*
Osteoporosis	*
Foodborne illness	*879,413*
Type 2 diabetes	*176,397*

Disease/Condition	Total Direct Benefit (USD)
Common infant diseases	*
Obesity	*127,343*

**These estimates cannot be calculated with the information given in the table.*

Note: The total direct benefit represents the present value of the estimated benefits accrued for each disease as a result of the program

Table 2. Calculated costs of diseases/conditions associated with optimal nutritional behaviors and monetized benefit of prevention/delay

		[B]	[C]	[D]	[E]	[F]
Disease / Condition	1996 Average Treatment Cost/Person, USD	Disease Rate in Population, %	Diet-Related Proportion, %	No. of Graduates with ONB (%)	Present Value of Benefit	Total Direct Benefit
Type A						
Stroke	$23,025	1.7	NA	290 (9.4)	$13,144	
Colorectal cancer	$33,046	15.0	35	59 (1.9)	$16,425	
Hypertension	$364	37.4	45	290 (9.4)	$698	
Heart disease	$3517	31.2	26	34 (1.1)	$692	
Type B						
Osteoporosis	$11,828	28.0	NA	885 (28.5)	$65,469	
Foodborne illness	$1,009	2.8	100	1664 (53.7)	$18,867	
Type 2 diabetes	$6,182	14.5	45	59 (1.9)	$45,898	
Common infant diseases	$1,537	100.0	NA	87 (2.8)	$1,537	
Obesity	$625	37.0	50	59 (1.9)	$11,687	

6. Given the information below and the calculated total direct benefits, calculate the total cost-benefit ratio for the nutritional education program.
    a. Create your ratio so that the number of dollars of benefit is compared to one dollar of cost, in the format: (Benefit: $1.00).
    b. Does the program produce economic benefits that are greater than its costs?
        - Total nutrition education program costs (annual): $1,713,081.
        - Calculated benefit for stroke: $65,112.
        - Calculated benefit for osteoporosis: $16,195,687.
        - Calculated benefit for common infant diseases: $133,412.

Answer:

a. Participants should sum up all benefits (those from the table and those listed in Q6) and divide them by the total cost:
Benefits = 17,664,292
Benefit: Costs = $10.31/$1

b. Yes, the nutrition education program is cost beneficial; for every dollar spent at least $10 is saved. Recommendation could include having a similar nutrition education program or to have nutrition education be incorporated into other existing interventions that reach homemakers (or others that influence food choices)

Scenario 2

New Scenario

You are part of a nongovernmental organization that has been asked to examine the costs and health effects of interventions to combat breast, cervical, and colorectal cancers to guide resource allocation decisions in developing countries. Specifically, you have been asked to estimate the cost per disability adjusted life year (DALY) averted for different prevention and treatment strategies.

Answer:
CUA. CUA aims to measure quality of life (in this case, a DALY)., rather than the years of life gained or cases of disease averted. CUA measures cost per QALY (or DALY) saved and CEA measures cost per life year saved or cases of disease averted (in naturally occurring units).

Table 3. The costs and effects of various health interventions

Intervention	**Annual cost per capita ($Int)**	**Annual DALY averted per million population**
Smear test at age 40 (with lesion removal) + cancer treatment	0.14	462
Treatment of stages I-IV breast cancer, plus biannual mammographic screening	0.68	313

7. After conducting your analysis you find the estimated costs and annual DALYs averted for each intervention (Table 3). Use this information to calculate the cost-effectiveness ratio for each intervention.

Answer:
Smear test + Cancer treatment = 0.14/(462/1000000) = $Int 303
Breast cancer intervention = 0.68/(313/1000000) = $Int 2173

8. The WHO-Choice considers an intervention yielding a healthy year of life for less than three times gross domestic product (GDP) per capita “cost-effective”, and an intervention yielding a healthy year of life for less than the GDP per capita “very cost effective”. If the GDP per capita in the country we are studying is $Int2000, how would you classify the cost-effectiveness of the above interventions classified?

Answer:
Smear test is highly cost-effective, since the cost-effectiveness ratio is less than the GDP per capita. Breast cancer intervention is cost-effective since the cost-effectiveness ratio is less than three times GDP per capita, but is more than the GDP per capita.