Cost Benefit Analysis

ECN 240

CMD

What is economic evaluation?

If the government is going to take on a project or intervene, we need ways to compare the costs and benefits of the project/intervention for decision-making:

- whether to take on a project or not
- which of several possible projects is best

Prevention is often not cheaper than cure

- Prevention targets more people than will ever get the disease, so even if per person prevention is cheaper, there are more people involved.
- Some interventions aren't very effective at changing behavior.
- Prevention makes people live longer, thus increasing health care expenses, social security and Medicare, but not economic productivity.

Implications:

- Need economic evaluation before decisions are made.
- Careful economic evaluation should take into account the appropriate costs and benefits.

Costs of interventions

Intervention	Costs per Life -year ($1993)
Influenza vaccine for all citizens	140
Mammography for women age 50	810
Random motor vehicle inspections	1,500
Water chlorination	4,200
Pneumonia vaccination	12,000
Strengthening of buildings in earthquake-prone areas	18 million

Cost Benefit Analysis

- Compare costs (C) and benefits (B) of public investment
- If $B - C > 0$, then invest
- Or choose approach with highest B/C ratio

CBA – details

- Opportunity costs:
  - what you pay (flu shot costs)
  - what you give up (time of workers getting shot)
- Benefits:
  - to recipient (person who got flu shot)
  - to external party (not immunized who has less exposure to flu)

CBA – details

- Take into account ALL costs:
  - Direct medical care costs
    Def:
  - Direct nonmedical costs
    Def:
  - Indirect costs
    Def:
- Examples of Total Costs:

Discounting

Which would you prefer?

1) $100 today or $100 in two months?

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Money today and money in two months may have a different value to you. This is called discounting.

Discounting

If project has future costs and benefits, need to discount

$$NPV = \sum_{t=1}^{T} \frac{B_t - C_t}{(1+r)^t} \tag{1}$$

- NPV- Net Present Value
- B_t - Benefit at time t
- C_t - Cost at time t
- r - discount rate (ex. annual rate of interest)
- T number of years in calculation

Discounting

- discount rate r is important- determines the rate at which the benefits fall off
- if too high then the future doesn't matter as much and you'll choose short-term benefit projects
- if too low then you only care about the future and choose long-term benefit projects

Example of CBA

Should college students be vaccinated again meningococcal disease?
Costs:

- cost of vaccine+admin cost = \$30.53 per dose
- 2.3 million freshmen enter college every year
- 80 percent would receive vaccine
- 1 severe reaction per 100,000 students vaccinated at cost of \$1830 per case

What is the total cost?

Example of CBA, cont.

Benefits:

- direct medical benefits per case (diverted costs)= \$8145
- Suppose college student rate of disease = 2.6*national average (76 nonfatal cases avoided)
- value of life of 20 year old = \$1 million
- 12 lives saved

What is the total benefit?

Example of CBA, cont.

- Benefit - Cost = ?
- program would save lives, but do the benefits outweigh the costs?

Example of CBA, cont.

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Rate of infection needs to be at least 13x the national average.

Cost Effectiveness Analysis

- Estimates costs associated with 2 or more medical treatment options for a given health care objective
  - cost effectiveness ratio $= \frac{C_1 - C_0}{E_1 - E_0}$
  - $C_1 - C_0$ = change in social costs incurred due to treatment
  - $E_1 - E_0$ = gain in health outcome
    - in life-years or quality-adjusted life years
- Advantage over CBA: don't need to convert *benefit* to dollars
  Note: still need to discount because life in 2 years is worth less than life today

QALYs

QALY (quality-adjusted life years) = life expectancy * measure of the quality of remaining life-years

- health utility index usually between 0 (death) and 1 (full health)
- developed from survey answers (respondents rate various health outcomes, or have to choose between 2 alternative health outcomes)
- mostly US, UK, and Canada surveys

Drawbacks of QALYs

- survey methods may be biased
- does not tell us whether society is better off (as with CBA)
- values older people less because successful treatment of older person saves fewer life-years

CEA Calculations

Treatment option	cost	life-years gained	health-utility index	QALY
Current procedure	$20,000	2 years	0.7	1.4
New procedure	$110,000	8 years	0.4	3.2

CEA Calculations

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  higher cost per QALY because quality of life is lower with new procedure; maybe shouldn't be adopted

Example of CEA/CUA

Autologous vs. traditional community blood donations

- autologous donation (donor and recipient are same person) are safer but admin and collection costs are higher
- Is the increased safety worth the costs? Case is total hip replacement surgery
- additional cost per unit of autologous blood transfused = \$68
- QALY saved per unit transfused = 0.00029 (2.5 hours of perfect health)
- CU ratio = $\frac{\$68}{0.00029} = \$234,483$
- costly way of saving a life