# Introduction to Effectiveness, Patient Preferences, and Utilities

Josephine Jacobs, PhD

HERC Cost Effectiveness Analysis Course

January 24, 2024

# Overview

- Outcomes measurement in CEA

- Concept of QALYs for a CEA

- Estimating QALYs

- Guidelines on selecting measures

- Issues surrounding QALYs

- References for more details

# The ICER

CEA compares the outcomes and costs of two (or more) interventions

$$\frac{(Cost_{treatment} - Cost_{control})}{(Outcomes_{treatment} - Outcomes_{control})}$$

# CEA/CUA review

- Compare outcomes and costs across interventions

  - Outcome defined by the health benefit achieved with the intervention.

  - Outcome(s) quantified in a single scale

# Which outcome to use?

1) Mortality/life years gained

    ✓  Primary objective is to extend life (e.g. cancer therapies)

    ✓  Generic outcome across life-saving interventions

    -  Does not capture QoL or patient preferences

# Which outcome to use?

2) Morbidity/disease specific outcomes

    ✓   Choosing among therapies for same condition

    ✓   More practical in clinical trials

    -   Limits comparisons between other types of interventions

# Which outcome to use?

3) Quality adjusted life year (QALY)

- ✓ Combines both quantity and quality of life in one generic measure

- ✓ Takes into account patient preferences

- ✓ Many guidelines recommend using QALYs

# What is a QALY?

- Measure of a person's length of life weighted by a valuation of their HRQoL

Length of life

x

Quality of life valuations (health utilities)

# How to Interpret QALYs

- 1 year in full health = 1 QALY

- 1 year in health state 0.5 = 0.5 QALYs

- Dead = 0 QALYs

- Negative values possible

# QALY Example #1

- Prophylactic antibiotic Rx vs. standard of care

|  | 3 mo. | 3 mo. | 3 mo. | 3 mo. | Total QALYs |
|---|---|---|---|---|---|
| New Txt. | .50 | .60 | .80 | .80 | ? |
| UC | .50 | .35 | .50 | .80 | ? |

# QALY Example #1

▪Prophylactic antibiotic Rx vs. standard of care

| | 3 mo. | 3 mo. | 3 mo. | 3 mo. | Total QALYs |
|---|---|---|---|---|---|
| **New Txt.** | .50 (.50 x .25) .125 | .60 (.60 x .25) .15 | .80 (.80 x .25) .20 | .80 (.80 x .25) .20 | (.125+.15+.20+.20) =.675 |
| **UC** | .50 (.50 x .25) .125 | .35 (.35 x .25) .0875 | .50 (.50 x .25) .125 | .80 (.80 x .25) .20 | (.125+.0875+.125+.20) =.5375 |

# Calculating cost/QALY

- ICER – New Rx vs. standard care
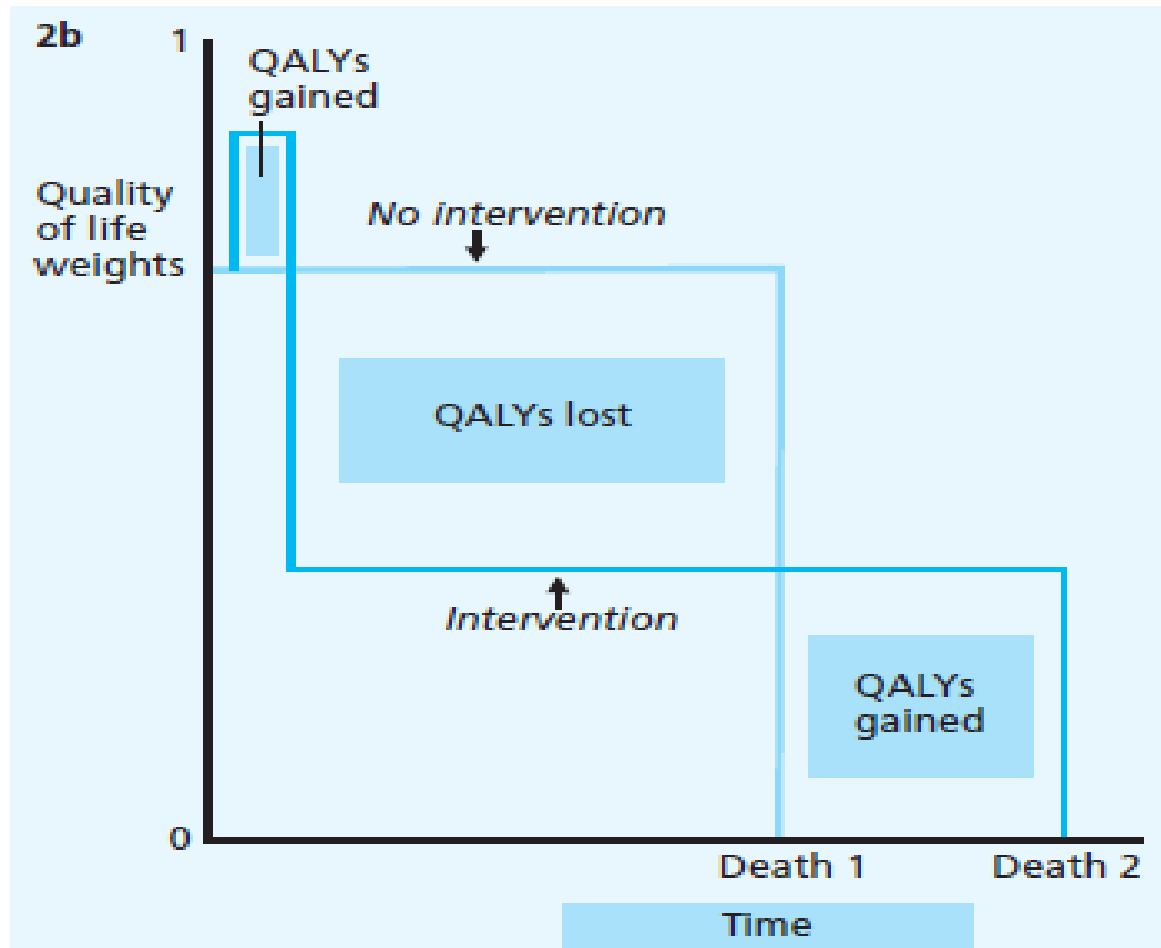
    *(hypothetical all other costs are equal)*

$$\frac{(\$10,000 - 0)}{(.675 - .5375)} = \frac{\$10,000}{.1375} = \$72,727 / QALY$$

# QALY Example #1
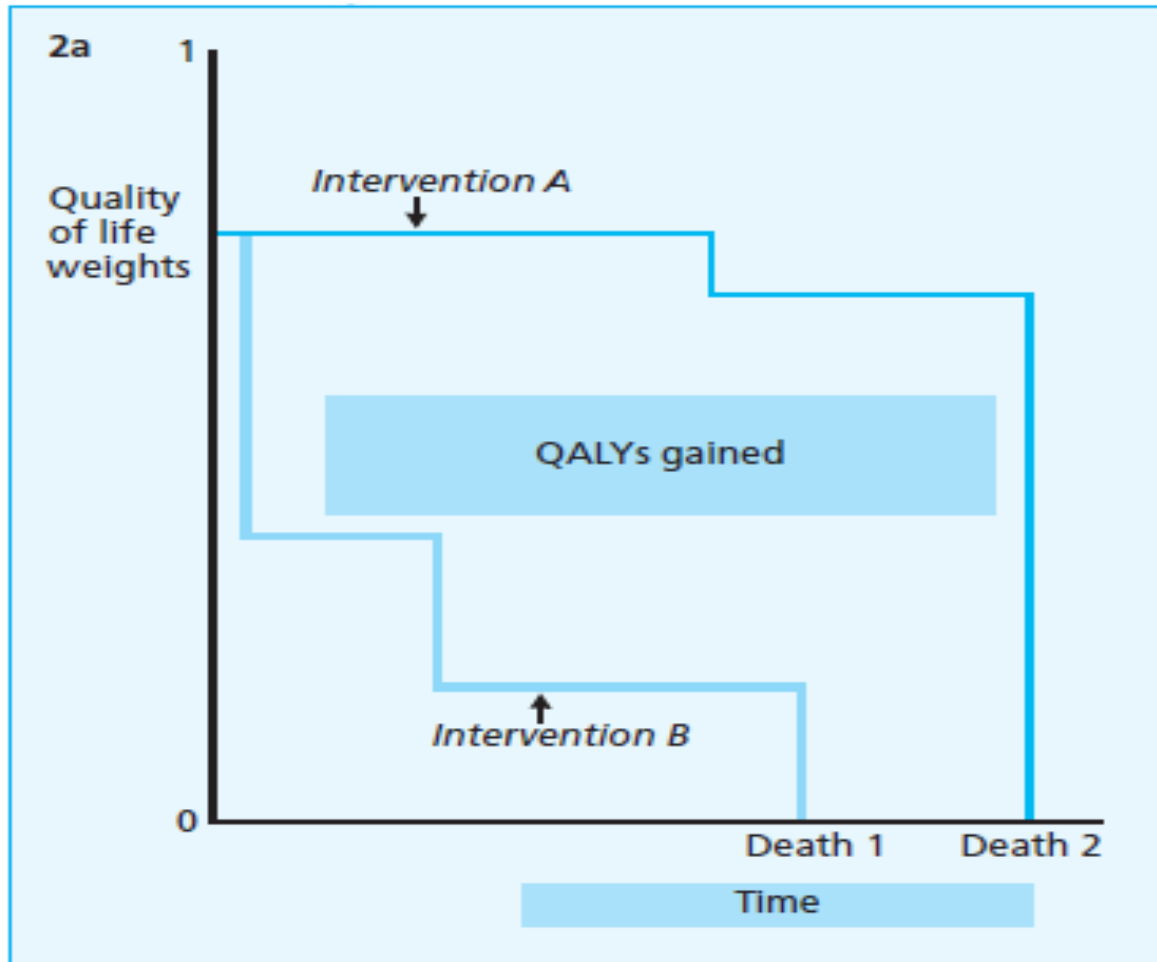


Source: Phillips, 2009

# QALY Example # 2



Source: Phillips, 2009

# QALY Example #3

|   | 1 year | 1 year | 1 year | 1 year | Total QALYs |
|---|--------|--------|--------|--------|-------------|
| **A** | .50 | .50 | .75 | .75 | ? |
| **B** | .50 | .50 | .50 | .50 | ? |

# Poll

- What are the additional QALYs generated by Treatment A?

a) 1 QALY

b) 2 QALYs

c) 0.5 QALYs

d) 0.25 QALYs

# QALY Example #3

| | 1 year | 1 year | 1 year | 1 year | Total QALYs |
|---|---|---|---|---|---|
| A | .50<br>(.50*1)<br>.50 | .50<br>(.50*1)<br>.50 | .75<br>(.75*1)<br>.75 | .75<br>(.75*1)<br>.75 | .50+.50+.75+.75 =<br>2.5 |
| B | .50<br>(.50*1)<br>.50 | .50<br>(.50*1)<br>.50 | .50<br>(.50*1)<br>.50 | .50<br>(.50*1)<br>.50 | .50+.50+.50+.50=<br>2.0 |

# Deriving Preferences or Utilities

- Basic methodology:

  - Individuals provide a personal reflection on the relative value (preference weight) of different health states experienced or described.

# Deriving preferences or utilities

- Three methods to derive preferences:

  - Direct

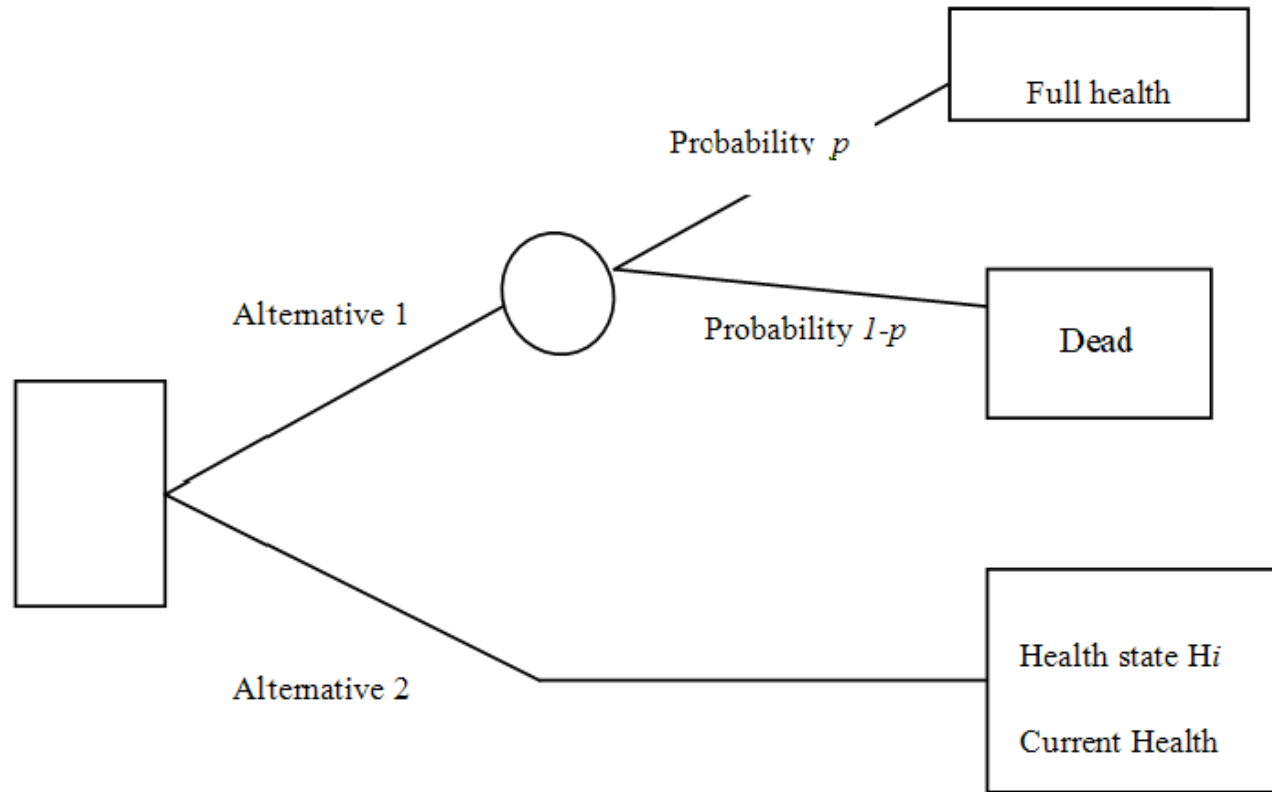  - Indirect

  - Off-the-shelf

# Direct Methods

- Individuals asked to choose (declare *preferences*) between their current health state and alternative health status scenarios

# Direct: Valuation Method

- Standard Gamble

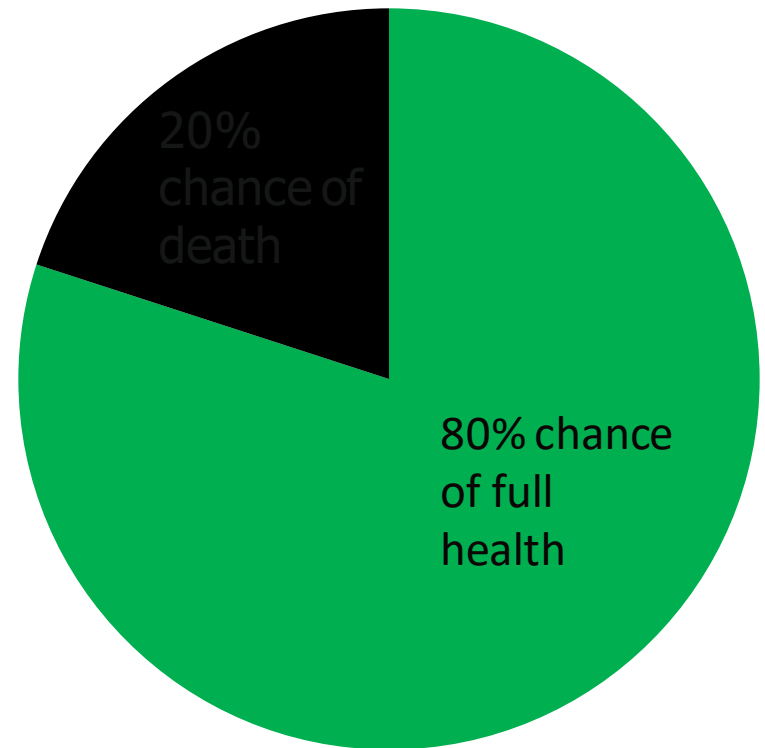- Time trade-off

- Rating scale (visual analogue scale)

# Direct: Standard Gamble



Source: Sinnott et al., 2007

# Direct: Standard Gamble

- Rest of life in current health state; or

- "take a pill (with risks) to be restored to perfect health"

- Scale represents risk of death respondent is willing to bear in order to be restored to full health.



20% chance of death

80% chance of full health

# Standard Gamble Scenario

- You are able to see, hear and speak normally
- You require the help of another person and a cane to walk or get around.
- You are occasionally angry, irritable, anxious and depressed.
- You are able to learn and remember normally.
- You are able to eat, bathe, dress and use the toilet normally.
- You are free of pain and discomfort.

# Standard Gamble Scenario

- Treatment A: allows you to live 10 years in this health state


- Treatment B: Gives a p% chance of returning to full health and (100-p%) chance of death
  - Successful=10 years of full health
  - Unsuccessful = immediate death

# Standard Gamble Scenario

- Your doctor tells you that the chance the second treatment will succeed is not known

- Please indicate the minimum chance of success (i.e. p%) that you would require to accept the second treatment
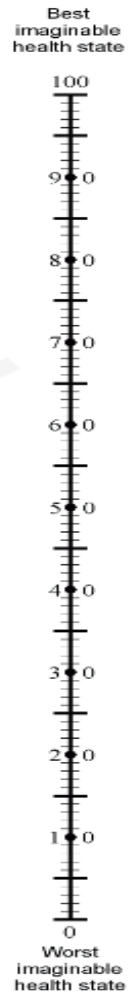
# Direct: Time Trade-off
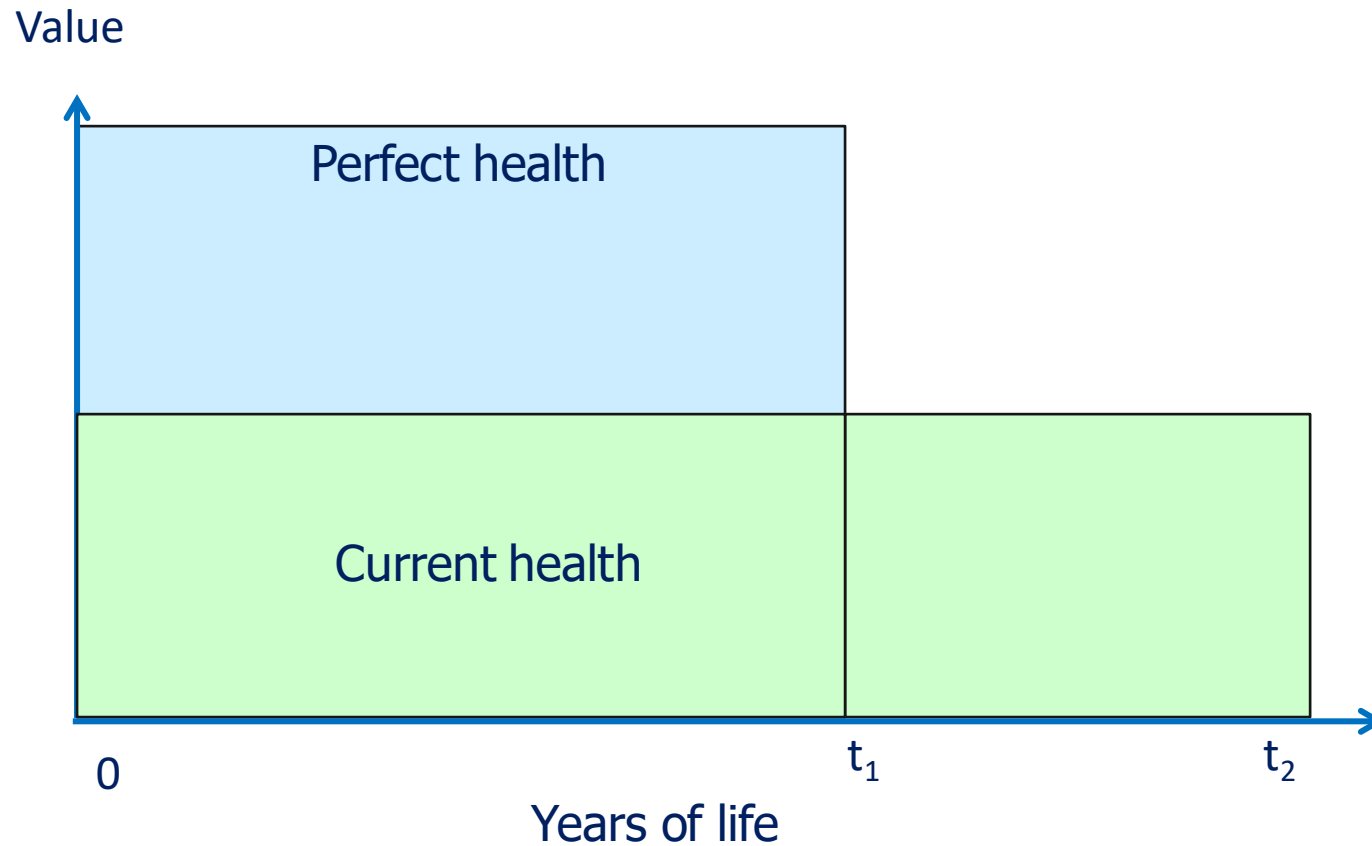
# Considering the health state described

- How many years of life in your current state would you be willing to give up to live out your life in perfect health?
  - 5 years
  - 10 year
  - No years

# Direct: Rating Scale (VAS)

- Place health state on line

- Anchors:
  - Best possible health state
  - Worst possible health state

- Generates values, not utilities

Best
imaginable
health state

100

9●0

8●0

7●0

6●0

5●0

4●0

3●0

2●0

1●0

0

Worst
imaginable
health state

# Poll

- With which valuation method would a respondent's utility be affected by their willingness to take on risk?

a) Standard gamble

b) Time trade-off

c) Visual analogue scale

# Direct Methods

- SG measures preferences under conditions of uncertainty

- TTO choices are made under conditions of certainty

- VAS involves neither choice nor uncertainty

# Direct Methods

- May be necessary if effects of intervention are complex:

  – Multiple domains

  – Effects not captured in indirect or disease-specific instruments

# Direct: Whose preferences?

- Patient
  - Experience disease and treatment
  - Recruitment challenges
  - Higher valuations of health states

- General public/"community preference"
  - Society's resources

# Indirect Methods

- Study subjects complete surveys

- Multiple domains of health

- Composite describes the health status

- Composite state is linked to community results (or "weights")

# How are you today? (EQ-5D)

- Which statements best describe you today?
    - Mobility:
        - No (1), slight (2), moderate (3), severe (4), or extreme problems (5)
    - Self-care
    - Usual Activities
    - Pain/Discomfort
    - Anxiety/Depression
- Health profile ranging from 11111 to 55555

# Indirect Measures

- EuroQol (EQ-5D)

- Health Utility Index (HUI)

- 15D

- Quality of Well-Being Scale (QWB)

- SF-6D

# Indirect Measures

- Vary with respect to:
  - Dimensions or attributes included;

  - Population used to establish the weights;

  - Health states defined by the survey; and

  - Method of valuation

# Indirect measures

✓ Standard surveys that are widely used

✓ Describe generic health states

— May lack sensitivity in specific contexts
(Payakachat, Ali & Tilford, 2015)

# EuroQol EQ-5D

- ## 5 questions in 5 domains of health
  - Mobility, self-care, usual activity, pain/discomfort, or anxiety/depression
  - EQ-5D-5L has 5 levels ("no," "slight," "moderate," "severe," and "extreme"/"unable to")
  - 3,125 health states ($5^5$)

- ## Basis of domain weights:
  - Past studies based on British community sample
  - US weights now available (Pickard et al., 2019)

# Health Utility Index (HUI)

- 41 questions

- 8 domains of health and 972,000 health states
  - vision, hearing, speech, ambulation, dexterity, emotion, cognition, and pain

- Basis of domain weights:
  - Canadian community sample rated hypothetical health states
  - Utility theory

# SF-6D*

- Converts SF-36 or SF-12 scores to utilities

- 6 health domains
  - physical functioning, role limitations, social functioning, pain, mental health, and vitality
  - Defines 18,000 health states

- Basis of domain weights
  - British community sample originally
  - US community sample (Craig et al., 2013)

# 15D

- **15 health domains:**
  - Mobility, vision, hearing, breathing, sleeping, eating, speech, excretion, usual activities, mental function, discomfort and symptoms, depression, distress, vitality, sexual activity
  - 5 levels each

- **Basis of domain weights:**
  - Finnish community sample (Sintonen, 1995)

- **For more details:**
  - http://www.15d-instrument.net/15d/

# Indirect: Disease-specific surveys

- Key methods issues:
  - Difficult to describe  health state to community respondent
  - Difficult to establish values when there are a large number of possible health states

- Expensive, but sensitive to variations in quality of life for specific diseases

- Often used in addition to generic measure

- Can sometimes be mapped to generic measures

# Off-the-shelf values

- Use preference weight determined in another study for health state of interest

  - Not all health states have been characterized

- Useful in decision modeling

# Which method to use?

- ■ Trade-off between sensitivity and burden

- ■ Start with a literature search re:
  - The condition of interest
  - In the population of interest
  - For the outcomes of interest

# Ease of Use

- Off-the-shelf utility values
- Indirect Measures (HUI, EQ-5D, QWB, SF-6D, 15D)
- Disease-specific survey during trial and transform later to *preferences*
- Direct measures (SG, TTO)

# Issues surrounding QALYs

- Lack of sensitivity

- Inadequate weight attached to emotional/mental health problems

- Lack of consideration for non-health outcomes

- A QALY is a QALY is a QALY?

# Issues surrounding QALYs

- CMS has stated that QALYs will not be used in drug price negotiations due to discrimination concerns

- Other alternatives:
  - Equal Value Life-Year (evLY)
  - Health Years in Total (HYT)
  - Generalized Risk-Adjusted Cost-Effectiveness (GRACE)
  - Comparative effectiveness
  - Comparative effectiveness + patient-centric value elements
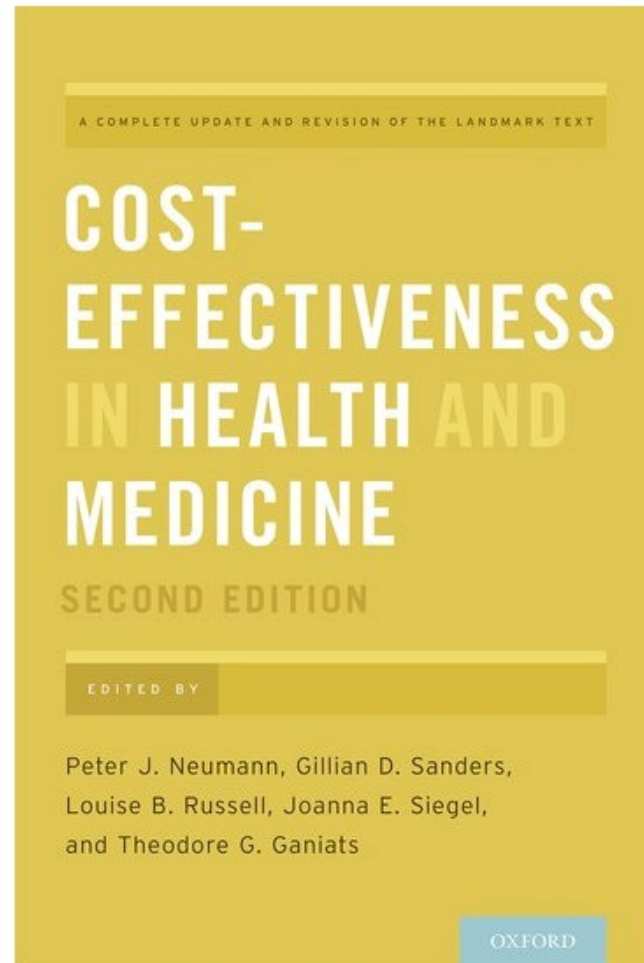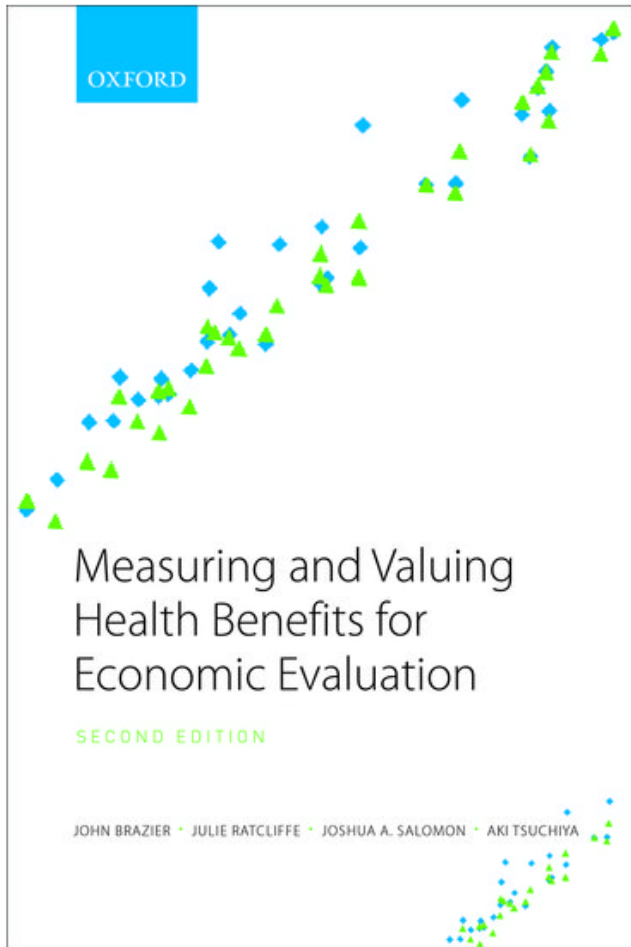
# Published Example

Jodar-Sanchez et al. (2015). Cost-Utility Analysis of a Medication Review with Follow-Up Service for Older Adults with Polypharmacy in Community Pharmacies in Spain: The conSIGUE Program. *Pharmacoeconomics* 33(6), 599-610

- – Collect EQ-5D data at baseline and follow up

- – Generate EQ-5D index scores

- – Calculate QALY gains for intervention and control groups

# Useful Resources

- Tufts Center for Evaluation of Value and Risk in Health

  https://cevr.tuftsmedicalcenter.org/

- Tufts Cost Effectiveness Analysis Registry

  https://cevr.tuftsmedicalcenter.org/databases/cea-registry

- ISPOR

  https://www.ispor.org/heor-resources/good-practices-for-outcomes-research

- National Institute for Health and Care Excellence, UK

  https://www.nice.org.uk/

# Useful Resources

# Useful Resources

- Institute for Clinical and Economic Review (ICER) https://icer.org/our-approach/methods-process/cost-effectiveness-the-qaly-and-the-evlyg/

- Preference Measurement in Economic Analysis. Guidebook. VA Health Economics Resource Center.
  https://www.herc.research.va.gov/files/BOOK_419.pdf

# Condition-Specific Measure Resources

- Person-Centered Assessment Resource Center
  http://www.healthmeasures.net/resource-center/measurement-science/intro-to-person-centered-assessment

- Brazier J, Deverill M, Green C. (1999). A Review of the use of health status measures in economic evaluation. *J Health Serv Res Policy*, 3(9):174-184.
  https://www.ncbi.nlm.nih.gov/pubmed/10538884

- Brazier J et al. (2012). Developing and testing methods for deriving preference-based measures of health from condition-specific measures (and other patient-based measures of outcome). *Health Technol Assess*, 16(32):1-11.
  https://www.ncbi.nlm.nih.gov/pubmed/22832015

- Brazier Jet al. (2014). A systematic review, psychometric analysis and qualitative assessment of generic preference-based measures of health in mental health populations and the estimation of mapping functions from widely used specific measures. Southampton (UK): NIHR Journals Library; (Health Technology Assessment, No. 18.34.) Chapter 4, Mapping mental health condition-specific measures to generic preference-based measures. https://www.ncbi.nlm.nih.gov/books/NBK262023/

# References

Craig, B.M., Pickard, S.A., & Stokl, E. (2013). US Valuation of the SF-6D. *Medical Decision Making*, 33(6): 793=8-3.

Jodar-Sanchez et al. (2015). Cost-Utility Analysis of a Medication Review with Follow-Up Service for Older Adults with Polypharmacy in Community Pharmacies in Spain: The conSIGUE Program. *Pharmacoeconomics* 33(6), 599-610

Payakachat, N., Ali, M.M., & Tilford, J.M. (2015). Can EQ-5D Detect Meaningful Change? A systematic review. *PharmacoEconomics*, 33(11):1137-54.

Pickard et al. (2019). United States Valuation of EQ-5D-5L Health States Using an International Protocol. *Value in Health*, 22(8): 931-941

Phillips, C. (2009). *What is a QALY?* What is...? Series. Hayward Medical Communications. Available at www.whatisseries.co.uk.

Sinnott, P.L., Joyce, V.R., & Barnett, P.G. (2007). Preference Measurement in Economic Analysis. Guidebook. Menlo Park CA. VA Palo Alto, Health Economics Resource Center.

# Upcoming HERC Seminars

Estimating the Cost of an Intervention
- Diem Tran
- 01/31/2024

Estimating the Cost of Treatment using VA and DoD Data*
- Libby Dismuke-Greer
- 02/07/2024

Introduction to Markov Models for CEA – Parts 1 & 2*
- Mark Bounthavong
- 02/14/2024 and 02/28/2024

# Questions or Comments?

For more information visit the HERC website at www.herc.research.va.gov

Email HERC at HERC@va.gov

Email me at josephine.jacobs@va.gov