DCP3 Disease Control Priorities

economic evaluation for health

www.dcp-3.org
info@dcp-3.org

Purposes and Types of Economic Evaluation: An Introduction or a Review

Rachel Nugent, Director

Disease Control Priorities Network

Department of Global Health, University of Washington

We are grateful to the Bill & Melinda Gates Foundation for support of the Disease Control Priorities Network

DCP3 Disease Control Priorities

economic evaluation for health

Outline: An economics discussion in 3 parts

Part 1: Economic concepts and definitions

Part 2: Welfare economics and health

Part 3: Economic evaluation

DCP3 Disease Control Priorities

economic evaluation for health

What is Health Economics?

Health economists are concerned with the organization of the market for health services and the net yield of investment in people for health. The "optimum" use of resources for the care of the sick and the promotion of health defines this special field of inquiry.

Health Economics focuses on:

- Interface of economic thinking with medicine, health sciences and well-being.
- Means of informing decision-making to maximize health when resources are scarce.
- Comparison of health interventions by examining the costs and benefits of each.

Did You Know? NCDs or Non-communicable diseases play an important part in global health. A recent economic analysis finds that with respect to cardiovascular disease, chronic respiratory disease, cancer, diabetes and mental health, the cumulative macroeconomic output loss will be an estimated US $47 trillion dollars over the next two decades. To put this in context, this amount is equal to 75% of the global GDP in 2010.

DCP3 Disease Control Priorities

economic evaluation for health

Terms and Concepts

- Cost-effectiveness
- Supply
- Demand
- Efficiency
  - Allocative efficiency
  - Technical efficiency
- Equity
- GDP
- GNI
- Opportunity cost
- Out of pocket (OOP)
- Utility

Did You Know? According to the World Bank, total health expenditure is the sum of public and private health expenditure. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation.

DCP3 Disease Control Priorities

economic evaluation for health

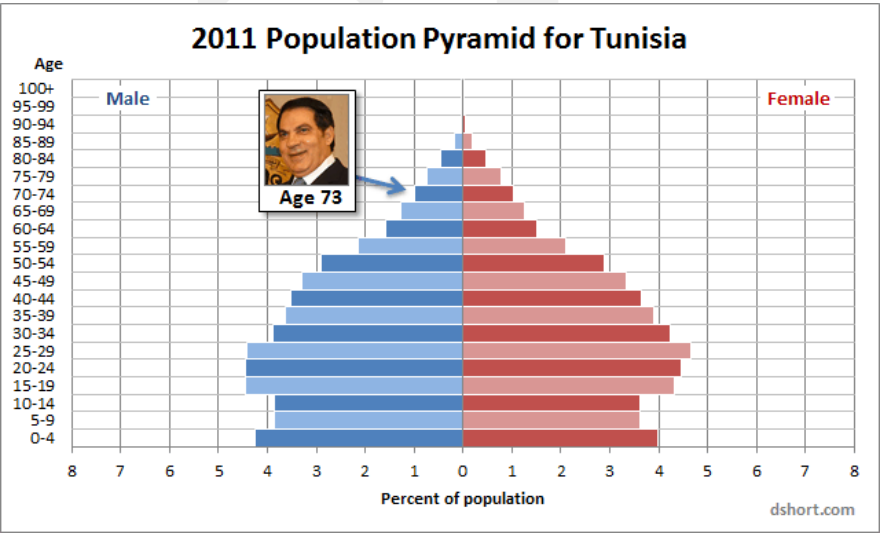
Total Health Expenditure, 2012

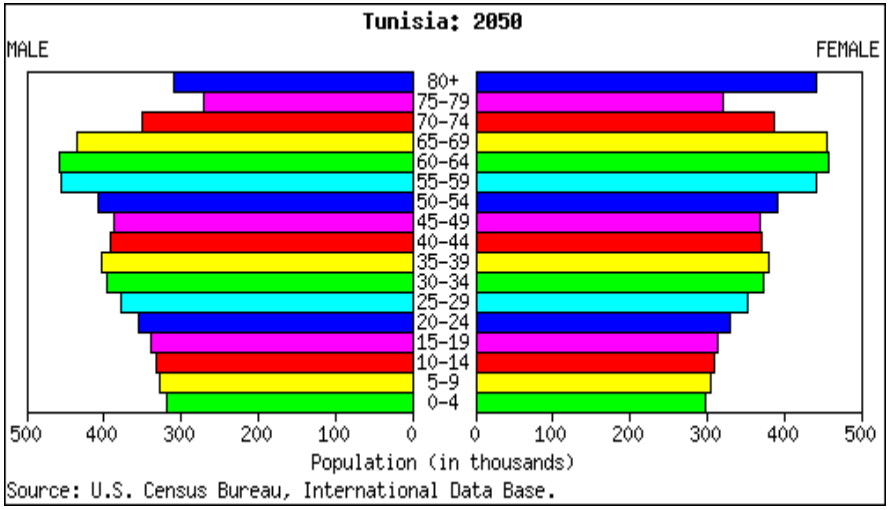
The global health expenditure database that WHO has maintained for the past ten years, provides internationally comparable numbers on national health expenditures. WHO updates the data annually.

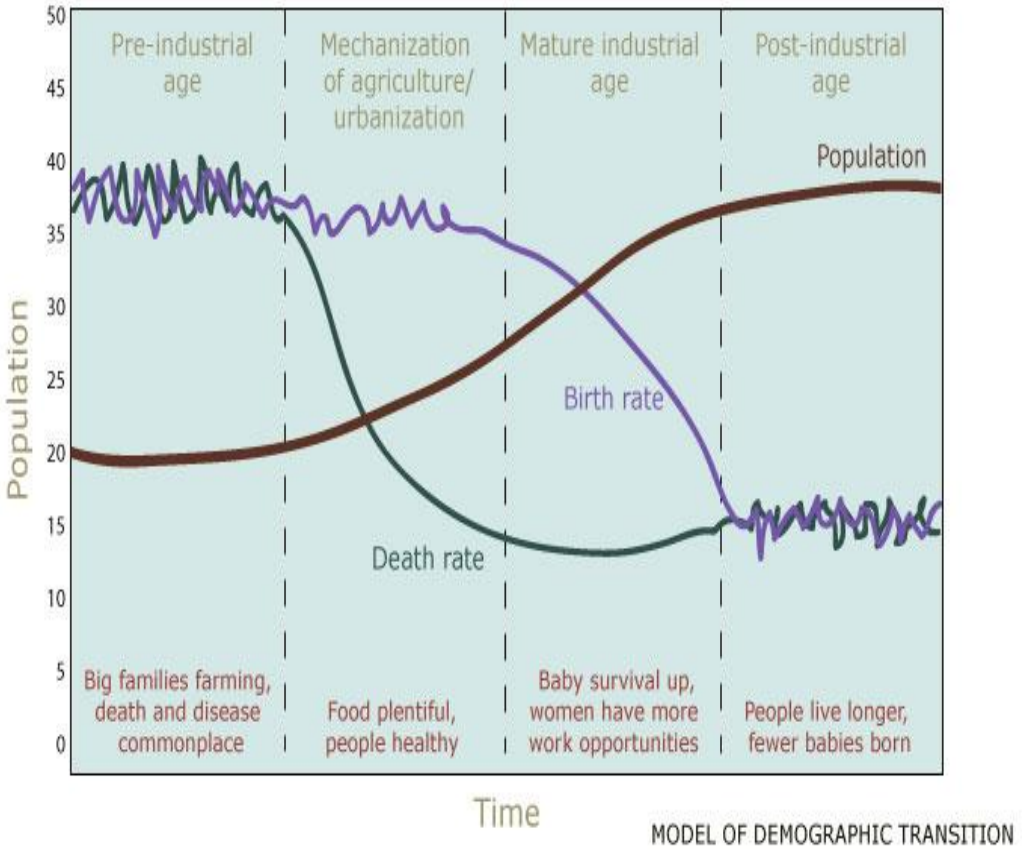
DCP3 Disease Control Priorities

economic evaluation for health

Demographic Transition







Infectious → Non-communicable

Payment for Health Care

- Paid for out of pocket (OOP)
- No risk-pooling
- High chance for catastrophic health expenditure (health expenditure that causes poverty)
- Financed by government /public insurance
- Risk Pooling strategy includes social insurance
- Coverage may be wide but for limited services
- Financed by private insurance
- Risk Pooling strategies include individually-purchased insurance and employer-based insurance
- Coverage gaps may be large
- Financed by private and public/government
- Most likely scenario
- "Universal Health Coverage"

DCP3 Disease Control Priorities

economic evaluation for health

Introducing Welfare Economics

DCP3 Disease Control Priorities

economic evaluation for health

Making Resource Allocation Decisions

1. Capital
   - •Physical Capital
   - •Human Capital
   - •Human resource capital
2. Affordability
3. Cost effectiveness
   - • Efficiency

Did you know? An innovative concept called "task shifting" has been introduced by some countries to deal with human resource capital shortages. Health personnel at different levels may be asked to perform tasks that they traditionally wouldn't in a developed country setting. Generally, lower tier health workers are trained to perform tasks of high skilled workers such as doctors. This practice has the potential to relieve shortages of skilled health providers and bring down the cost of procedures.

DCP3 Disease Control Priorities

economic evaluation for health

Making Resource Allocation Decisions, cont.

4. Cost
   - Total Cost
   - Average cost
   - Marginal cost
5. Disease burden
6. Effectiveness and efficacy

Fact: Contrasting Affordability and Efficiency - While an intervention may be "efficiency enhancing" in the sense that it has a favorable cost-effectiveness ratio, research in costing and budget impact may also be able to tell us which interventions are cheap (WHO WHR 2000). Affordability of services will likely increase the chances that more people will have the capacity to pay for them.

DCP3 Disease Control Priorities

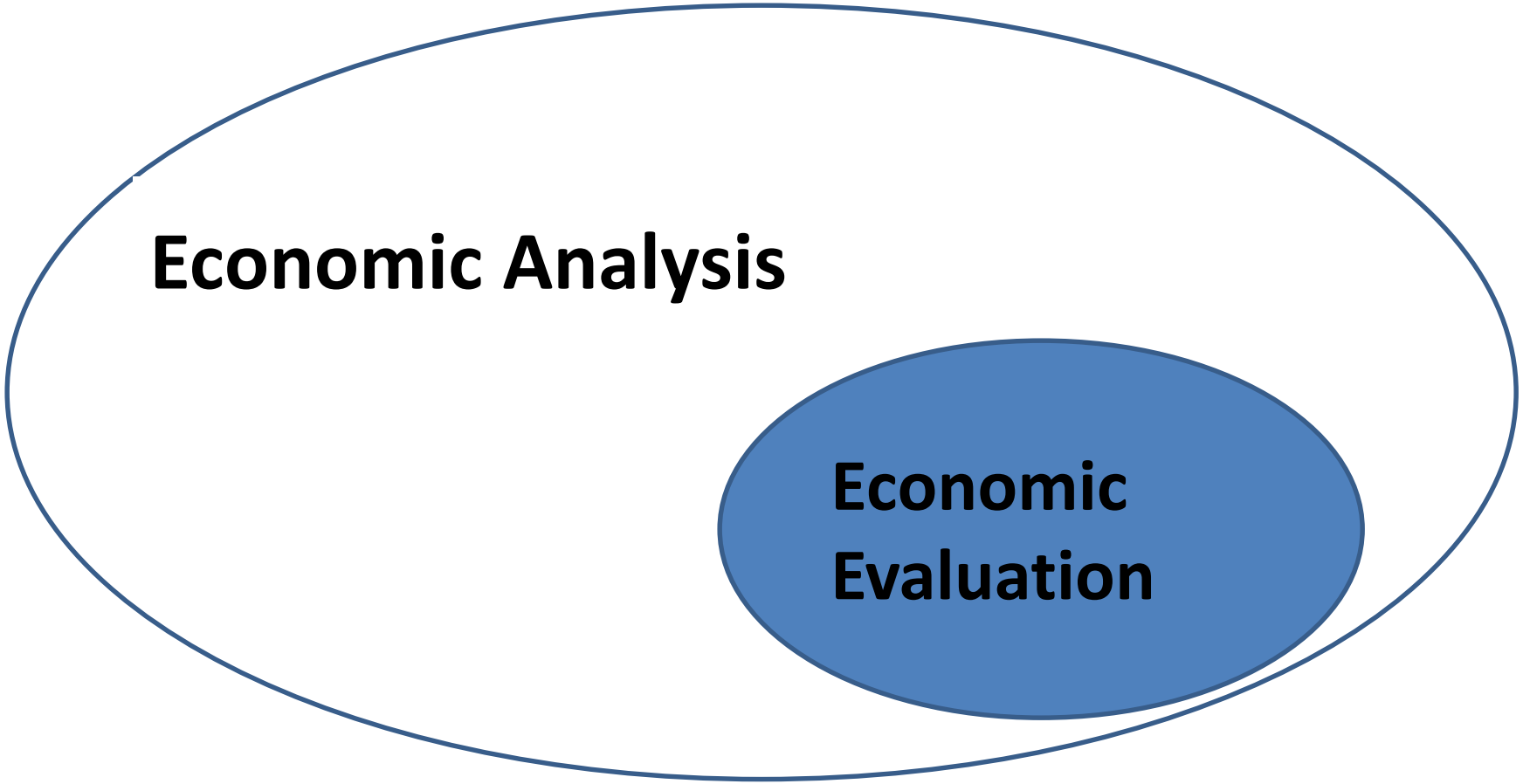
economic evaluation for health

Making Resource Allocation Decisions, cont.

7. Equity
   - –intergenerational
   - –vertical
   - –horizontal
8. Political and social acceptability
9. Population segmentation
10. Feasibility or Practicality
11. Scalability

DCP3 Disease Control Priorities

economic evaluation for health



DCP3 Disease Control Priorities

economic evaluation for health

Purposes of Economic Evaluation

- Value for money objective
- Resource limitations
- Growing demands on health systems

- Need systematic and transparent methods to compare alternative interventions, set budgets, and make choices

DCP3 Disease Control Priorities

economic evaluation for health

Data to Use in Economic Evaluations

Type	Pros	Cons
Trial based	**Highly accurate costs are obtainable** **Accurate effectiveness data for the population**	**Information may not be generalizable outside of the trial**
Model based	**More flexible in analyzing alternative scenarios**	**May not represent real life**
Observational	**Can have many data points** **Collected in normal contexts**	**Many opportunities for error to be introduced** **Expensive to collect** **Can be hard to obtain the desired variables**

DCP3 Disease Control Priorities

economic evaluation for health

A Digression for Models: (1) Models Need Data

- Demographics
- Mixing patterns
- Natural history
- Transmission probability
- Factors that change susceptibility
- Factors that change infectiousness
- Effectiveness of interventions
- Engagement in health care

Thanks to RuAnn Barnabas, UW

DCP3 Disease Control Priorities

economic evaluation for health

(2) Power of Using Models in Economic Evaluation

- Models are used to structure the economic question and compare all relevant alternatives
- Extrapolate beyond observed data
- Link intermediate and final endpoints
- Generalize results to other settings/patient groups
- Synthesize evidence to simulate comparisons where RCTs don't exist
- Indicate the need for further research

Thanks to RuAnn Barnabas, UW

DCP3 Disease Control Priorities

economic evaluation for health

(3) Choosing a Model

- Static models – equilibrium (time-invariant)
- Dynamic models – time dependent change
  - Force of infection can change over time
  - Includes herd immunity
- Both static and dynamic models can be either deterministic or stochastic (constrained random variables)
- Choice of model depends on scientific question

Thanks to RuAnn Barnabas, UW

DCP3 Disease Control Priorities

economic evaluation for health

(4) Summary on Models (for now)

- Disease modeling is a useful tool – assumptions are explicit, characterize uncertainty
- Study data can be used to parameterize models
- Models can be used to estimate health outcomes
- Consult with disease specialist to choose the data to put into your model

Thanks to RuAnn Barnabas, UW

DCP3 Disease Control Priorities

economic evaluation for health

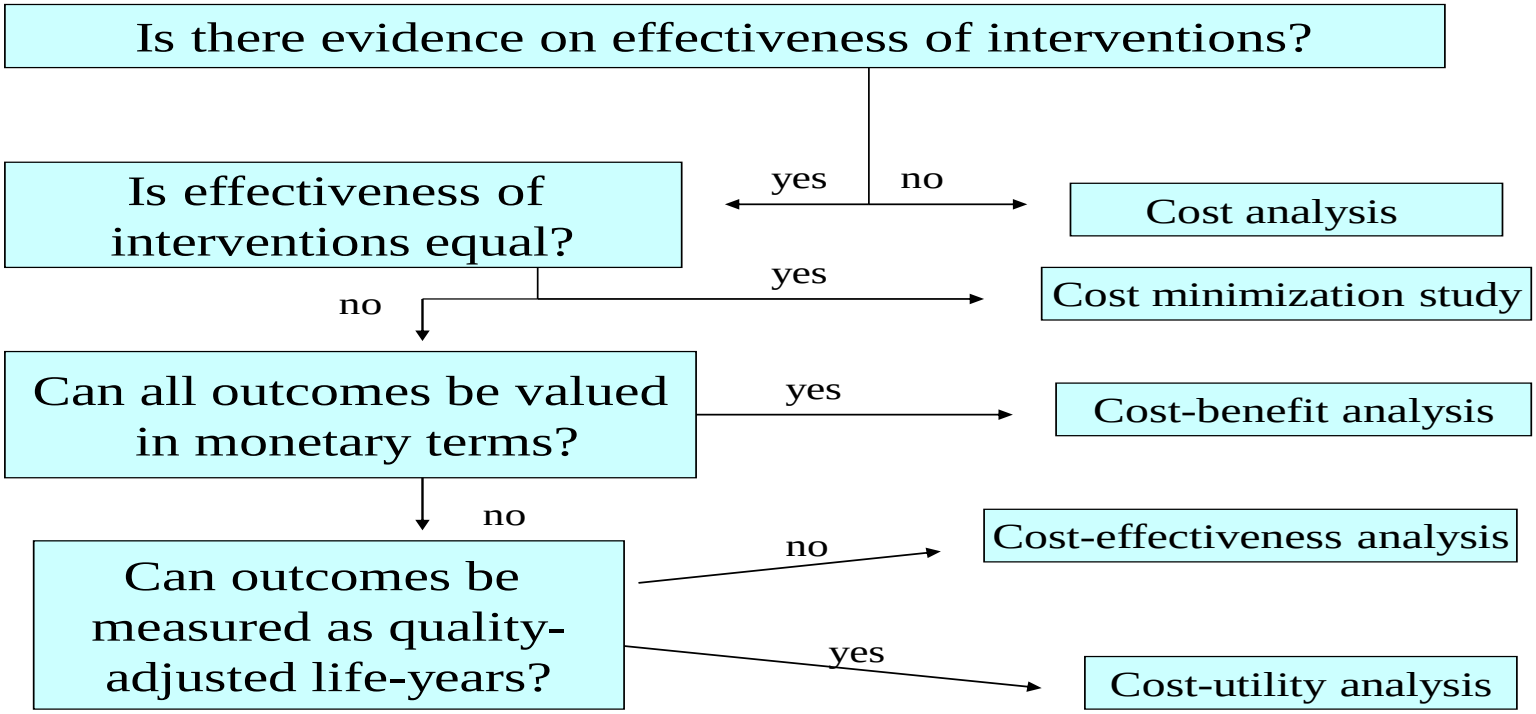
Primary Types of Economic Evaluations

- Cost-benefit analysis (CBA)
- Extended cost-effectiveness analysis (ECEA)
- Cost-effectiveness analysis (CEA)
- Cost-utility analysis (CUA)

- Cost-minimization analysis
- Costing analysis

DCP3 Disease Control Priorities
economic evaluation for health

Choosing the Right Economic Method

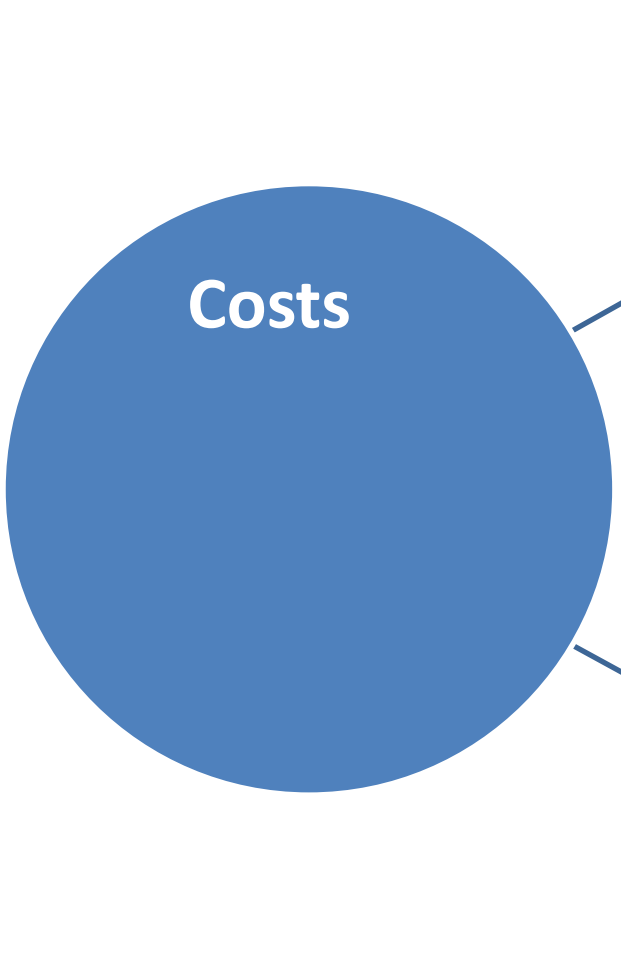


Source: Gray, A. Economic Evaluation in Dawes, et al. Ed. Evidence Based Practice: A primer for health care professionals. 2001.

DCP3 Disease Control Priorities

economic evaluation for health

Costs Considered in Economic Evaluation

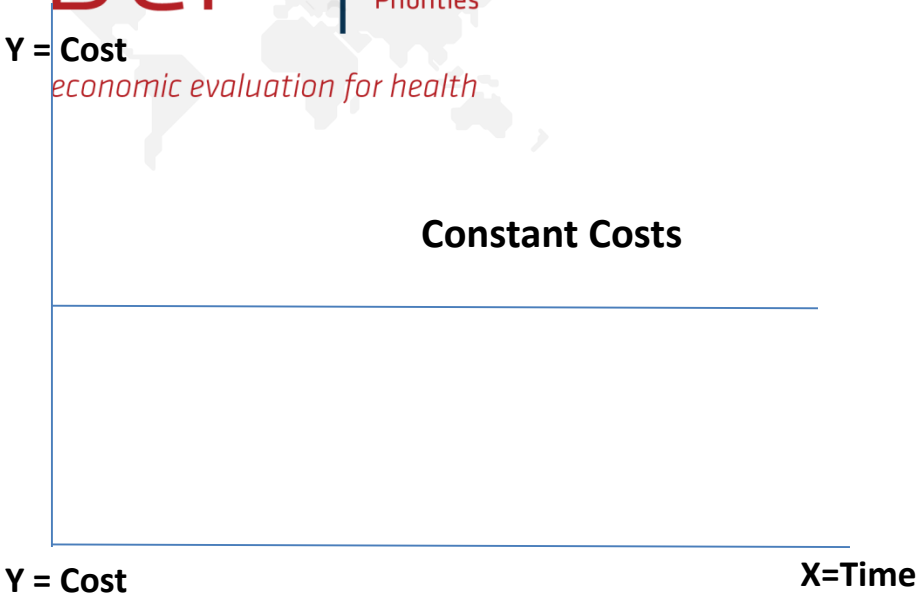


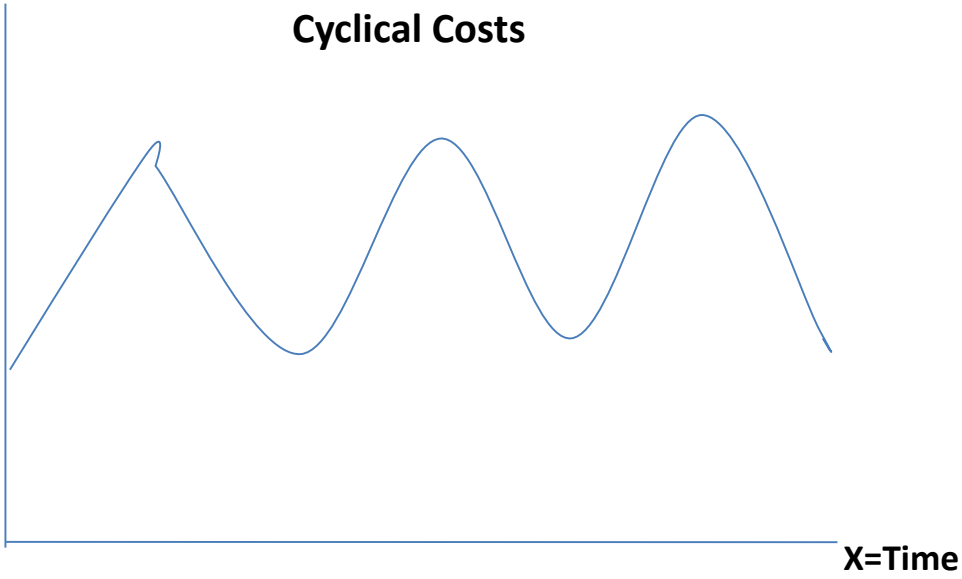
- Patient time cost
- Caregiver time
- Productivity cost

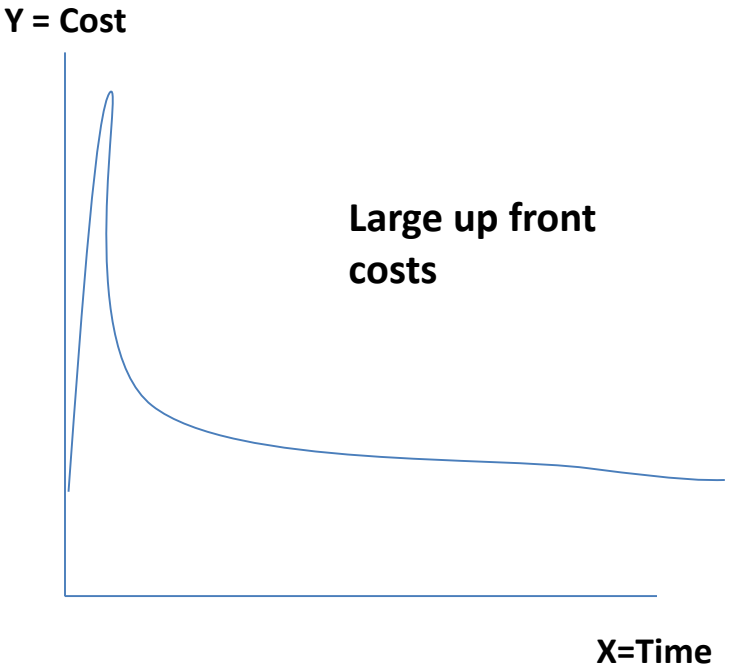
- Personnel
- Supplies and equipment

Cost functions: variable over time and scale

DCP3 Disease Control Priorities
economic evaluation for health







Measurements of Costs and Consequences in Economic Evaluation

Type of Study	Measurement/valuation of costs for alternatives	Measurement/ valuation of consequences
Cost Analysis	**Monetary units**	**None**
Cost Benefit Analysis (CBA)	**Monetary units**	**Monetary units**
Cost Effectiveness Analysis (CEA)	**Monetary units**	**Natural units (e.g. life years gained, disability days saved, points of blood pressure reduction, etc.)**
Cost Utility Analysis (CUA)	**Monetary units**	**Healthy years (typically measured as quality-adjusted or disability adjusted life years)**

Source: (adapted) Drummond, M. et al. *Methods for the Economic Evaluation of Health Care Programmes*. 3rd ed. Oxford: 2005.

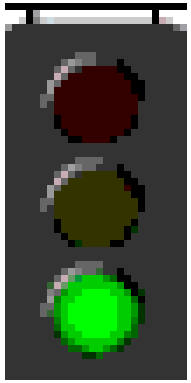
Cost-Benefit Analysis (CBA)

- Benefits received to costs incurred

- Benefit cost ratio:

$$\textbf{Benefit Cost Ratio} = \frac{\textbf{B}}{\textbf{C}}$$

- Benefit-cost ratio > 1 = Evidence for the adoption of Intervention/Activity



Cost-Effectiveness Analysis (CEA)

- Compare outcomes of technology, services, and programs.
- Average cost effectiveness ratio = total costs divided by total effects.
- Incremental cost-effectiveness ratio (ICER). The ICER formula is:

$$\textbf{ICER} = \left(\frac{C_1 - C_0}{E_1 - E_0} \; \boldsymbol{OR} \; \frac{dC}{dE}\right)$$

- Lower ICER is more favorable.

DCP3 Disease Control Priorities

economic evaluation for health

Cost-Utility Analysis (CUA)

Compare outcomes to cost of resources used

Rating	Decision Threshold
Highly Cost Effective	**ICER ($/DALY)<1x Gross Domestic Product/capita**
Cost Effective	**1x Gross Domestic Product/capita ≤ ICER ($/DALY) ≤3x Gross Domestic Product/capita**
Not Cost Effective	**ICER ($/DALY) >3x Gross Domestic Product/capita**

DCP3 Disease Control Priorities

economic evaluation for health

What cost-effectiveness research question are you interested in?

- What is:
  - the intervention?
  - the comparator?
- What outcome measures are appropriate?
- How will you evaluate intervention benefits?
- How will you measure program costs?
- Can you sketch a decision tree that portrays the consequences of the intervention and its comparator?

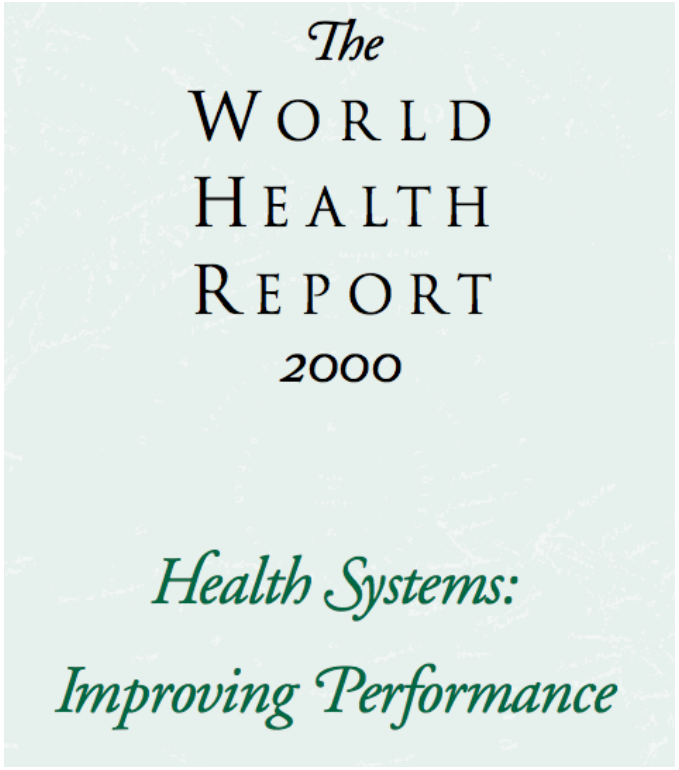
Thanks to Jim Kahn, UCSF

DCP3 Disease Control Priorities

economic evaluation for health

Health system objectives

- **Improving health and the distribution of health in the population**
- **Prevention of medical impoverishment**
- **Fairness in the financial contribution toward health**



Thanks to Stephane Verguet, UW

DCP3 | Disease Control Priorities

economic evaluation for health

January 8, 2014 -- London

DCP3 | Disease Control Priorities

economic evaluation for health

January 8, 2014 -- London

DCP3 | Disease Control Priorities

economic evaluation for health

January 8, 2014 -- London