Pharmacoeconomics and Management in Pharmacy X

Further reading (i)

[John Vella B.Pharm.(Hons.) M.Sc.(Pharmacoeconomics)]

Introduction

- This lecture serves as an excellent reference to the work we covered over the course of this credit unit
- Use it as a second look at the material we have discussed
- Prepared as an official ISPOR teleconference lecture it is well presented and accurate

Introduction to Pharmacoeconomics

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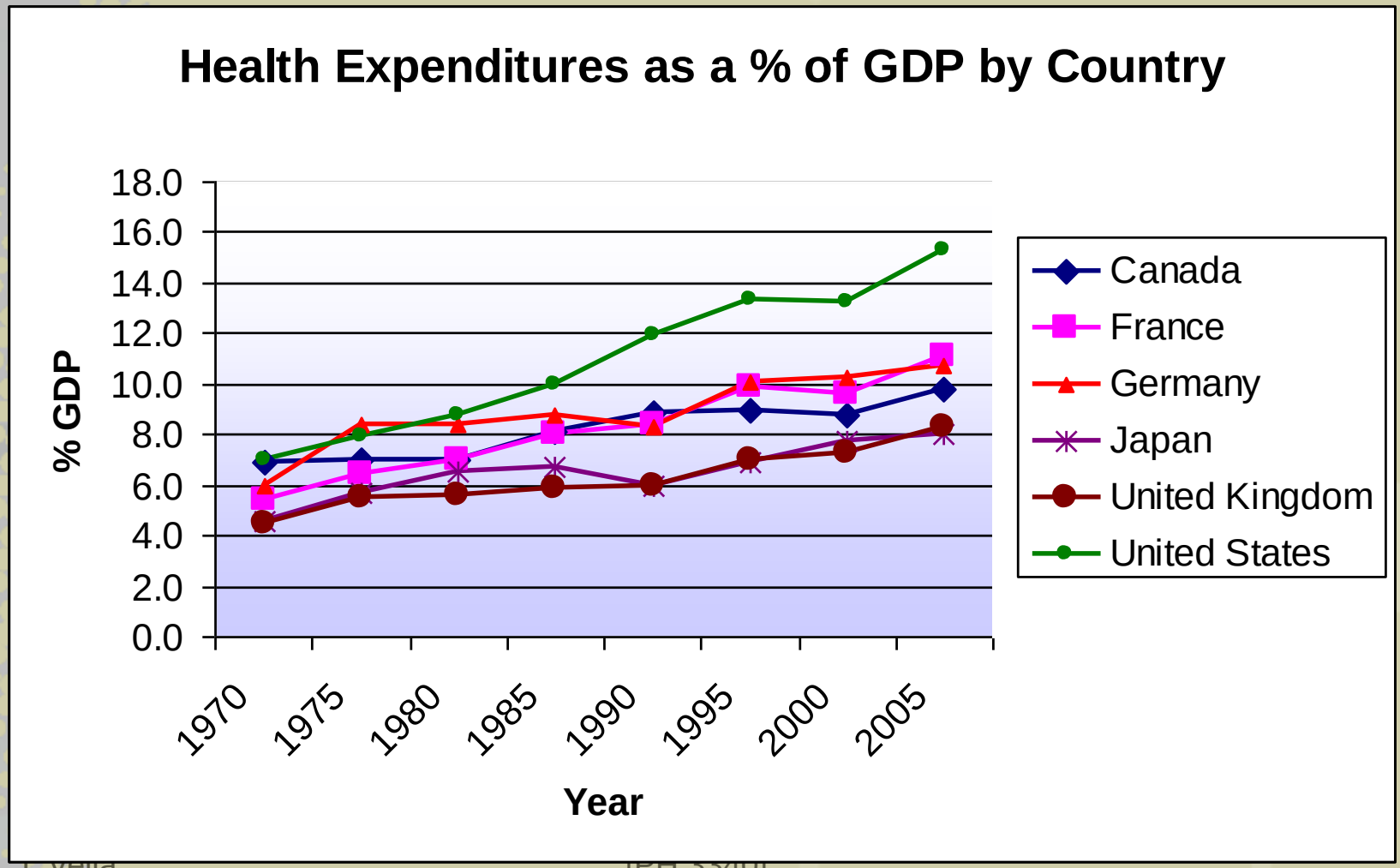
Outline

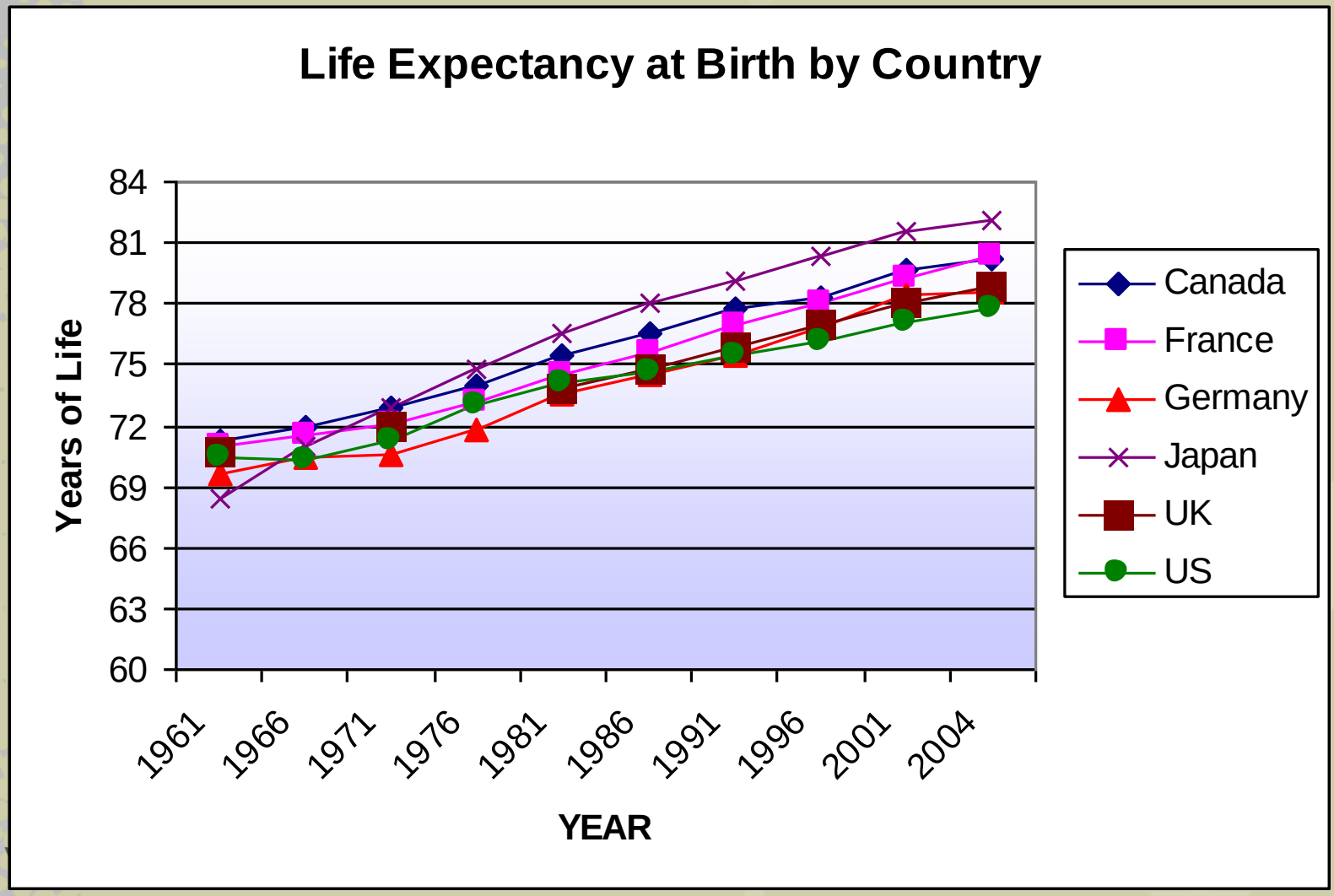
- What is Pharmacoeconomics?
- Types of Analyses
- Steps for PE Analysis
- Sources of Data

- Examples
  1. COI
  2. CMA
  3. CEA
  4. CBA
  5. CUA
- Approaches
  1. Clinical Trials
  2. Modeling
     1. Decision Analysis
     2. Markov Modeling

Why study Pharmacoeconomics?



But when it comes to outcomes…



So…

- What are we doing wrong?
- And how can we improve our performance?
  - by spending less
  - getting better outcomes

Pharmacoeconomics

is a set of methods to evaluate the

1. Economic,
2. Clinical, and
3. Humanistic

Outcomes (ECHO) of pharmaceutical products and services *(or any health care service)*

Pharmacoeconomics allows us

to compare the economic resources consumed (inputs) to produce the health and economic consequences of products or services (outcomes).

INPUTS

Economic Resources

OUTCOMES

Health and Economic Consequences

Five types of Pharmacoeconomic Analyses

1. Cost of Illness (COI)
2. Cost-minimization (CMA)
3. Cost-benefit (CBA)
4. Cost-effectiveness (CEA)
5. Cost-utility (CUA)

these methods differ by how you measure the consequence or outcome

Comparison of PE Methods

Method	Cost	Consequences
Cost of Illness	Partial	analysis in $
Cost Minimization	Dollars	Natural units (*show equivalency*)
Cost Effectiveness	Dollars	Natural units
Cost Benefit	Dollars	Dollars
Cost Utility	Dollars	QALYs

Steps for conducting a PE Analysis

1. define the problem
2. identify the perspective and alternative interventions to be compared
3. identify and measure outcomes of each alternative
4. identify, measure and value costs of all alternatives
5. use discounting and sensitivity analysis when appropriate

1. Define the problem and state the objective

- Identify the disease state and what aspect you want to deal with.

- i.e. What is the most cost effective method for controlling glucose in the treatment of type II diabetes?

2. Identify the perspective…

- that is, who will be utilizing the information to make what decisions.
- This will guide you in choosing the relevant costs and benefits.

Perspectives

1. Patient
2. Health Practitioner
3. Hospitals or Hospital systems
4. Third-Party payers
5. Societal

Patient Perspective

Examples of costs that directly affect the patient include:

- Out-of-Pocket costs
- lost income
- transportation

Relevant Consequences are:

- Therapeutic effectiveness
- Adverse events
- Quality of Life (QOL)

Health Practitioner

Costs to physicians may include:

- Hospitalization
- Pharmacy
- Personnel
- Supplies

Consequences of interest are:

- Therapeutic effectiveness
- Adverse events

Hospitals

Costs include:

- Hospital stay costs
- Treatment of adverse events & complications

Consequences of interest:

- Therapeutic effectiveness
- Adverse events

Third-Party Payer

Costs of care incurred for covered services which may include:

- Hospitalization
- Pharmacy
- Nursing home care

Consequences of interest

- None

Societal

- All possible costs including lost productivity
- All possible consequences including QoL, & life years.

3. Identify Alternative Interventions

- What are the relevant choices?
- Often a head-to-head comparison of the most used (traditional) treatment with the new one.
- It's important to compare with the most likely substitute for a realistic result.
- The comparator doesn't have to be a drug therapy.

Cost and Effectiveness Comparison Grid

		Effectiveness		
		A>B	A=B	A<B
Cost	A>B	*Analyze*	Choose B	Choose B
	A=B	Choose A	Indifferent	Choose B
	A<B	Choose A	Choose A	*Analyze*

4. Identify and measure outcomes of each intervention

- Typical outcomes used include:
  - cure rate (percent cured of illness)
  - improved quality of life
  - decreased incidence of morbidity
  - years of extended life
  - relief or reduction in symptoms
  - no effect
  - Adverse events (drug interactions and side-effects)
  - mortality

ECHO Model

- E conomic
- C linical
- H umanistic
- O utcomes

Types of Outcomes

- **intermediate outcomes** such as controlling sugar levels, blood pressure and cholesterol levels are indicators that a disease or event (like a stroke) is less likely to occur.
- final outcomes would be measured as the reduction in the disease or events.
- Values can come from RCTs, literature, surveys or other data sources

5. Identify, Measure and Value costs

Costs include:

- direct medical costs like office visits, hospitalizations, any treatment costs;
- direct non-medical costs like transportation to get treatment;
- indirect costs like missed work due to illness;
- intangible costs like pain and suffering.

Be sure to include those costs that are relevant to your perspective.

Measuring Costs

Costs are measured over a relevant time period such as a month or year.

The length of time used depends on the typical span of the illness.

Acute diseases such as the flu would have a short span; while chronic or long-term illness such as depression or heart disease would span years.

Valuing Costs

- Determining the amount (dollar value) for each item (cost/benefit) listed can be difficult, especially for indirect and intangible costs.
- The key is to determine the "opportunity cost" of the resource used. That would be the highest valued alternative use of the resource. Typically use market value.
- Sources of cost data include claims data, published price lists..depends on your perspective.

Sensitivity Analysis

When estimating costs and outcomes, you typically have a range of possible values.

Sensitivity analysis requires that the results be recalculated at the different values to see if the conclusions change.

Discounting

If the analysis spans more than a year, then the dollar values must be adjusted to a common point in time.

- Discounting adjusts future costs or benefits using an expected interest or ***discount rate*.**
- Present Value = $\frac{\text{Future value}}{(1+r)^n}$

where r = discount rate (typically ranges from .03 to .06) and n = the number of years in the future.

Discounting example

- You wish to implement a diabetes DSM program which will cost you $1500 per year.
- The benefits from this program won't be evident for 2 years, so you want to evaluate it after 4 years.
- Use r = .05

Discounting Example

Year	Costs	PV
1	1,500	1,429
2	1,500	1,361
3	1,500	1,296
4	1,500	1,234
total	$6,000	$5,320

Sources of data

1. Published information – journals, RCTs
2. Secondary data – single firm (internal), company level, state or national data (external)
3. Primary data collection – sample selection, validated instruments

Each choice affects the generalizability of your results

Five types of Pharmacoeconomic Analyses

1. Cost of Illness (COI)
2. Cost-minimization (CMA)
3. Cost-benefit (CBA)
4. Cost-effectiveness (CEA)
5. Cost-utility (CUA)

1. Cost of Illness

- Evaluation of overall economic impact of a disease on a population
- Measures the economic burden of a disease
- Sum of all costs and all consequences of the disease
- Has the advantage of defining the disease, its epidemiology, outcomes and consequences.

Example – Costs attributable to Type II diabetes in adults

Cost of Illness

"An illness consumes resources and, thus, it has a cost. The cost of an illness is the sum of three broad components:

(1) medical resources used to treat the illness,

(2) the nonmedical resources associated with it, and

(3) lost productivity due to illness or disability" (Larson, 1996)

2. Cost-Minimization

- This type of evaluation compares two or more alternative treatments that produce clinically equivalent outcomes.
- Once equivalency is demonstrated, the focus is on choosing the one with the smallest total costs.

- *Example – treating patient w/same therapy in hospital vs home.*

3. Cost-effectiveness

- If you can measure the therapeutic effect in "natural units" (I.e. weight gained, blood cholesterol level reduction) you compare the Cost per gain in therapeutic effect.

- Cost-Effectiveness Ratio =

$$\frac{\text{Cost of treatment (\$)}}{\text{Therapeutic effect* (Natural units)}}$$

Limitation – must choose a single measure!

Cost-effective therapies

- are those with outcomes worth their corresponding costs relative to competing alternatives
  - Therapies that are less expensive and at least as effective as other alternatives
  - Therapies that are more expensive than alternative therapies with an additional benefit worth the additional cost
  - Therapies that are less expensive and less effective in instances where the extra benefits provided by the competing therapy in not worth the additional expense

Examples where CEA is best technique

- Compare the costs and outcomes of two or more antihypertensives
  - Cost per decrease in blood pressure
- Compare two programs designed to prevent excess mortality
  - Cost per life saved

Note: Cost-utility analysis is a special form of cost-effectiveness analysis

4. Cost-Benefit Analysis

- Evaluation technique for comparing the value of all resources consumed (costs) in implementing a program or intervention against the value of the outcome (benefits) from that program or intervention.
- Outcomes of alternative interventions is valued in monetary units ($) thus you can compare alternatives with different outcomes.
- Scope of analysis is usually broad, addressing large societal issues.

4. Cost-Benefit Analysis

Two methods are used for CBA.

All costs and benefits are expressed in dollars.

There are two ways to express the results:

1. Calculate the **Benefit to Cost ratio** for each action

$$\frac{\text{Benefit (\$)}}{\text{Cost (\$)}}$$

2. Or calculate the **Net Benefit**

= Benefit ($) – Cost ($)

Choose alternative with the largest value.

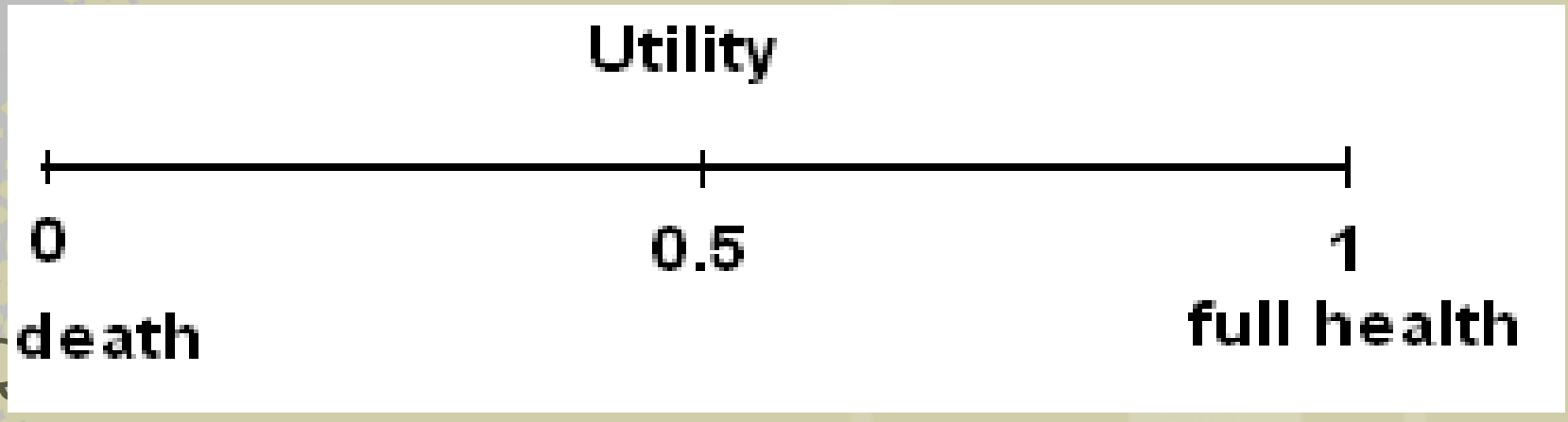
Examples of questions CBA may address

- AIDS prevention and awareness programs
- Smoking cessation intervention
- Diabetes drug adherence
- Breast cancer screening

5. Cost-utility

- integrates both costs and consequences within the utility analysis framework.
  - A variation of CEA
  - differences between CUA & CEA
    - CUA requires the measurement of final outcomes in terms of changes in life expectancy adjusted for patient preferences
    - Intermediate outcomes are not appropriate to use in cost-utility analysis
  - outcomes expressed in QALY gained

Quality Adjusted Life Years



- Q
- One year at full health QALY = 1.0
- Death QALY = 0.0
- 3 years disabled (U =0.5) = 1.5 QALYs

Application of CUA

- CUA is the most difficult and expensive economic evaluation method to use
- CUA should be used when QoL is the important outcome:
  - Psychological well-being, physical and social function are important in the treatment of arthritis
  - Chemotherapy may increase survival but decrease well-being, both quality and quantity of life are important

Approaches to Obtaining Effectiveness

Clinical Trials

1. Randomized Controlled Trials (RCTs) are typically performed by the drug company to establish safety and efficacy. Results from RCTs are not always applicable to the real world due to issues such as patient heterogeneity and compliance.
2. Naturalistic design is more real world than RCT, but more expensive to implement.

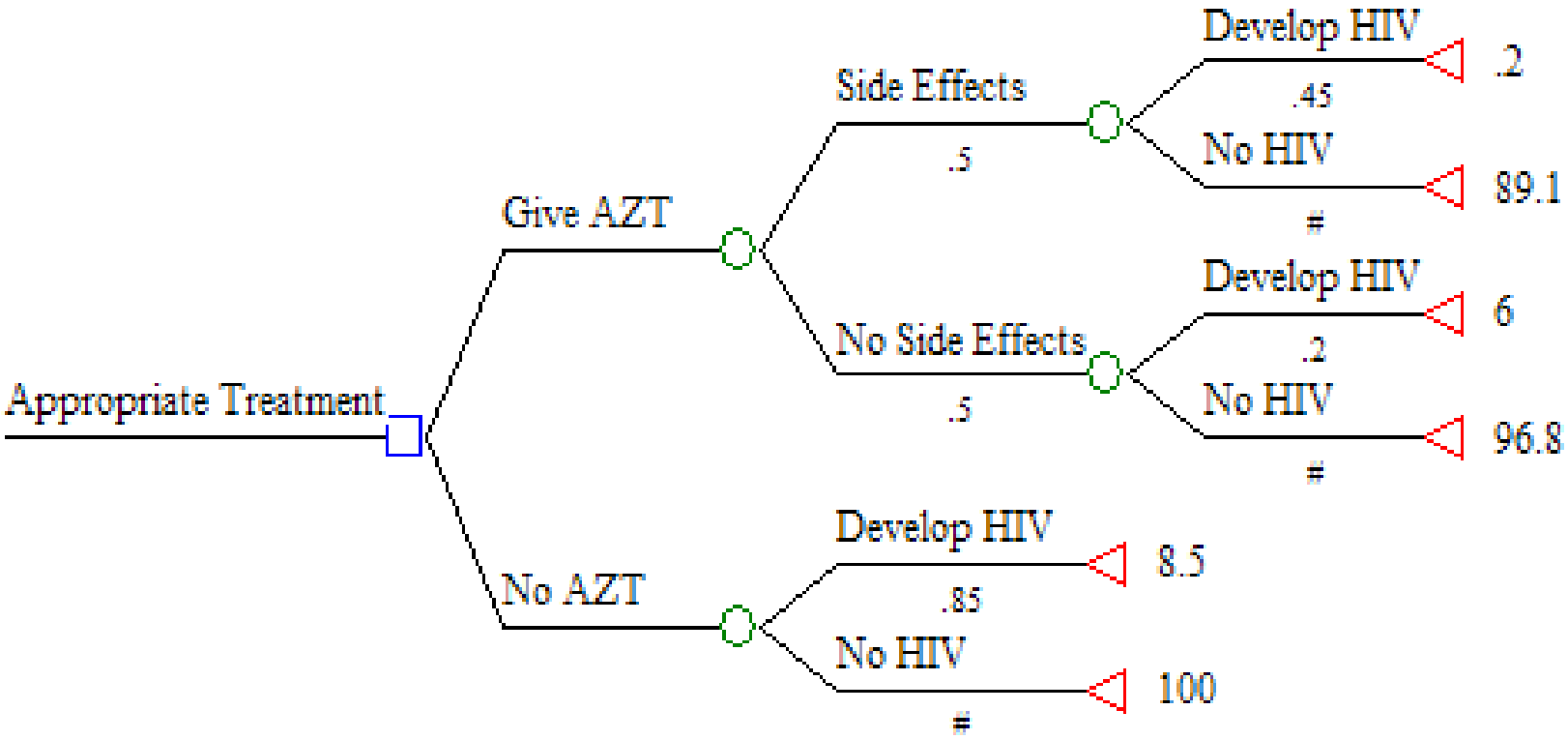
Approaches to Obtaining Effectiveness Modeling

Synthesizes data from the literature to model the disease, treatment and outcome process.

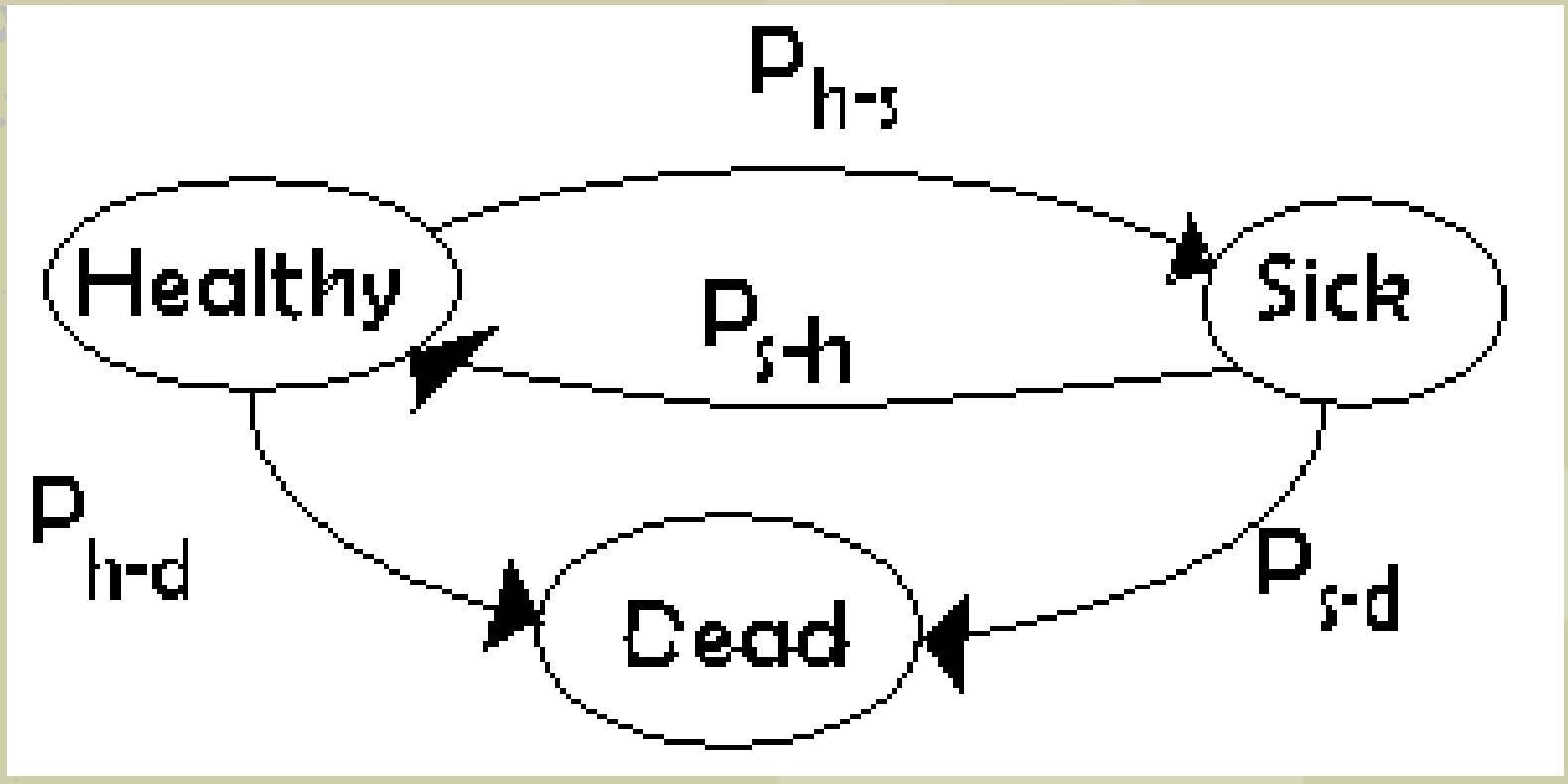
There are two types of models:

1. Decision Tree
2. Markov

(1) Decision Tree Models



(2) Markov models



Summary

1. Research question
2. Perspective
3. Type of analysis
4. Appropriate Comparators?
5. Relevant costs and consequences
6. Validated instruments
7. Time period, discounting
8. Sensitivity analysis
9. Generalizability