
Valuing Health

Emmett Keeler

July 16, 2005

Outline

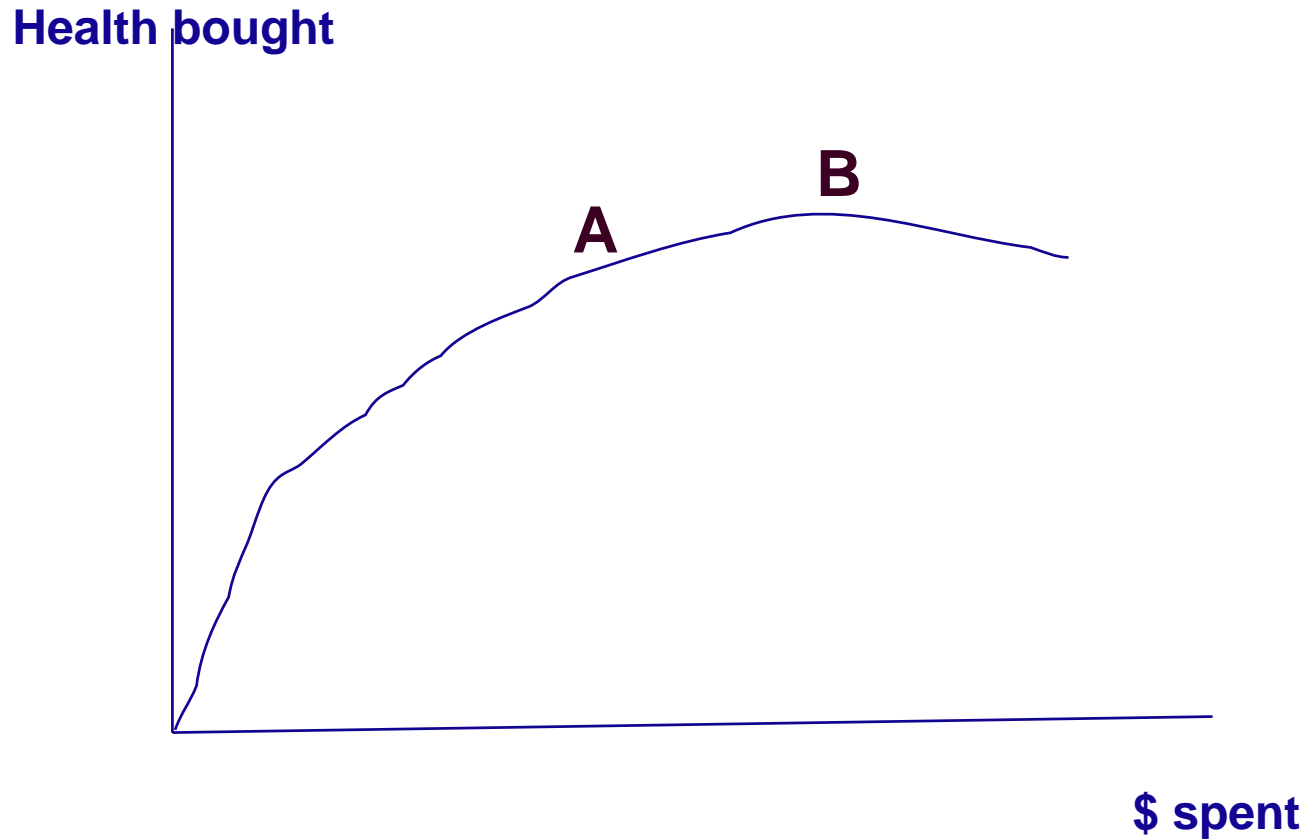
- Introduction: Health and Money
- Value of Saving a Life
- QALYs

Why do we need CEA/RIA*?

- Even US can't afford all beneficial health policies
 - ↙ Diminishing returns
 - ↙ New technology keeps on coming
 - ↙ people gaining health often don't pay for it
- People have other needs and wants
- How can we say no to beneficial care/regulations?
 - ↙ Require them to give good value for money.
 - ↙ Make policies before people get sick

*Regulatory Impact analysis.

Diminishing returns to health spending



RAND

Multiple Outcomes Make Health Policy Decisions Hard

- Maximize lives saved?
- Policies affect more than mortality
 - ↳ **Costs**
 - ↳ Morbidity
 - ↳ Non-health outcomes
- Have to decide among people
 - ↳ Disease
 - ↳ Age (nursing home quality vs immunization)
 - ↳ Location -- time and space

Steps in Air Pollution Regulatory Impact Analysis

Modeling Steps

- What will polluters do if regulation is passed?
 - ↳ what will it cost?
- What will happen to air in different locations?
- How will changes in air quality affect health?
 - ↳ in various dimensions

Evaluation steps **<-- This talk**

- How do we compute and maximize the value of health changes?

Summary Table of Costs and Effects

Changes in Effects

Options	Direct Cost, millions	Indirect Cost	Years of Life Exp.	Restricted Activity Days	chronic disease incidence
A	4		100	1000	
B	1		50		
C	10		200		

Methods for Evaluating Costs and Effects of Policies

- Cost-Consequence Analysis
 - ↳ Allows multiple measures of effect
- Cost-Effectiveness Analysis
 - ↳ Focuses on a single effect
 - ↳ e.g. aggregate health measure like QALYs
- Cost-Benefit Analysis
 - ↳ Aggregates all effects into dollars
- Risk-Risk Analysis
 - ↳ aggregates all effects into health
 - e.g. airport security lines

Outline

- Introduction
- Value of saving a Life
- QALYs

For a recent US Government attempt, see <http://www.usdoj.gov/victimcompensation>, Article in New Yorker on Kenneth Feinberg

Cost of Workers' time

- Does value of time = their wage rate?
 - ↙ Working conditions assumption
 - ↙ Leisure time assumption
- Assumption: employers veil for worker's wants
 - ↙ So generally include fringes in cost of time
 - ↙ Not overhead

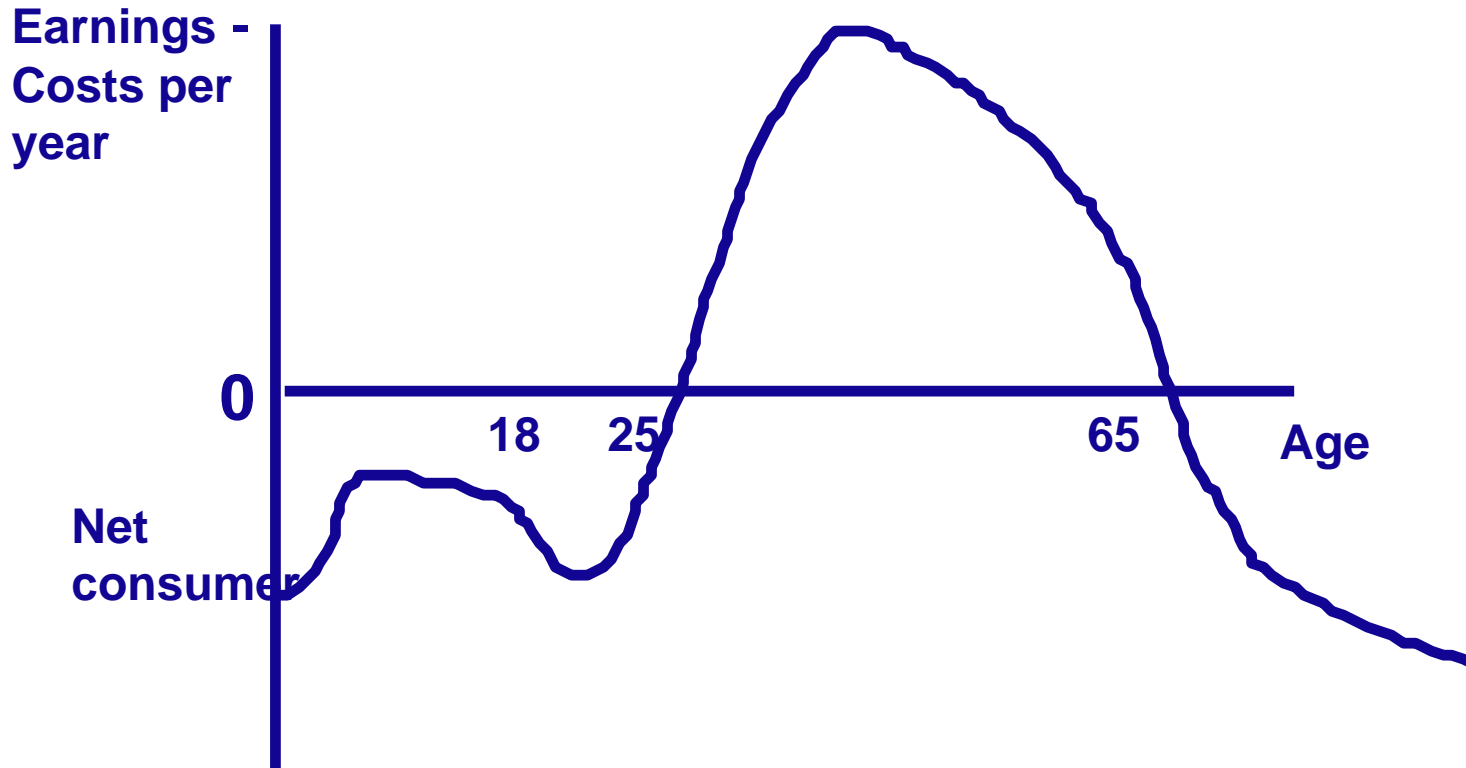
My daughter took off time from work to care for her baby. In that period, should her time be valued at:

(a) what she made before she quit? (b) what she would have to pay for a nanny? (c) some other value?

Methods for valuing lives/safety

- Impact on economy (Lost wages)
- Revealed preference for safety
 - ↙ In past government decisions
 - ↙ Hedonic price methods on market decisions
- Surveys of hypothetical willingness-to-pay
- “Benefit transfer” from previous studies
 - ↙ Boardman Chapter 15 has nice list.

Lifetime Human Capital Calculations



To get remaining lifetime value, take integral weighted by probability of staying alive, and a discount factor.

Problems with Lost Wages as a measure of value of life

- Rhetorical:
 - ↙ Retired people's lives are worth something
 - ↙ Women are worth > 80% as much as men
- Economic:
 - ↙ People are paid what they are worth.
 - ↙ Taxes and benefits cancel out.
 - ↙ Value = what people are willing to give up for it.
 - Only you, your family and friends care much.

Inference from Past Decisions

- Values from government programs conflict
 - ↙ other considerations
 - ↙ risks or their perception may have changed
- Legal
 - ↙ usually based on another theory
 - ↙ doesn't include values of deceased
- Private: hazardous job premiums
 - ↙ Everything equal, how much extra wages are paid?
 - difficulty is adjusting for confounders
 - ↙ Viscusi and Aldy 2003 summarize this field

Value of a statistical life (VSL)

- \$/life is reported, but it comes from scaling up \$/fraction of life.
 - ↳ appropriate because most life-saving programs change risks slightly
- surveys, wage premia
- range = \$3-10 million /life (1996)
 - ↳ Much larger than human capital values.

Hirth RA et al. WTP for a QALY: In search of a standard, *Med Dec Making* (20) 332-342,2000 has a big table of \$/YLS and \$/life

Ashenfelter speed limit study

- In 1974, National 55 mph speed limit passed to reduce dependence on Mideast oil. In 1987, states allowed to change back and about 2/3 did, primarily to 65 mph.
- Higher speed limits increase fatalities but reduce driving time.
- If State legislatures are smart and reflect median voter time/fatality tradeoff, calculate that tradeoff at 65 mph to get adjusted marginal value of ~\$1.5 million/fatality.
 - ✦ might multiply by 1.7 for multiple occupants of cars
 - ✦ or include serious injuries, which would reduce VSL.

Willingness-to-pay for safety

- Survey CV such that $U(\text{New} - \$CV) = U(\text{status quo})$
 - ↙ In principle, can value anything with a survey
 - ↙ What wages would you give up for a safer job?
 - ↙ What are you willing to pay to reduce your risk of dying in an operation from .002 to .001?
- People may object to such surveys, but they risk their life to save time or money every day.
 - ↙ They don't act as if "life is priceless".

Problems with Willingness-to-Pay and CBA in health decisions

Good basis in economic theory, but

- People find it hard to guess
 - ↳ + exhibit well known systematic biases
- Willingness-to-Pay (WTP) higher for rich
- Usually ignores paternalistic altruism
 - ↳ only adds up values of directly impacted
 - ↳ as taxpayers, we may value a poor child's health as much as rich child's
 - ↳ “extra-welfarist”: allocate budget to max. health

Reconciling wages and willingness to pay.

- Young adults will work 10-20% of their future living hours
- So if they value leisure hours like work hours
- Value of life = 5-10 times lifetime wages

Keeler, The value of remaining lifetime is close to estimated values of life, *J Health Econ*, (20) 141-3 (2001)

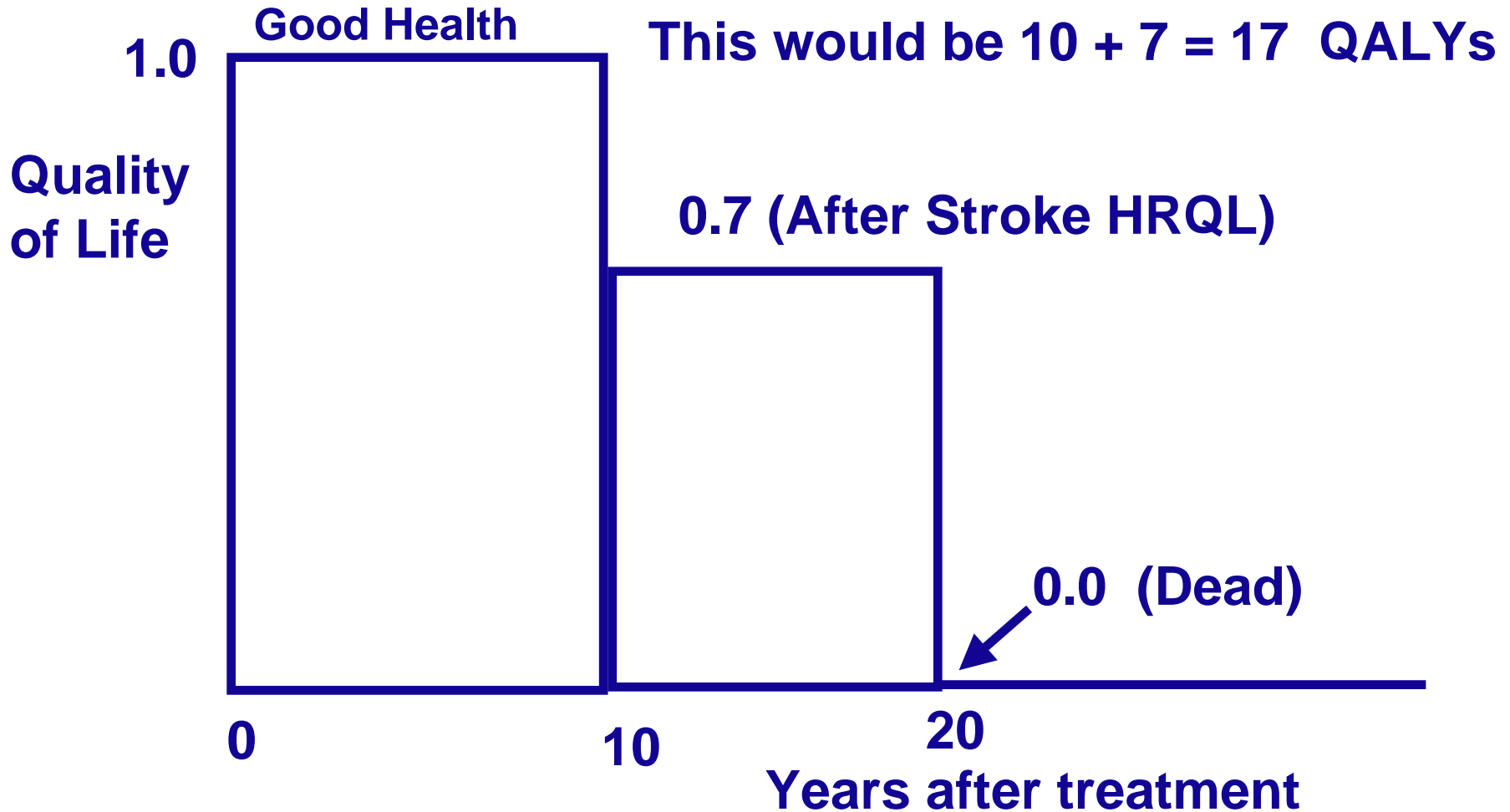
Outline

- Introduction
- Value of saving a Life
- QALYs

Are all saved lives the same?

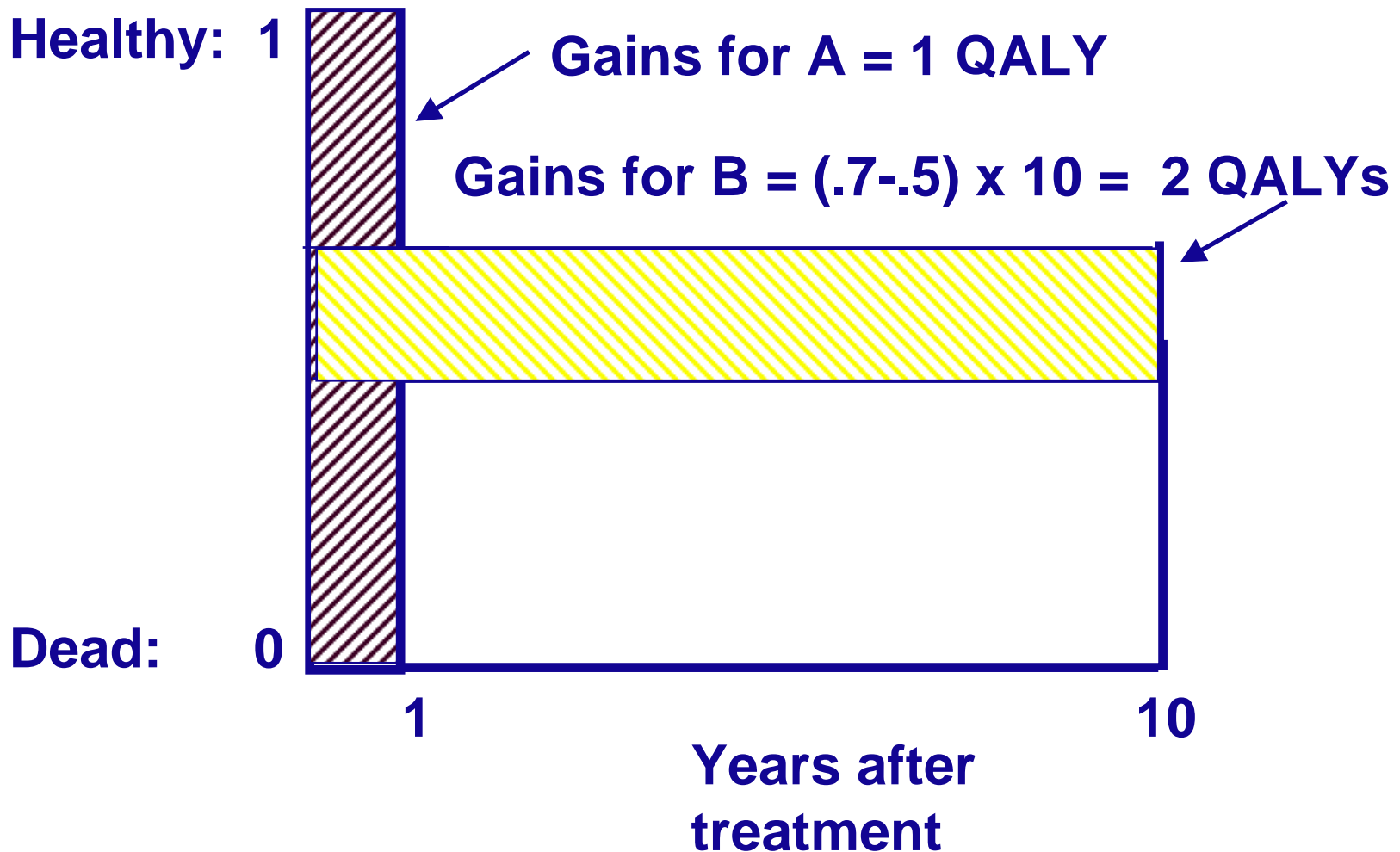
- Is it as valuable to save life of a sick 75 year old as that of a young adult?
 - ↙ Remaining years of life
 - ↙ Quality of those years
- Health care analysts say no, and
 - ↙ Use QALYs instead of lives.
 - ↙ QALYs are usually discounted

What are QALYs?



Using QALYs to rate policies

Add up QALYs gained and lost over all affected people

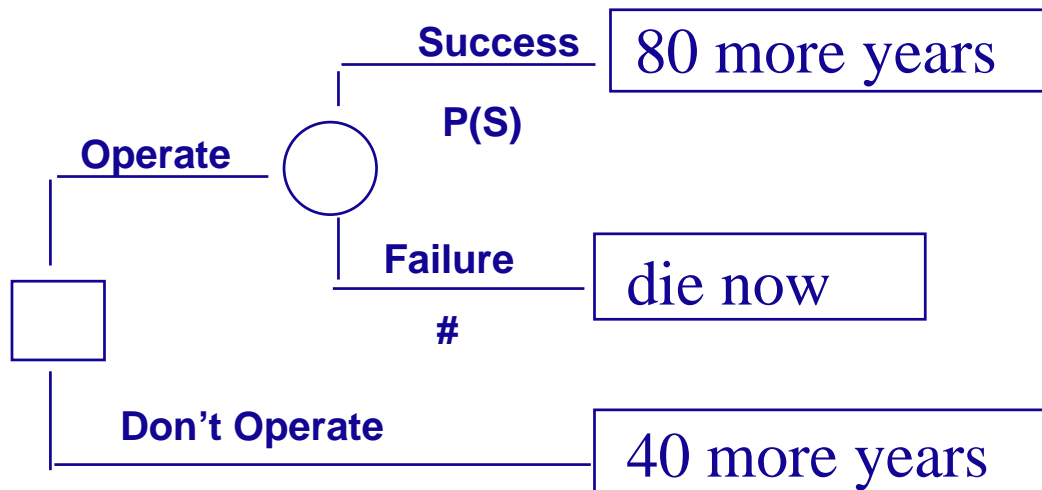


Two questions about QALYs

- Is the concept useful and valid?
- How do we get the HRQL adjustments?
 - ↙ Standard gambles
 - ↙ Time Tradeoffs
 - ↙ psychological ratings
 - ↙ willingness to pay to relieve symptoms
- We can look them up in HRQL catalogs
 - ↙ as given in references

QALYs assume years of life average.

- But for some people, they don't:
 - ✗ Dislike of age and frailty
 - ✗ Current responsibilities
 - ✗ Time preference



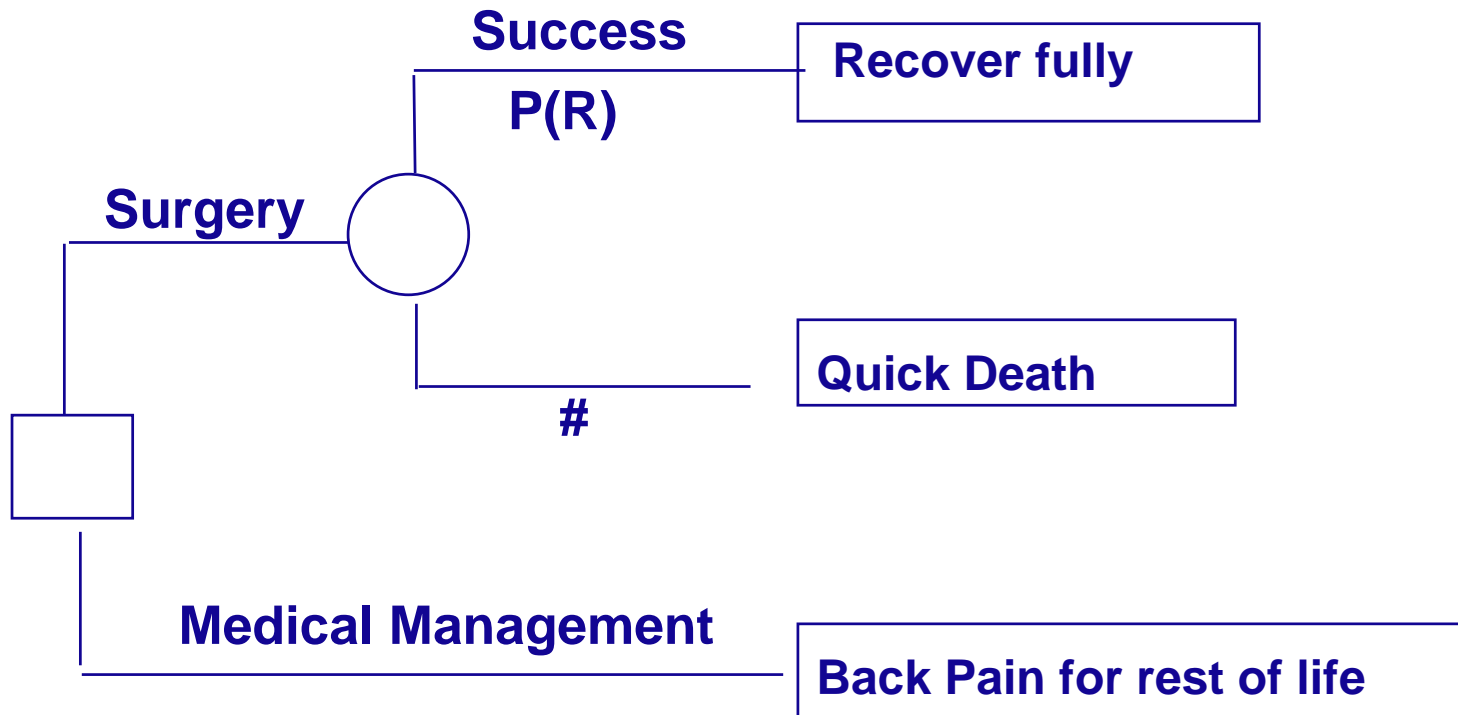
Societal judgments don't follow QALYs

- Who should have priority?
 - ↳ Those who start sicker?
 - ↳ Those who can be helped more by treatment?
- Health officials and citizens favor sicker
 - ↳ Oregon residents did not think filling cavities could best cancer treatment
 - ↳ Up to a point (comatose, or .001 chance)
- Poor countries may need to be more efficient

Nord, *Cost-Value Analysis in Health Care*, 1999

Standard Gamble to get HRQL #s

Breakeven P is the HRQL adjustment for Back Pain



von Neumann-Morganstern Utility

Time Tradeoffs to get HRQL #s

How many years T with good health are equivalent to 20 years with back pain?

Then $T/20 = \text{HRQL adjustment for back pain.}$

Easier rating methods

- Generic Health measures
 - ↳ SF-36
 - ↳ Illness scales
- Psychological scaling
 - ↳ Mark 0-100 line for various scenarios*
 - ↳ called Visual Analog Scaling (VAS)
 - ↳ Easy to do, but what does it mean?

Death

Good health

RAND

Conclusions

- People don't like to put a value on health
- Don't like to say saving one life is worth more than saving another
- But society can't do it all, so decisions are made that trade off health and money implicitly.
 - ↳ good analysis, even if rough, should improve the process.

Some backup slides and references

RAND

Why Not to Discount Health Benefits

Everyone agrees we need to discount future collar costs and benefits to compare policies with impacts over time.

What about Health benefits? Discounting:

- ↙ Doesn't treat future generations fairly
- ↙ Makes Life Expectancy hard to grasp
- ↙ Makes prevention look bad

Reasons for Discounting Health

- People value present years of others more than future years of others (see Nord book)
 - ↳ Discount their own 80th year vs 40th even more
- If we discount costs but not benefits, weird things happen
 - ↳ Delay improves the CE ratio
- Prevention is often overpriced and oversold
- Future generations will be richer and can choose for themselves.

Example of improvement by delay

Suppose years of life are not discounted and the ability to produce health does not fall over time:

- Spend \$1 million to save 100 years of life now
- OR, put money in bank to get \$1.05 million next year
 - ↳ save 105 years of life next year
 - ↳ 110 the year after that etc.
- It is never efficient to start a program!

Keeler & Cretin, Discounting of life-saving and other non-monetary effects *Management Science* 29 300-306, 1983

Impact of methods on old/young weights

	Lives	Life years	QALYs	QALYs disc at 5%
Sick 70 year old	1	10	6.4	5
Healthy 35 year old	1	50	40	15
Ratio old/young	1	0.2	0.16	0.33

Contingent Valuation

- A method to get better WTP answers
- Forced choice: are you WTP \$X for better school?
 - ↙ vary X randomly from 5-100 in large survey.
 - ↙ fit logistic regression line, find 50% value
- Say they must pay in taxes
- Mention substitutes, the full list
- Use telephone or face to face to reduce bad answers by help from interviewer

References: see Boardman Chapter 14.

Assumptions underlying QALYs

Pliskin et al., 1980

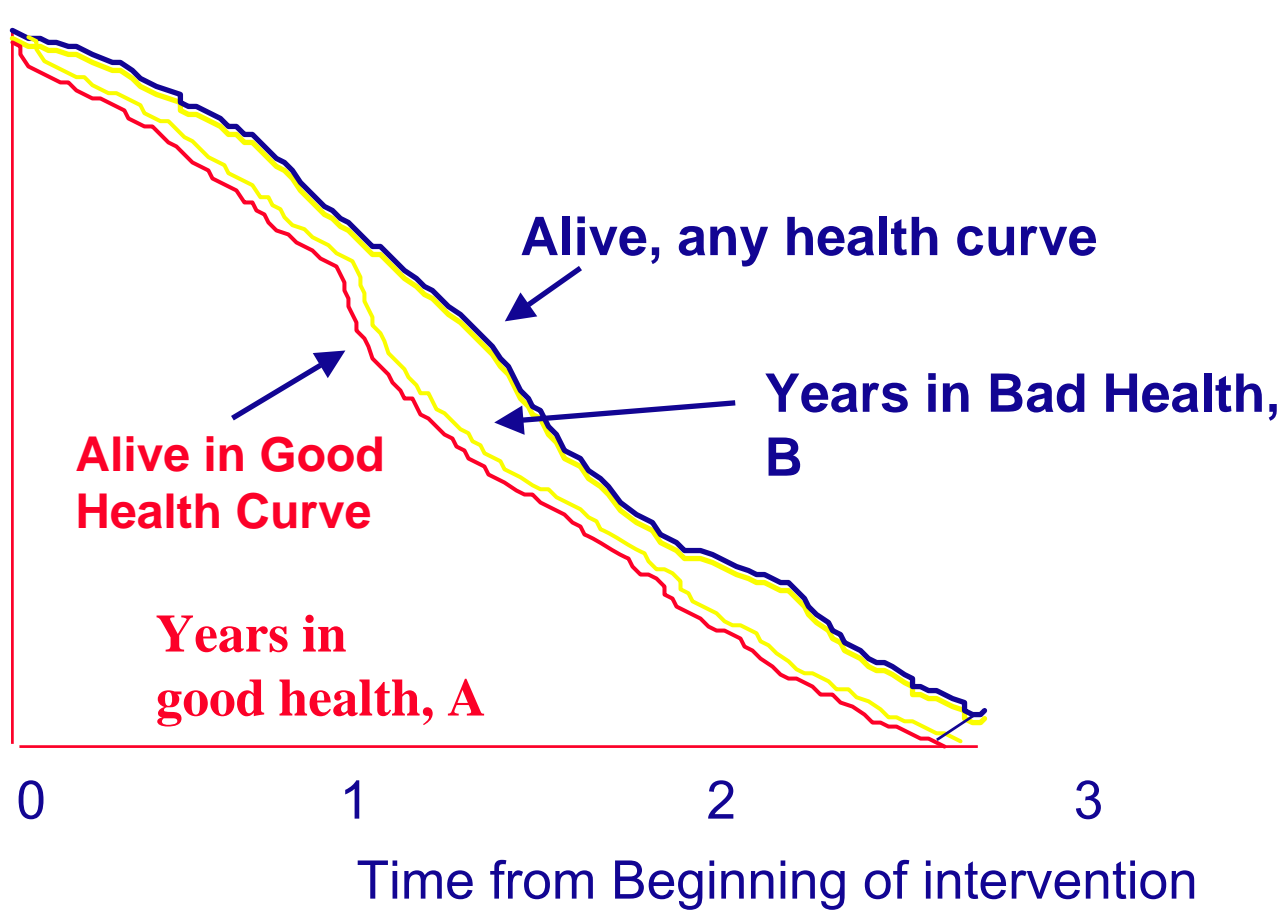
- For $U(Q, T) = V(Q) * T$ must assume
 - ↙ Mutually utility independent in Q, T
 - SGamble: ranking Q', T by Death vs Q^*, T is independent of T
 - Risk aversion on years $.5(Q, 20) + .5(Q, 0) \sim (Q, 8)$ ind of Q
 - ↙ Constant proportional tradeoffs: (you only have to do time tradeoffs once)
 - ↙ Risk neutrality for T
- $V(Q)$ can be assessed in a variety of ways.
- T can represent discounted years, theory still works
- With many people, multiply U by person- weights; typically assume equal weights, average values for $V(Q)$

Survival Curve QALYs

$$\text{QALYs} = A + kB, \quad k < 1$$

Prob of Survival

1.0



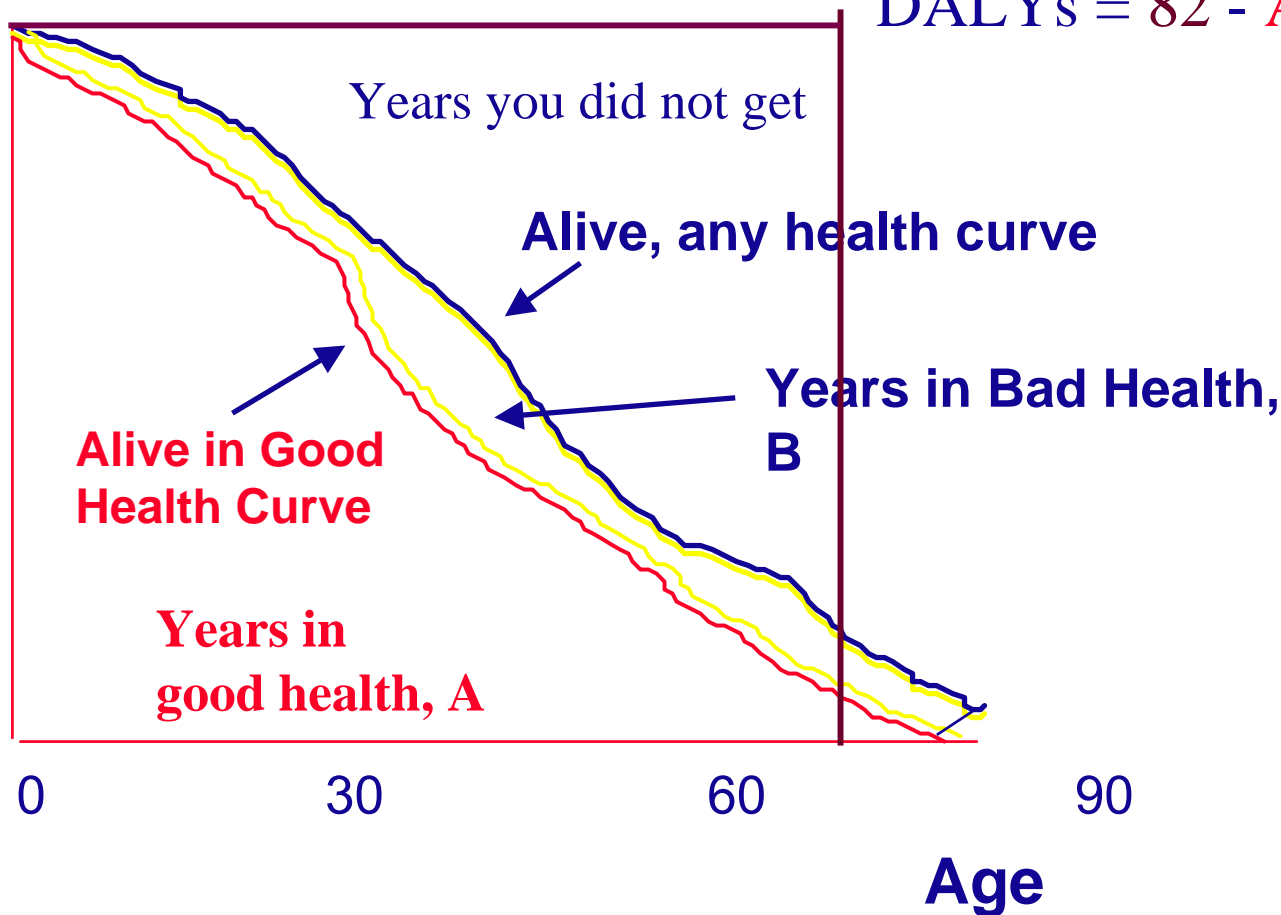
DALYs and the “burden of disease”

DALYs assume you should have good health until you are 82.

Prob of Survival

1.0

$$\text{DALYs} = 82 - A - (1-k)B$$



EuroQOL, HUI, QWB method

- Pick n dimensions of health, and 3-5 levels on those dimensions.
 - ↳ HUI: vision, hearing, speech, ambulation, dexterity, emotion, cognition, pain
- Get citizen to rate some vectors $X = (x_1, x_2, \dots, x_n)$ in health n -space on 0,1 scale.
- Statistically fit $f(X) = \sum w_i g(x_i)$
 - ↳ May add adjustments for symptoms
- Locate Diseases into health vectors D
 - ↳ then HRQL = $f(D)$

A QWB Rating Scenario

Example: Housebound,
moved own wheelchair
without help, performs
ADL, but not housework

**Scenarios rated on 0 to 100
scale**

Who should be rating?

- Patients in state H understand it but,
 - ↳ adapt to H, and rate it higher than Public
 - ↳ which undervalues cure or prevention of H
- General Public may not understand H
 - ↳ So patients locate themselves into health cells
 - ↳ General public rates those unnamed cells
- Dementia and depression a challenge.

See Gold, pp 98 + for justification of this method.