COST-EFFECTIVENESS WITH BINDING BUDGET CONSTRAINTS: BAD MEDICINE, BAD ECONOMICS, NEITHER OR BOTH? (“Advanced” ISPOR Workshop)

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17:00 – 18:00

Purpose and Plan for Workshop

- Discuss ways to establish proper Willingness-to-pay (WTP) cost-effectiveness cutoffs (K) and to assess choices when technologies funded using that cutoff exceed available health system budgets.
- 1a) Explore ways to determine WTP threshold from utility maximization models (WTP)
- 1b) Explore “supply side” models using budget constraints to determine operative WTP
- 2a) Reconciling (sort of) the two approaches
- 2b) What to do when “cost-effective” technologies are unaffordable
- 2c) Some observations on societal choice of WTP thresholds

Preliminary Poll (Part 1)

- BACKGROUND:
  - WHO previously recommended 1X to 3X per capita GDP
  - ICER says WTP = $50,000 to $150,000 per QALY
  - US EPA says VSL = $9.1 million ➔ $300,000 to $400,000/LY
  - Per capita GDP in US (2019) ≈ $60,000

- QUESTION 1: What $/QALY should ICER use in the U.S.?

Preliminary Poll (Part 2)

- BACKGROUND:
  - Again, WHO previously recommended 1X to 3X per capita GDP
  - British National Health Service uses £20,000 - £30,000 per QALY
  - Analysis estimated operative value of £13,000 - £15,000
  - UK Treasury (Green Book) recommends £60,000 per QALY
  - UK per capita GDP in 2019 ≈ £30,000 (about $40,000)

- QUESTION 2: What £/QALY should British NHS use?

Part 1a: Methods to Assess WTP

- League Tables
  - Compare ICER of new to “reasonable” existing technologies (“revealed preference”)
- Value of a Statistical Life (VSL)
  - Wage differentials for risky occupations
- WTP surveys
  - Direct questions or Discrete Choice Experiments (DCEs)
- Calibrate utility functions using risk aversion estimates
  - Phelps (2019, *Value in Health*)
- Incremental Cost of Adding Life Years
  - Hall and Jones (2007, *Quarterly Journal of Economics*)

League Tables (2012 US $)

• Pneumococcal Vaccine 13 valent	
• Ages 50-65 “all” vs. “high risk”	$55,657
• Add 23 valent for all at age 75	$612,107
• Total knee replacement	
• Low perioperative risk	$11,971
• Medium risk	$23,077
• High risk	$34,678
• Aspirin to prevent heart disease	
• Men, age 45 (2.5% risk 10 year)	$13,686
• Men, age 45 (5% or higher risk)	Dominant strategy
• Screen once for HIV	
• Prevalence = 1%	$41,209
• Prevalence = 0.1%	$81,214
• Cardiac resynch vs. medical therapy	$150,543
• Smoking cessation (15 different programs)	$3,603
• Diet-exercise to prevent diabetes	
• Adults at high risk	$227,495
• Adults with diabetes	$56,317

Source: *Cost Effectiveness in Health and Medicine, 2nd Edition,* Neumann P et al, 2017, Oxford Univ. Press, Table 1.2

Problems with League Tables

- Is the list comprehensive?
- Were the interventions approved for use with cost-effectiveness criterion "in mind"?
- What is a "reasonable" intervention?
  - (from which you infer a "reasonable" threshold)
- Has the use of these interventions been adjusted optimally?
  - Intensive margin (frequency of use)
  - Extensive margin (prior probability of disease)

Wage Premiums for Risky Occupations (aka "Value of a Statistical Life" or VSL)

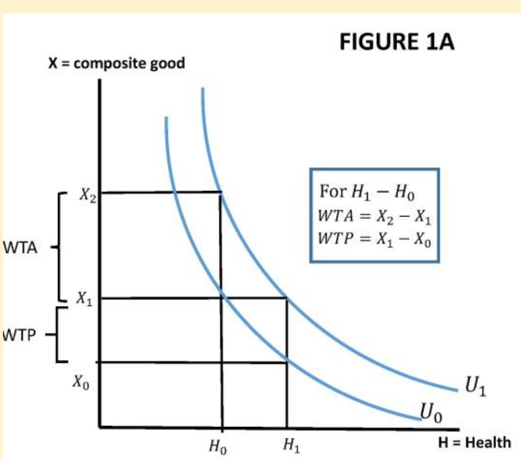
- Compares wages for various occupations with occupational risk of death during single year
- Example:
  - Risky occupation adds 0.1% chance of death per year
  - Annual earnings increase by $10,000 per year (comparable job skills)
  - 1000 people accept this risk
  - On average, 1 of them will die during year from extra risk
  - These 1000 people have been paid an extra $10 million
  - *Ergo*, VSL = $10 million
  - This implies (assuming a 25 year remaining life expectancy and no discounting) the value of a life-year (LY) is $400,000 (*not* quality adjusted)
  - VSL ➔ $/LY involves choice of horizon (age bracket) and discount rate
- Current estimates (e.g., Viscusi) VSL ≈ $9 million

Problems with VSL

- People perceive probabilities imperfectly and use them irrationally
  - (extensive literature from "behavioral economists")
- Method attributes risks of injury (etc.) to risk of death.
  - Standard "omitted variable bias" in regressions
  - Necessarily overstates estimated VSL
- Very large range of empirical estimates*
  - $40,000 to $675,000 (2019 US $)
  - "The value of life literature can provide only a rough empirical basis for a decision rule for CEA/CUA."
- **Conceptual issue**: VSL approach measures Willingness to Accept (WTA) health risks, not Willingness to Pay (WTP) to improve health.

* SOURCE: Hirth RA, Chernew ME, Miller E, Fendrick AM, Weissert WG, "Willingness to Pay for a Quality-Adjusted Life Year: In Search of a Standard," *Medical Decision Making* 2000; 20:332-342.

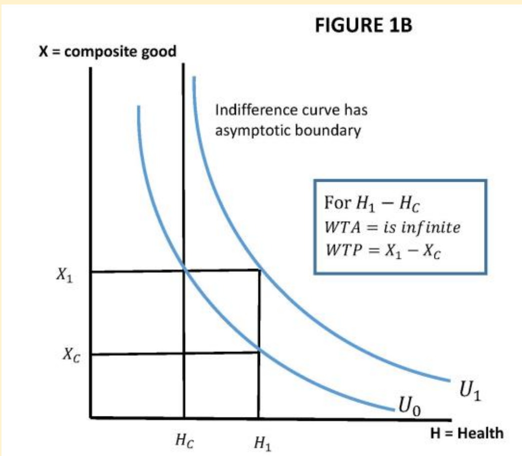
WTA vs. WTP -- Marginal rate of substitution



WTP *measures foregone* X *to increase from* H_0 *to* H_1 *(on* U_0*)*

WTA *measures required additional* X *to move from* H_1 *to* H_0 *(on* U_1*)*

WTA vs. WTP – Asymptotically bounded utility



$WTA\ loss\ from\ H_1\ to\ H_0$
is infinitely large on U_1

WTA vs. WTP – What the data show

- In environmental projects, WTA ≈ 5X – 7X WTP *
- In health-related projects, WTA ≈ 5X WTP **
- Discrepancy grows as object becomes less like marketed good.
- We need further evidence on this in personal health care settings.

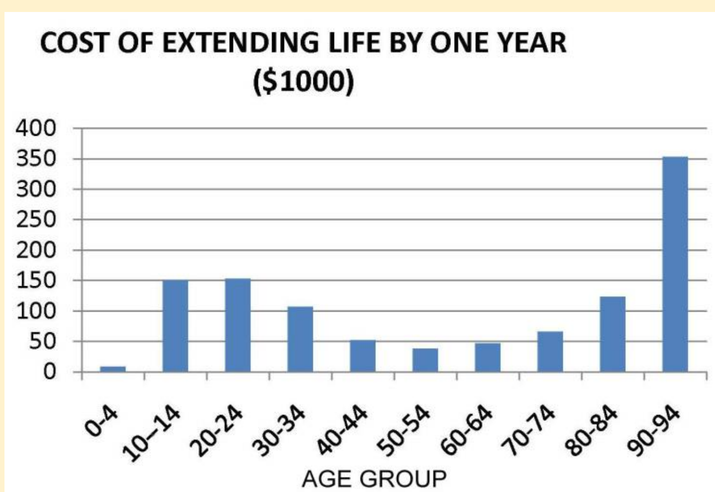
* Horowitz JK, McConnell KE, "A review of WTA/WTP studies," *Journal of Environmental Economics and Management* 2002, 44:426-447. 26
** Tunçel T, Hammitt JK: "A new meta-analysis on the WTP/WTA disparity." *Journal of Environmental Economics and Management* 2014, 68:175-187.

Stated Preferences from Consumers

- Summary of 383 European studies
  - Mean = €97,683
  - Range = €741 to €892,605 (1200X factor)
- Omit one large outlier
  - Mean = €26,189
  - Range = €741 to about €300,000 (400X factor)

Source: Ryen I, Svensson M, "The Willingness to Pay for a Quality Adjusted Life Year: A Review of the Empirical Literature," *Health Economics* 2015; 24:1289-1301.

Hall and Jones "Production Cost" Estimates



Hall RE, Jones CI, "The Value of Life and the Rise in Health Spending," *Quarterly Journal of Economics* 2007; 122(1):39-72.

Problems with Cost of LY Extension

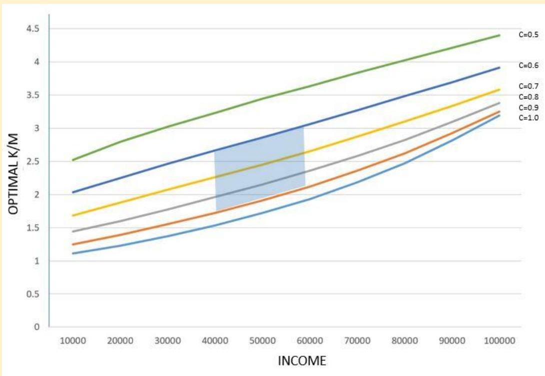
- Not true WTP
  - US system has few relevant constraints on new technologies
  - No presumption that in actual equilibrium, WTP = MC of production of health
- Data reveal important patterns
  - Immense opportunities in early life
  - Teens have few risks except self-inflicted injury
  - Rising marginal cost as aging progresses
  - Huge cost/QALY at end of life
- Except for teens and end of life, Cost/LY < $100,000

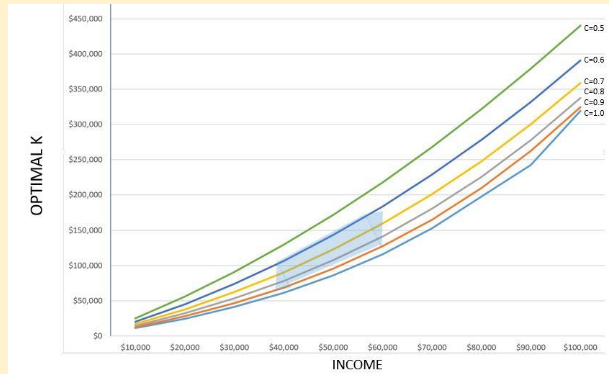
Economic Model Using Relative Risk Aversion

- U(M) = $1 - \exp(-\gamma M^C) \;=\; [\frac{\exp(\gamma M^C - 1)}{\exp(\gamma M^C)}$
  - Weibull utility function
  - Bounded between 0 (at M = 0) and 1 (as M ➔ ∞)
  - $r^* = C\gamma M^C + (1 - C)$
- Can be calibrated with relative risk aversion (r*) and parameter C
  - For any M and r* value, for assumed C, calculate γ
  - Then $\frac{K}{M} = \frac{\exp(\gamma M^C) - 1}{C\gamma M^C}$
- Weibull utility Function encompasses wide variety of risk attitudes
  - C = 1 ➔ Constant Absolute Risk Aversion (CARA)
  - C = 0.5 ➔ approximately Constant Relative Risk Aversion (CRRA)
  - Matches Arrow's criteria (DARA, IRRA)
  - r* = 1 at median income (e.g., $50,000) used as central value

Source: Phelps CE, "A New Method to Determine the Optimal Willingness to Pay in Cost-Effectiveness Analysis," *Value in Health July 2019; 22(7):785-791.*

Estimates Using Relative Risk Aversion (r*)





Source: Phelps CE, "A New Method to Determine the Optimal Willingness to Pay in Cost-Effectiveness Analysis, *Value in Health* July, 2019, 22(7):785-791

Conclusions from Phelps (2019)

- At median incomes for US and advanced EU countries
  - Optimal threshold relative to income (K/M) is about 2
  - K rises rapidly with income
  - K/M rises modestly with income
  - K/M level modestly lower than WHO, ICER standards at median income
  - K/M level considerably lower than "VSL" results
- Results not overly sensitive to chosen r* within reasonable range
- Results somewhat sensitive to choice of parameter C
- Somewhat risky to extrapolate extensively beyond median income

For more details, see tinyurl.com/phelps-cea-and-mcda

1b) “Supply Side” Models: Positive or Normative?

- Seek to estimate what is happening under budget constrained publicly funded health care systems
- Usually positive but (sometimes) normative
  - Positive – if we estimate the incremental cost-effectiveness of the health care system then we know what is happening at the margin and therefore what threshold a new technology needs to meet in order to improve health rather than displace an existing (or alternative new) technology that is (could) deliver more health gain
  - Normative – budgets are the revealed preference of voters through a political process. The supply side threshold therefore reflects the “real” collective WTP for health gain

1b) Exploring “Supply Side” Models

- Assumptions we make in using a threshold
- Issues in estimating the threshold in a health system
- Estimates:
  - UK
  - Spain
  - Australia
  - Netherlands
  - Sweden
  - MLICs

A Simple Illustrative Example of Applying a Supply Side Cost-Effectiveness Threshold

Intervention	Cost (million £)	QALYs	Value for money (cost per QALY)	Ranking	Included in the healthcare package with a £50 million budget
A	32	7000	£4571	1	Yes (100%)
B	22	4000	£5500	3	Yes (partly funded, 36%)
C	20	3500	£5714	4	No
D	10	2000	£5000	2	Yes (100%)
E	12	1900	£6316	5	No
F	4	600	£6667	6	No
G	3	400	£7500	7	No

Maximum QALYs gained with £50 million budget: $7000 + 2000 + (0.36 \times 4000) = 10{,}454.5$ QALYs

QALYs quality-adjusted life-years

Table 3 Introducing intervention X to the currently optimal allocation

	Intervention	Cost (million £)	QALYs	Value for money (cost per QALY)	Ranking
Existing intervention	A	32	7000	£4571	1
Existing intervention	B	22	4000	£5500	4
Existing intervention	D	10	2000	£5000	2
New intervention	X	5.2	1000	£5200	3

QALYs quality-adjusted life-years

Source Thakola at al. PharmacoEconomics 2018

Assumptions we make in using thresholds to believe that they represent marginal productivity of health care system

- Perfect information about alternative technologies
- Perfect divisibility of each technology
- Linearity (health gains do not diminish within our groups)
- Independence of each treatment
- New investment is at the margin
- Ability to undertake disinvestment
- Frictionless adjustment – perfect fungibility
- We can ignore or assume away allocative efficiency issues
  - weighting, i.e. a QALY is a QALY is a QALY

Sources: Thakola et al, PharmacoEconomics 2018; Birch and Gafni, Social Science and Medicine, 2006; Pekarsky, The New Drug Reimbursement Game, ADIS Springer 2015.

Issues in estimating supply side thresholds

- We want to know how much *extra health gain* arises *at the margin of the system from additional $ / € of health care spending*
- Negative endogenous relationship between health and health care expenditure (more is spent on "sicker" populations)
- Attribution of health gain to health expenditure
    - How much health gain is due to health care spending?
    - Duration of effect – today's health gain comes from today's expenditure?
- Lack of longitudinal data
    - Strengths and weaknesses of cross-sectional data. We can estimate coefficients, but what do they mean? Is there an intuitively plausible interpretation?
- Lack of health related quality of life data
- Are we at the margin or are we calculating an average?

Estimates

- England (Claxton K et al. "Methods for the estimation of the National Institute for Health and Care Excellence cost-effectiveness threshold". *Health Technol Assess*. 2015;19(14):1–503 (v–vi). and Lomas et al. *Value in Health* 2019; 22(9): 995- 1002). Builds on work in Martin, Rice and Smith
- Spain (Vallejo-Torres L, et al. "On the estimation of the cost-effectiveness threshold: Why, What, How?" *Value in Health* 2016;19(5):558–66.)
- Australia (Edney, L.C., Afzali, H.H.A., Cheng, T.C., Karnon, J. "Estimating the reference incremental cost-effectiveness ratio for the Australian Health System". *Pharmacoeconomics* 36(2), 239–252 (2018)
- Netherlands (van Baal P et al. "A cost-effectiveness threshold based on the marginal returns of cardiovascular hospital spending" *Health Economics*. 2019;28:87–100.)
- Sweden (Siverskog J and Henriksson M. "Estimating the marginal cost of a life year in Sweden's public healthcare sector". *European J Health Econ* https://doi.org/10.1007/s10198-019-01039-0)
- MLIC (Ochelek et al. BMJ Global Health 2018; 3(6)

England: Claxton et al. and Lomas et al.

- Results: Claxton et al. reported cost-per-QALY of £12,936 for 2008. Lomas et al. reports rising real terms threshold within range £5000 and £15000 per QALY for 2003 – 2012
- IVs used reflecting socioeconomic deprivation
- Cross-sectional within units of the English NHS: assumption is that additional money would lead to low spending units moving to mix and outcomes of high spending units.
- Average of 3 year spending is matched to effects on health in a particular year (assumed one-to-one relationship)
- Mortality rates translated into life years lost using ONS data
- QoL QALYs pro-rated from Global Burden of Disease, plus HODR

Spain: Vallejo-Torres et al.

- Results: Cost-per-QALY of between €22,000 and €25,000
- Cross-sectional across 17 regional units of the NHS, 5 years longitudinal panel (2008-2012)
- Use of fixed effect model with an IV approach also used
- Lag structure used to take account of delays between spend and health gain
- Use of life expectancy (LE) from ONS but LE adjusted by health status. Quality of life taken from SHS EQ-5D data.
- Weighted estimate of Quality Adjusted Life Expectancy (QALE) by age cohort. Assumption is that changes in QALE over time and across regions reflect differences in spending over time and across regions and indicate the effects of changes in spending.
- Cost-per-QALY at 5 year age points range from €18,618 to €28,896 except for cohort at 95 years which is €5,632
- Spending is coming down but LE continues to go up. Unusual period?

Australia: Edney et al.

- Results: Base case ICER estimate of AUD 28,033 per QALY gained with parametric uncertainty giving 95% interval of AUD 20,758 – 37,667.
  - AUD 28000 ~ € 20,000
- Change in national health expenditure 2010/11 to 2011/12 divided by sum of estimated mortality and morbidity related QALY gains to get an ICER.
- Estimated at SLA unit level and then aggregated
- IVs using unpaid care provision
- Mortality: YLL estimated as age/sex LE minus age at death or as 1 if age > LE, QoL taken from age/sex 2015 SF-36 survey data to get QALYs
- Morbidity from HILDA survey (12 years, 69,000 people, SF-36). Controlled for range of variables other than health care spend that may have led to changes in HRQoL over time.

Netherlands: van Baal et al.

- Results: Estimate of €41,000 per QALY for CVD spending in hospitals
- CVD Expenditure from cost of illness studies (1994 to 2010) using OECD Health Accounts methodology and Dutch Hospital Discharge Register.
- Lagged effect of spending on health included – much bigger than immediate
- CVD Mortality taken from National Mortality Register
- Sought to control for trends in CVD mortality not linked to hospital CVD spend
- Assumption is that the variation in mortality trends that cannot be explained by the year –specific and age/gender-specific time trends is caused by changes in CVD expenditure.
- Mortality adjusted to LYG using life tables, with age/sex QoL also estimated
- Seems to assume that in CVD, gains are all mortality related (underestimate?). Also an issue about the use of prescription drugs, outside of hospital budget (overestimate?)

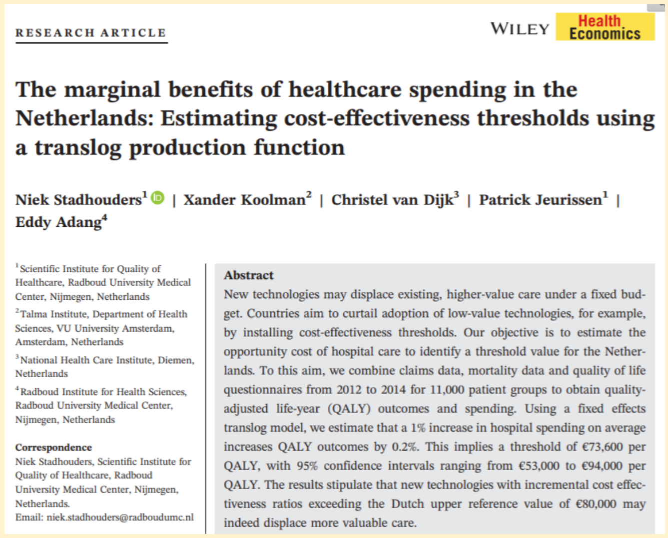
Sweden: Siverskog and Henriksson

- Results: Marginal cost per life year of €39,000
- Expenditure from time series of aggregate national expenditure, adjusted for relative price effects, for period 1970-2016 from the Swedish OECD SHA, at the regional country council level.
- Data on Remaining Life Expectancy (RLE) by age and gender from Statistics Sweden for the period 1970-2016
- Calculate age and gender mortality rates, and use to derive RLE. Then calculate standardised average RLE (ARLE)
- Conclude time series analysis not feasible, life expectancy is driving expenditure
- Use of panel data analysis using with two stage least squares to tackle endogeneity (IVs including graduated nurses). Looking at cross sectional variation of expenditure and life expectancy, assuming this reflects the relationship of interest
- They note that if they make crude HRQoL adjustments, they get to €45,400. If they assume in addition Claxton et al. morbidity gains, the marginal cost per QALY would fall from €39,000 to €19,000

MLIC: Ochelek et al.

- Results: cost-per-DALY averted as % GDP per capita. Few countries have any estimates > 1xGDP
- Use of cross country data on mortality and on health expenditure
- Use the Bokhari et al. model specification and expands on their original dataset for year 2000 of 127 countries with public health expenditures and mortality rates
- Bokhari et al. use IVs (that are relevant and valid) including consumption investment ratio, military expenditure of neighbouring countries
- Elasticities (of outcomes to expenditure) are calculated at the country level using data from 2000, but little evidence to suggest elasticities would vary over time.
- DALY 1: mortality effects only
- DALY 2: survival burden of disease using cross-country data
- DALY 3: survival burden of disease and direct effects on morbidity using cross-country data
- DALY 4: survival/morbidity effects estimated from DALY-burden of disease using cross-country data
- Assumes cross-country estimates are a good proxy for country estimates. Authors state the "importance of further research using within-country data to estimate these values at a country level and to account for the heterogeneity between different HCS."

A late addition ….. € 73,600



RESEARCH ARTICLE

WILEY Health Economics

The marginal benefits of healthcare spending in the Netherlands: Estimating cost-effectiveness thresholds using a translog production function

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Abstract
New technologies may displace existing, higher-value care under a fixed budget. Countries aim to curtail adoption of low-value technologies, for example, by installing cost-effectiveness thresholds. Our objective is to estimate the opportunity cost of hospital care to identify a threshold value for the Netherlands. To this aim, we combine claims data, mortality data and quality of life questionnaires from 2012 to 2014 for 11,000 patient groups to obtain quality-adjusted life-year (QALY) outcomes and spending. Using a fixed effects translog model, we estimate that a 1% increase in hospital spending on average increases QALY outcomes by 0.2%. This implies a threshold of €73,600 per QALY, with 95% confidence intervals ranging from €53,000 to €94,000 per QALY. The results stipulate that new technologies with incremental cost effectiveness ratios exceeding the Dutch upper reference value of €80,000 may indeed displace more valuable care.

Supply Side Estimates – Where Do Things Stand?

- Much innovative work taking place
- Many data challenges requiring a lot of assumptions:
    - Structural uncertainty often not handled in line with US 2nd Panel Recommendations
- Are studies estimating incremental threshold, or some sort of average?
    - Redefined as the marginal productivity of the health system
- How policy relevant are the results?
    - What do we need to assume about health systems to rely on results?
    - Should we be using different methods and “triangulating” the results?
- The results appear to be consistently below (i) thresholds being used by HTA / payer bodies and (ii) the demand side WTP estimates
    - What does this tell us?

Example of England: Combinations of key assumptions

Assumption 1	
Conservative	Health effects of a change in expenditure are restricted to one year
Optimistic	Health effects of a change in expenditure apply to whole of remaining disease duration

Assumption 2	
Conservative	People whose deaths are averted by change in expenditure live for an additional two years
Optimistic	People whose deaths are averted by change in expenditure have mortality risk of general population

Assumption 3	
Optimistic	People whose deaths are averted experience QoL of general population
Conservative	People whose deaths are averted experience QoL of disease sufferer norms

	Future effects of current spending	Future mortality of saved patients	Un-discounted threshold
Including quality-of-life effects during disease analysis	Conservative	Optimistic	**£12,936**
	Optimistic	Optimistic	£2,018
	Conservative	Conservative	£29,314
Adjusting life-years for quality-of-life analysis	Conservative	Optimistic	£30,270
	Optimistic	Optimistic	£10,644
	Conservative	Conservative	£63,844

Example of England: Differences across clinical (PBC) areas

Programme Budget Category	Cost per QALY	Programme Budget Category	Cost per QALY
Cancer	£16,997	Mental Health	£49,835
Circulatory	£7,038	Learning Disability	£78,854
Respiratory	£1,998	Problems of Vision	£76,850
Gastro-intestinal	£7,293	Problems of Hearing	£19,070
Infectious Diseases	£20,829	Dental Problems	£55,916
Endocrine	£3,124	Skin	£174,775
Neurological	£5,480	Musculoskeletal	£20,254
Genito-urinary	£43,813	Poisoning and AE	£163,766
Trauma & Injuries	NA	Healthy Individuals	£1,483,012
Maternity & Neonates	£2,969,208	Social Care Needs	NA
Disorders of Blood	£28,305	Other	NA

Source: Claxton et al. (2013), Table 5.2

Binding budget constraints: Relationship between Budget constraints, Thresholds and Affordability* (1)

- Budgets and thresholds cannot be set separately from each other. One can be taken as a given and the other adjusted.
- If budgets will not (cannot) change in the short run then thresholds should reflect the budgets.
- Let's be positive (rather than normative)
  - Will binding budget constraints change over time? What might that mean for the threshold? Not straightforward, but if nothing else changes, it goes up. See (e.g.) Paulden et al. Determinants of Change in the Cost-effectiveness Threshold. *Med Decis Making*. 2017 Feb;37(2):264-276
  - Are there competing health plans? If so, competing over premiums or over treatment access (i.e. cost-effectiveness threshold)?

*Danzon et al. (2018) Objectives, Budgets, Thresholds, and Opportunity Costs—A Health Economics Approach: An ISPOR Special Task Force Report [4] Value in Health (21):140–145

Binding budget constraints: Relationship between Budget constraints, Thresholds and Affordability (2)

- Following Danzon et al. "we define *affordability* as being relevant if paying for all patients potentially eligible for a new treatment would force either an overrun of the payer's planned budget or a displacement of other treatments regarded as being cost-effective."
- The assumption behind the use of thresholds is that new investment is at the margin. But it may not be, e.g. Hep C treatments. We need an "inframarginal adjustment"
- Three options to manage the impact on the budget of the new technology
- Option 1: Delayed / targeted introduction of the new technology
  - This worked for Hep C because many patients could wait, and competing products entered stimulating price competition
  - But it may not be an option if there is irreversible harm and / or limited competition

Binding budget constraints: Relationship between Budget constraints, Thresholds and Affordability (3)

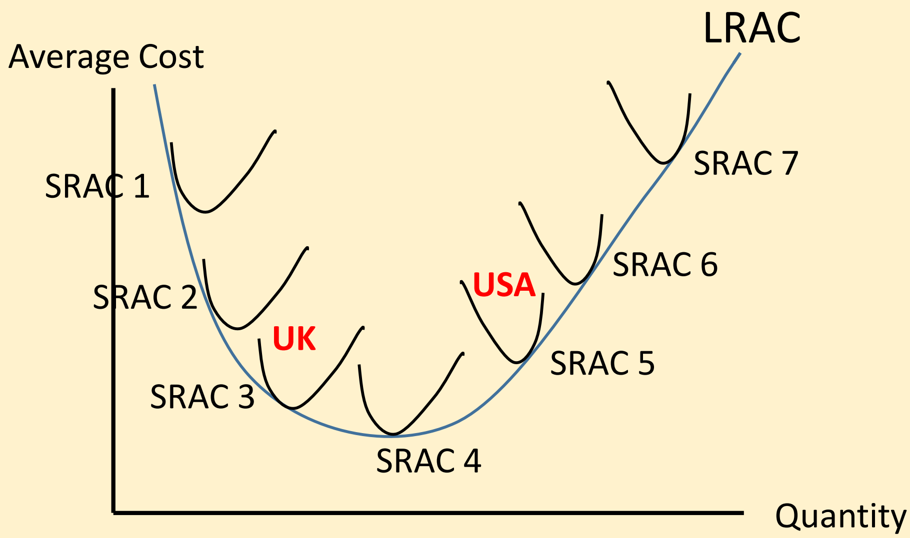
- Three options to manage the impact of the new technology:
  - Option 2: Planning in advance for the budget impact (ability to disinvest / obtain extra budget)
  - Option 3: Adjusting the cost-effectiveness threshold downwards to take account of the non-marginal budget impact:
    - Lomas et al.** argues that the empirical estimation of the threshold can yield the information to make a non-marginal adjustment to the budget.
    - This assumes that not only is the central estimate correct but that the outcome elasticity estimate is also accurate

**Lomas et al. Resolving the 'cost effective but unaffordable' 'paradox:' estimating the health opportunity costs of nonmarginal budget impacts. Value Health 2018;21:266–75.

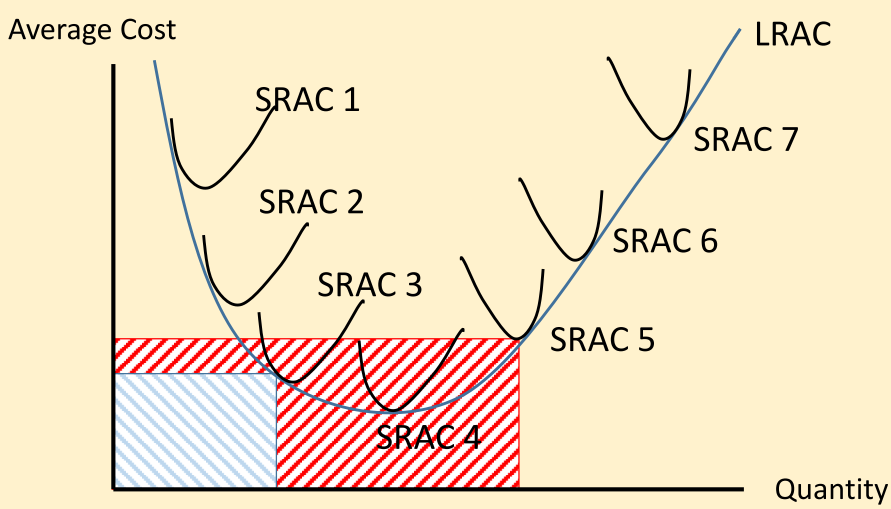
Reconciling Supply and Demand Side Estimates

- Economic analysis says in long run, WTP is proper measure.
- In budget-constrained situations, health can be lost by using wrong WTP estimate.
  - "shadow price" within system pertains if total is "unaffordable"
- Estimates of constrained optimization are analogous to estimating minimum average cost with inefficient capital investment.

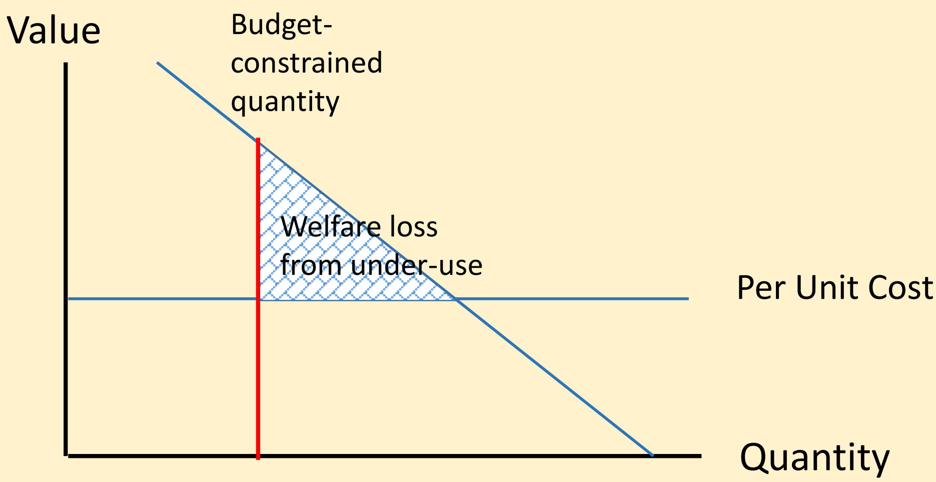
Reconciling "demand side" and "supply side"



Reconciling "demand side" and "supply side"



Implied Rationing from Too-Low Investment



Picking Optimal WTP Threshold in Single System

- Can higher-income people supplement "basic care" from single system?
  - In UK, "yes" with insurance
  - In US (thinking of Medicaid or Medicare as "basic plan") "Yes with insurance."
  - In Canada, "yes if not covered, no if covered in basic plan"
  - Allowing higher-income people to supplement leads to lower "system" choice for WTP threshold
- Opting out reduces high-income incentives to support higher universal threshold
- How does the system choose the threshold?
  - If welfare-maximizing, integrates over optimal WTP for all citizens
  - If popular vote, median voter determines outcome
    - Skewed income distribution leads to lower WTP than welfare-maximizing model
- Do voters trust the system?
  - Restricted funds vs. general tax increase

How It Works with Competing Health Plans

- Plans compete on generosity of coverage
  - In US, not CEA threshold but "prior authorization," drug pricing tiers, etc.
- Higher income citizens choose higher coverage (and premiums)
- Regulation interferes with natural market equilibrium
  - Tax subsidies to employer-based plans
  - Medicare Advantage plans (voucherized Medicare): restricted options
  - Medigap "supplements" create negative financial externality on other people

Pauly MV**,** **"**The Questionable Economic Case for Value-Based Drug Pricing in Market Health Systems," *Value in Health February, 2017, 20(2):*278-282

Concluding Poll (Part 1)

- BACKGROUND:
  - WHO has recommended 1X to 3X per capita GDP as threshold
  - ICER says WTP = $50,000 to $150,000 per QALY
  - US EPA says VSL = $9.1 million ➔ $300,000 to $400,000/LY
  - Per capita GDP in US (2019) ≈ $60,000
    - New results suggest 2X per capita GDP at mean income
- QUESTION 1: What $/QALY should ICER use in the U.S.?

Concluding Poll (Part 2)

- BACKGROUND:
  - Again, WHO recommended using 1X to 3X per capita GDP
  - British National Health Service uses £20,000 - £30,000 per QALY
  - Analyses from York Univ. show operative value is £13,000-£15,000
  - UK Treasury (Green Book) recommends using £60,000
  - UK per capita GDP in 2019 ≈ £30,000 (about $40,000)

- QUESTION 2: What *$/*QALY should British NHS use?

Discussion

I’m tired. Let’s go to dinner!