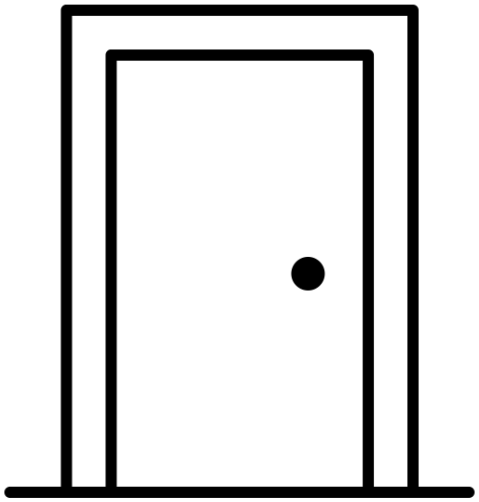
Introduction to Decision Modeling

Decision Analysis

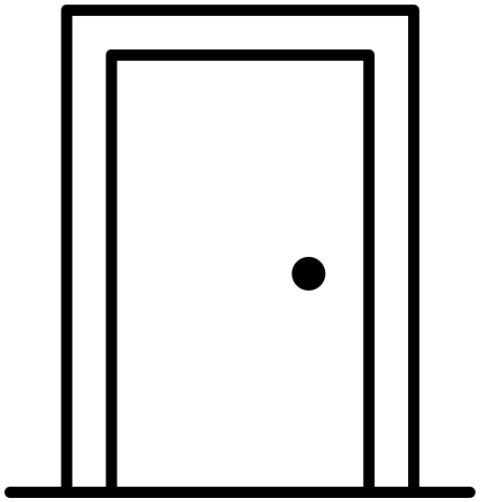
- Explicit, quantitative and systematic approach to decision making under *uncertainty*
- Identify, measure, and value the consequences of decisions as well as the uncertainty that exists when the decision needs to be made
- Help structure the analysts' thinking and facilitate the communication of assumptions
- Provide a structural framework for synthesizing data from disparate sources and allows for *extrapolation*
- Elements are incorporated into a *model* to structure the decision problem over time, and used to compare the outcomes of different options or interventions

Decision Analysis

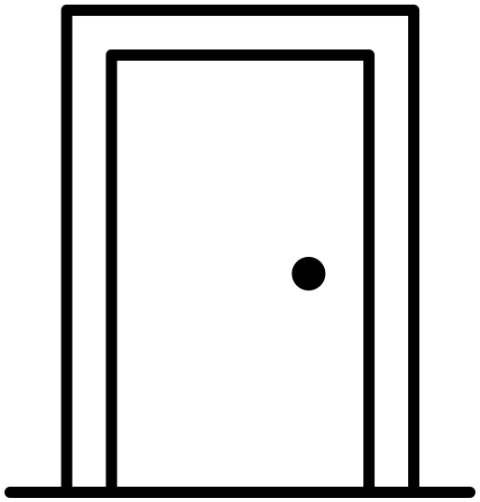
Option 1



Option 2



Option 3



Created by Icons Bazaar
from Noun Project

Benefits?

Created by Vectors Point
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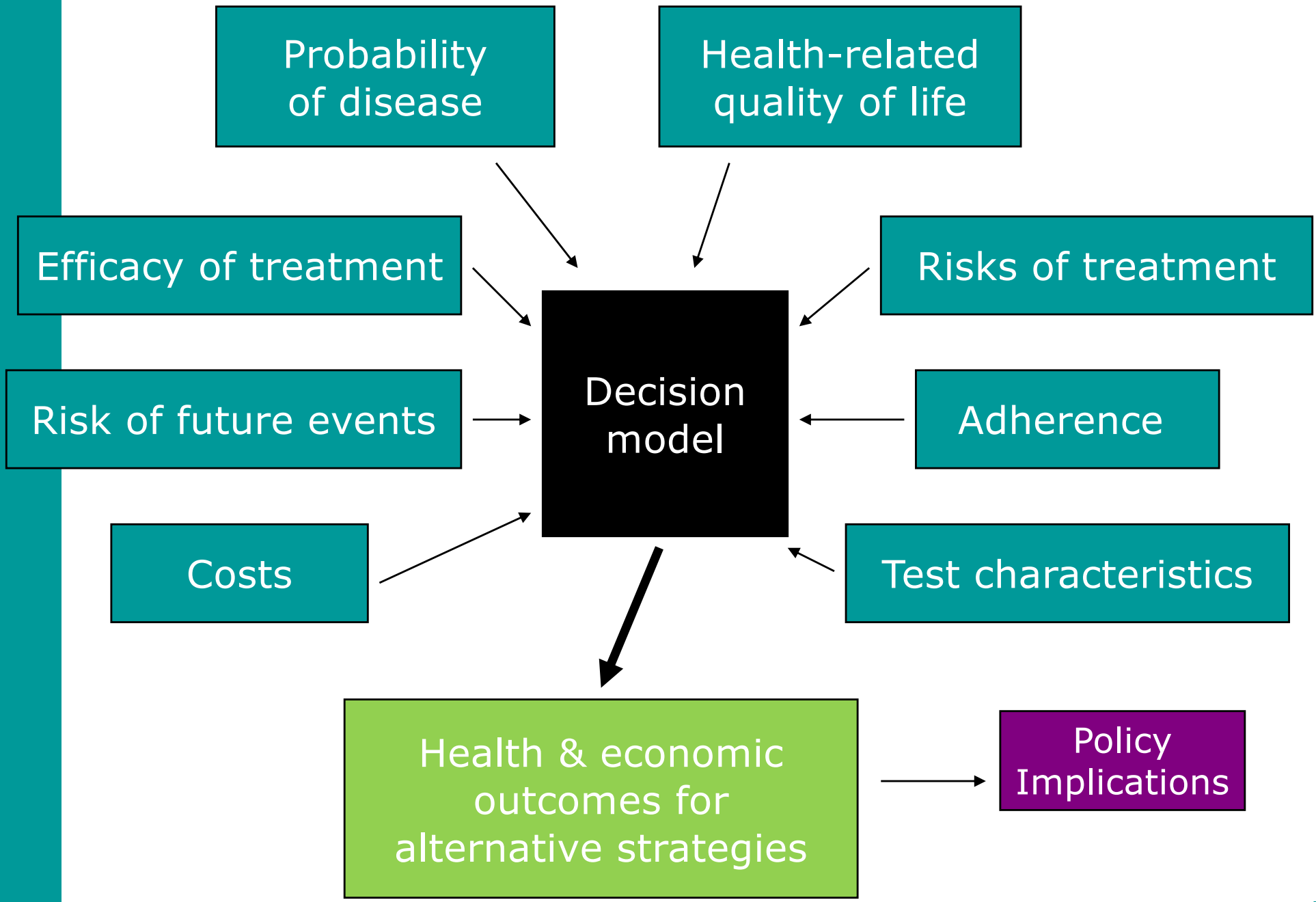
Harms?

Cost?


Probability of disease
Health-related quality of life
Efficacy of treatment
Risks of treatment
Risk of future events
Decision model
Adherence
Costs
Test characteristics
Health & economic outcomes for alternative strategies
Policy Implications

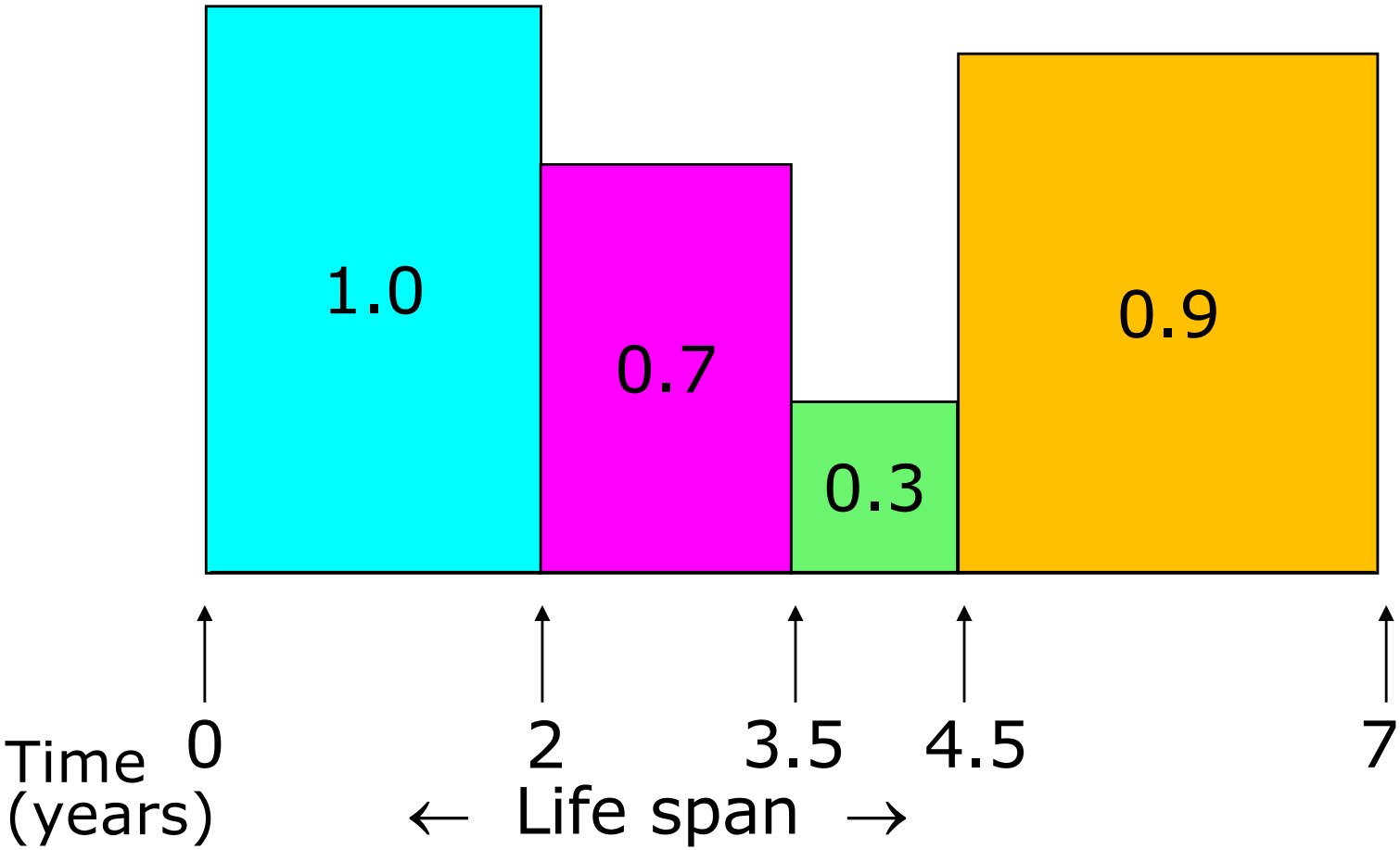
Models Types

- Decision tree
  - Schematic representation of uncertain events/consequences of different alternatives
  - Best for short time horizons
- Cohort state transition model
  - Dynamic model that reflects disease progression and other events
  - Models a cohort
- Microsimulation
  - Stochastic dynamic model
  - Models individuals

Health Outcomes

- Disease-specific
  - Intermediate clinical markers
  - Cases averted
  - Events averted
- Generic
  - Lives saved
  - Life-years gained
  - Quality-adjusted life-years (QALYs) gained

Quality-Adjusted Life-Years



$$QALYs = (2)(1)+(1.5)(.7)+(1)(.3)+(2.5)(.9) = 5.6$$

Costs

- Formal healthcare sector
  - Facilities and resources
  - Drugs and devices
  - Personnel time
- Informal healthcare sector
  - Patient time
  - Unpaid caregiver time
  - Transportation costs
- Non-healthcare sector
  - Legal or criminal justice
  - Education
  - Housing

Cost-Effectiveness Analysis

- Subset of decision analytic questions where the objective is to balance costs and health benefits
- Defined willingness-to-pay per unit of health benefit (also called cost-effectiveness threshold)