JOHNS HOPKINS BLOOMBERG SCHOOL of PUBLIC HEALTH

PREFERENCE ELICITATION METHODS

Lecture 9

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Problem

- Return to instructor's radial head crack
- How can we get the instructor to express a preference for that health state in comparison with others?
  - What is typically asked of ER patients who are there for an injury? Is this a tradeoff?
  - What matches with theory?

Introduction

- Trying to obtain a preference weighted measure with *interval* properties to use in a QALY calculation
  - Interval properties implies that a difference of 0.1 anywhere means the same thing
    - The meaning of a change from 0-0.1 should be the same as the meaning of a change from 0.9-1.0
      - 0 implies death
      - 1 implies perfect health
- Some issues we'll discuss at the end rely on "ratio" rather than interval properties

Outline

- Discuss methods
  - Standard gamble
  - Time Tradeoff
  - Visual Analog Scale
  - Person Tradeoff
  - Risk Tradeoff
- Compare QALYs with Healthy Year Equivalents
- Discuss other issues of health utility measurement

Objectives

- Calculate health utility value for…
  - Chronic disease
  - Temporary disease
  - States better and worse than death
- Understand the pros and cons of various measures
  - Including the burden of various measures
    - The need for an interviewer

Describing Health States

- Choice of how to describe health states
- No one method is universally agreed upon as best

Scenarios

- Abstraction of reality
- Reading a scenario is not equivalent to seeing and/or interviewing a patient
- Only certain elements are emphasized
- Not everyone describes state the same way
  - Comorbidities may be included or excluded

Taxonomic Description

- List domains
  - Health perceptions, social function, psychological function, physical function, impairment
    - Each of these can get more specific
- Describe status of each domain
  - Various indicators can be used for each domain
    - Social relations
      - Interaction with others or participation in the community
- Domains may interact with one another

Preference and Non-preference Systems

- Preference based
  - Ask subjects to make judgements regarding the value of particular health states in comparison with one another
- Non-preference based
  - Use methods that assign scores to individual components and simply sum component scores

Standard Gamble

- Notation
  - Perfect health denoted as PH
  - Health state to be valued denoted as HS
- Expected utility
  - weighted average of state-specific utilities
- Assume
  - utility of death = 0
  - utility of perfect health = 1

Chronic & Preferred to Death Calculation

- $EU(HS)=(1-p_{PH})U(Death)+p_{PH}U(PH)$
  - In question posed to respondent:
    - Specify that experience both HS and PH for the same number of years, which is the rest of the person’s life
  - Conventions are arbitrary
    - Contribute to tractability

Chronic & Preferred to Death Result

- From…
  - $EU(HS)=(1-p_{PH})U(Death)+p_{PH}U(PH)$
- To…
  - $EU(HS) = p_{PH}$
- Consider varying responses…
  - A higher probability of perfect health
    - Implies lower probability of death
    - Implies higher valuation of health state

Standard Gamble – Temporary Health State

- What has a value of 0?
- Alternative #1: Assign worst temporary health state a value of zero
  - Arbitrary
    - While individuals may have different feelings about death it is easily identified and recognizable
  - Score similarly to chronic conditions

Standard Gamble – Temporary Health State

- Alternative #2: Suppose want to put on the 0-1 death-perfect health scale
  - Get a value for the worst temporary health state (still arbitrary) as a short chronic disease
    - Not same as basic standard gamble since don't have usual life expectancy
  - Then value others of increasing value
- $EU(HS)=(1-p_{PH})U(Worst)+p_{PH}$
  - Knowing U(Worst) allows calculation

Standard Gamble – State Worse than Death

- Change what is "certain" as the certain outcome needs to have a value between the other two
  - Death is certain
  - $0=(1-p_{PH})U(HS)+p_{PH}U(PH) \Rightarrow U(HS)=-p_{PH}/(1-p_{PH})$
- Consider varying responses
  - As the probability of perfect health increases
    - Utility of the health state decreases
    - As the respondent indicates that a lower probability of the health state in question makes her indifferent to death the utility associated with that health state must be lower

Problems with Expected Utility Theory

- Does it hold?
- Some findings suggest that respondents will value a gain less than a loss of similar magnitude
  - Prospect theory
  - People really like to avoid losses

End Result of Expected Utility Theory Problems

- Desire to avoid death
  - Place very low probability on death & very high probability on perfect health
- Results in very high values for what seem to be “bad” health states
  - Result 1: Overestimate utility of conditions
  - Result 2: Underestimate utility gain from cure/avoidance
  - Result 3: Potential lack of sensitivity to changes in health

Are People Accustomed to Tradeoffs Implied?

- Clinical choices are more complex than accepting disease or having a treatment that leads to only cure or death
- To facilitate consideration of tradeoffs
  - Use props or visual aids
    - Probability wheel

Time Tradeoff

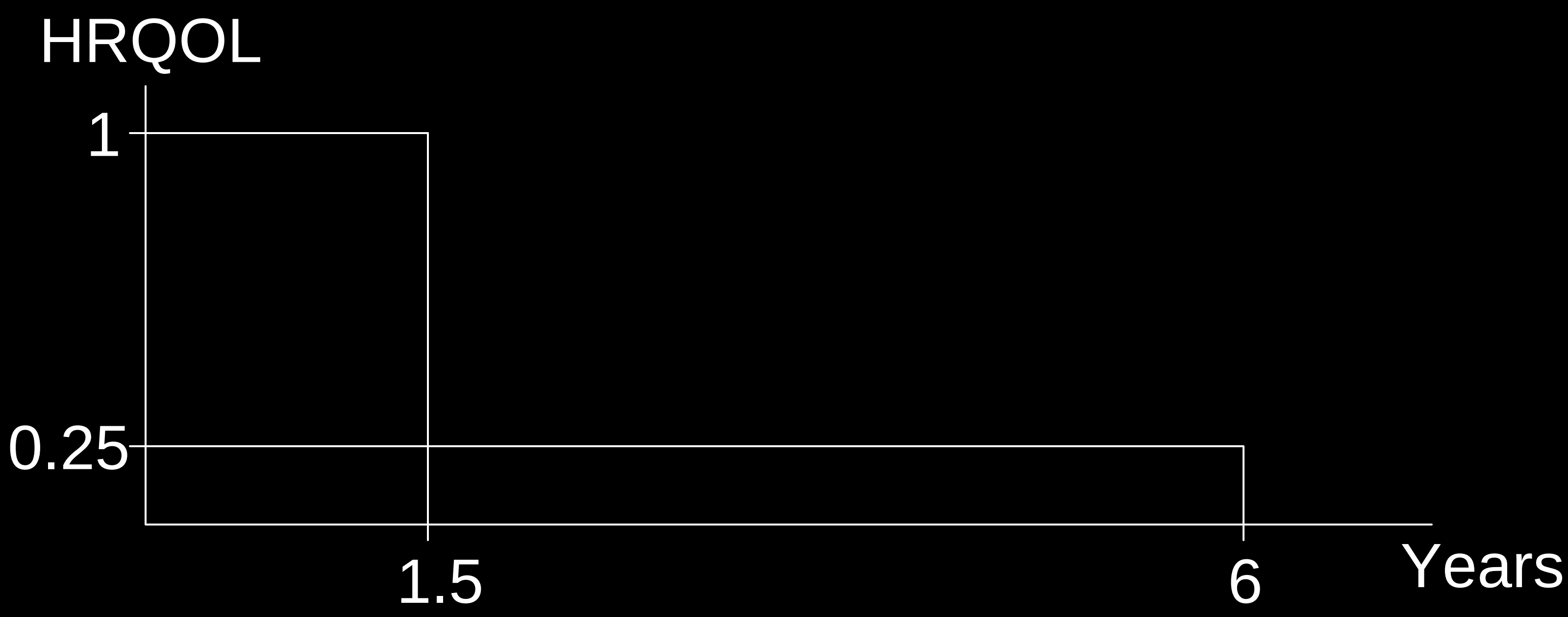
- Two certain outcomes rather than one certain outcome and one “lottery”
- Assume
  - U(X Years in HS) = X U(1 Year in HS)
  - Oversimplification
  - No discounting

TTO – Chronic Condition Preferred to Death

- X U(HS) = Y U(PH) = Y
- U(HS) = Y/X
  - For a fixed length of time in a health state, the longer the time in perfect health the higher the utility of the health state

Graphical interpretation

- Total value of being in perfect health for 1.5 years is the same as being at 0.25 quality level for 6 years



TTO – Temporary Health State

- Have temporary state for time T
- What is time (X<T) that would have worst (or any worse) temporary state followed by perfect health for remainder of T?
- T U(HS) = X U(WORSE) + (T-X) U(PH)
- U(HS) = 1 - (1- U(WORSE)) X/T
- Consider varying responses
  - Longer in worse state yields lower HS
- Can convert to a death to perfect health scale by scoring the worst health state as a short chronic condition just as in standard gamble

TTO – States Worse than Death

- Setup with 2 choices
  - Immediate death or healthy for Y years and ill for T-Y years
    - Does it matter whether you begin healthy or unhealthy?
- Set utilities equal
  - $0 = Y + U(HS)\ (T-Y)$
  - $U(HS) = Y / (Y-T)$
    - The longer the time that the person would need to spend in perfect health the lower the value of the health state

TTO – Issues

- Time tradeoff focuses on years at end of life
  - Years at end of life are valued less with discounting
    - May lead to bias without discounting correction

Visual Analog Scale

- Not preferred by some health economists
- Use a scale with anchor points
  - 100 is perfect health
  - 0 could be death or worse imaginable state
    - Issue will arise if zero is worst imaginable state
      - Need to obtain valuation of death in order to make the analysis similar to standard gamble and time tradeoff

VAS Empirical & Theoretical Issues

- Are we making tradeoffs?
- This method leads to lower scores than other two measures
  - Perhaps because not making explicit tradeoffs
  - Perhaps because in making tradeoffs not forced to consider death
- Reference: Kaplan on psychometric methods and evidence (in Sloan, Valuing Health Care, Cambridge University Press, 1995)

Healthy Year Equivalents

- Procedure
  - Start with a health state and ask a standard gamble question
  - Then tell how many years in full health would provide equal value
- With no discounting seems identical to time tradeoff
  - However, what is being measured?
    - # of years in PH with same *utility* as X years in HS
    - Not impute Y/X ratio to the other length of time
      - May be important with discounting
- Other considerations
  - Can describe health trajectories
  - Burden of asking for each length of time

Person Tradeoff (PTO)

- References
  - Richardson SSM 39:7-21
  - Prades HE, 6: 71-81
- Why consider this?
  - Does it yield a better social value of HS?
  - Does consistency of value obtained in original DALY exercise depend on PTO method or on multiple step validation

PTO Methods

- One formulation of the question
  - "With W people in adverse state A, and Z people in adverse state B, you can only cure one group. Whom would you choose to cure?"
  - Vary W and Z until the respondent is indifferent
  - Assume both will live same length of time after cure

PTO Calculation

- Setting utility gains or disutilities equal rather than setting utility levels equal
  - $W(1-U(A))=Z(1-U(B))$
  - $(1-U(B))=[W/Z](1-U(A))$

Alternative PTO Question

- Helps to make tradeoffs among population explicit
- “How many chronically ill people would need to be cured to be indifferent to saving 10 healthy people with similar life expectancy who are about to die?”
  - $Z(1-U(B)) = 10(1-0)$, where $0 = U(\text{Death})$
  - $U(B) = (Z-10)/Z$
  - Deals directly with states worse than death
    - Any $Z<10$ implies a health state worse than death
  - Consider varying responses
    - As Z increases, U(Z) also increases

PTO Advantages

- No special methods for:
  - Temporary health states
  - States worse than death
- Since assume same life expectancy have no discounting issues
- Compare any two health states
- Can ask series of questions to work from worse states to better states

PTO Issues

- Not valuing one's own health so it violates the principle of one person's valuation of their own health
  - How important is this principle
  - We typically use the population average value
- Alternative frames of reference
  - Is number chronically ill or about to die fixed?
  - Are we talking about 10 people, 1,000 people or 100,000 people
  - Is there a decreasing marginal utility per person saved?
- No uncertainty

PTO & Prospect Theory

- Prospect theory
  - Similar magnitude loss is valued much more than a gain
  - Value of achieving an outcome depends on where one starts
    - Importance of relative rather than absolute

Risk-Risk Tradeoff

- Reference
  - Clarke et al., Quality of Life Research, 6: 169
- Questions still compare three states
  - PH, HS, Death
- Have risks with all three states on both sides of equation
- Deal with risks for two states worse than perfect health

RRTO - Empirical Example Scenario Setup

- Multimedia presentation has appearance of a population measure
- Two cities
- Natural disaster may strike tomorrow that is not under individual’s control
- City A has a higher risk of painless death from disaster
- City B has a higher risk of HS
- No discounting issues

RRTO - Empirical Example Mathematical Setup

- Vary probabilities until expected utilities are equal
- Maintain $p_{DA} > p_{DB}$ and $p_{HSA} < p_{HSB}$
- If had higher probabilities of both less than perfect health states in one city, the expected utility of living there would necessarily be lower
- $p_{HSA}\, U(HS) + p_{DA}\, U(D) + [1 - p_{HSA} - p_{DA}]U(PH) = p_{HSB}\, U(HS) + p_{DB}\, U(D) + [1 - p_{HSB} - p_{DB}]\, U(PH)$

RRTO- Empirical Example Calculation

- Use fact that U(D) = 0 & U(PH) = 1
- p_{HSA} U(HS) + [1 - p_{HSA} - p_{DA}] = p_{HSB} U(HS) + [1- p_{HSB} - p_{DB}]
- U(HS) = [(p_{DA} - p_{DB}) - (p_{HSB} - p_{HSA})]/[p_{HSA} - p_{HSB}]
- U(HS) = 1 + [(p_{DA} - p_{DB})/(p_{HSA} - p_{HSB})]

RRTO – Empirical Interpretation

- Either the numerator or denominator of the fraction is negative
  - Important because this yields health state utilities that are less than one
- If smaller differences in the probability of a health state than in the probability of death, the state is worse than death
- If hold all fixed other than p_{HSB}, increasing p_{HSB} increases the utility of HS

RRTO Empirical Results

- Empirically this measure did not do so well
  - Frame of reference issues
  - Lack of difference between death and health state as adverse events
  - With four variables it may be difficult to conceptualize so the actual implementation varied only two

Measurement when Death $\neq$ 0

- Death $\neq$ 0
  - Not everyone has the same preferences
  - Expand the scale linearly
  - Assume that U(PH)=1 in all cases
  - Have to adjust value of death so that it is at the intended anchor point
  - Reset scale
    - Scale is too short
    - Smaller than actual marginal impacts

Comorbidities and Perfect Health

- Utility without the disease in question is actually something less than one among the general population
  - Misperceived question
    - Maybe respondent problem
    - Maybe survey problem
- Where does life without disease belong
  - Less tractable problem

Implications of Comorbidity Issue

- Moving to life without disease from life with disease has excess marginal impact relative to what it would have if the general population value were used
  - Suppose person considers a value of 1 to be life without a particular disease or in light of other comorbidities rather than PH
    - Patient considers health without the disease in question to be of higher quality than individual in general population
    - Overestimate the effects of getting rid of the disease

Adaptation and Coping

- Difference in perceptions
- Rank health with disease closer to one and decrease marginal impact
- Need general perception of disease
- Individual with disease ranks state with disease higher than general public but other conditions are ranked similarly
- Not as much room for improvement among people with adapted preferences as among the general population