

Economic evaluation, QALYs and well-being

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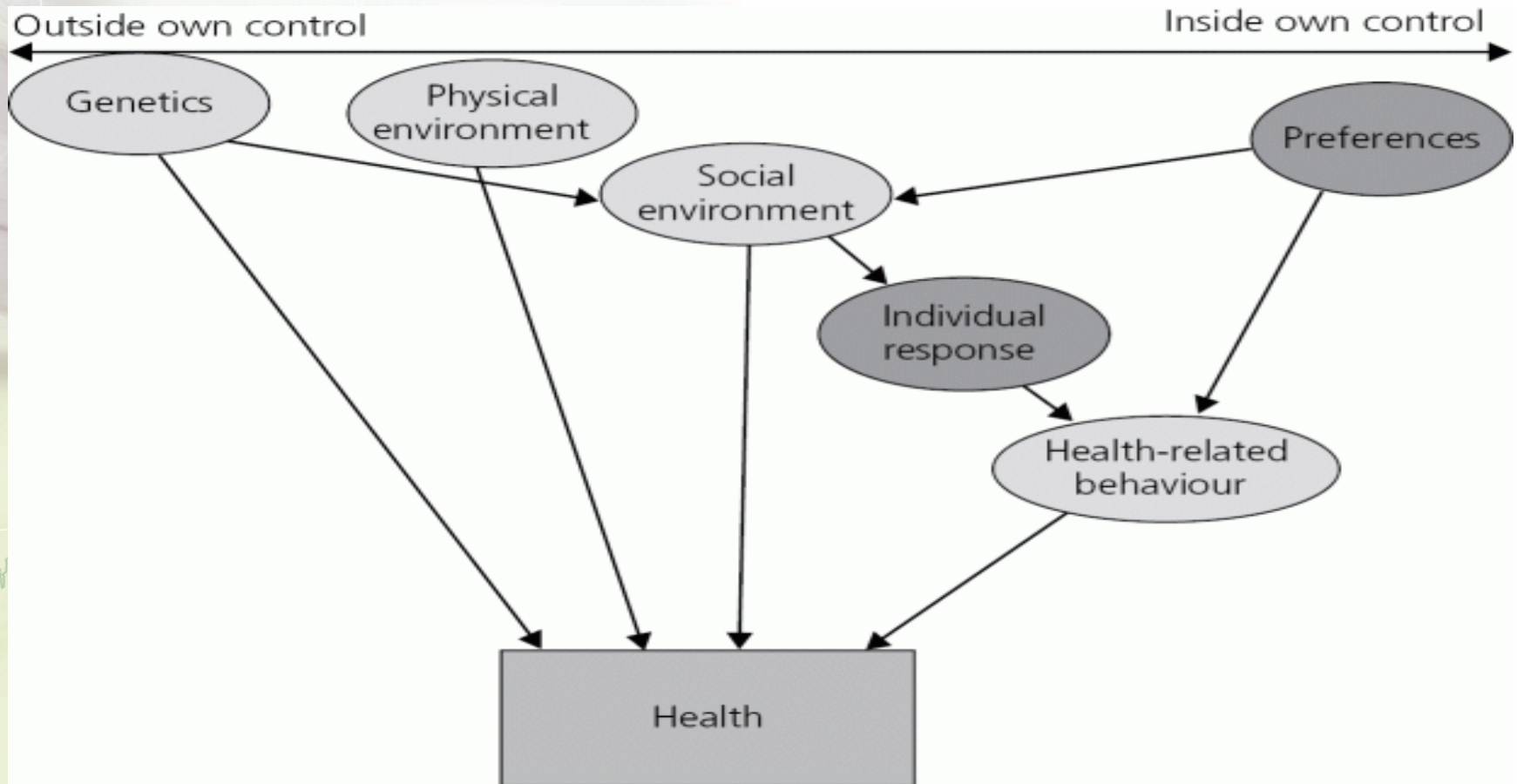
Outline

- Wider determinants of health and well-being
- Economic criteria – equity and efficiency
- Different techniques of economic evaluation
- Measurement of outcomes: Quality-adjusted life years (QALYs) and well-being
- Trial-based evidence vs. modelling

Determinants of health & well-being

- Why are some people healthier & happier than others?
- In what ways can policy make a difference?
- The contribution of *genetics*, *environments* (physical and social) and *lifestyle*

Health determinants model



Economic criteria

- Equity
- Efficiency

Efficiency definitions

- Technical efficiency
 - *Are we doing it right?*
- Allocative efficiency
 - *Are we doing the right things?*
- Marginal analysis
 - *Are we doing too much (or too little)?*

Efficiency

- Technical efficiency
- Cost-effectiveness
- Allocative efficiency

Economic evaluation

- Seeks to:
 - Maximize benefit / health
 - Minimize ‘opportunity cost’
- Comparative analysis of alternative options in terms of both:
 - Costs
 - Benefits

What is opportunity cost?

“The value of benefits forgone when deploying resources in one way rather than in their best alternative use”

Opportunity cost example

- Competing claims on resources:
 - 20 minutes of classroom time each week for 8 weeks to deliver mindfulness training to all school pupils
 - 20 minutes of physical education (or alternatively, what was done before mindfulness)
- Both interventions cost US\$50
- What is the 'opportunity cost' of providing mindfulness?

Opportunity cost

The health and well-being gains from the 20 minutes of physical education that are now lost

Economic evaluation types

Type	Costs	Consequences / Outcomes
Cost-Minimization Analysis (CMA)	£s	Equivalent
Cost-Effectiveness Analysis (CEA)	£s	Single measure
Cost-Utility Analysis (CUA)	£s	Quality-Adjusted Life Years
Cost-Benefit Analysis (CBA)	£s	£s

Cost Utility Analysis

- Outcomes measured and valued by weighted life years (“Quality Adjusted Life Years”, “QALYs”), where 0 = death and 1 = perfect health
- Common metric permits broad comparisons
- QALYs may not capture all relevant and important benefits, e.g. social care
- Interpretability

Incremental Cost Effectiveness Ratio (ICER)

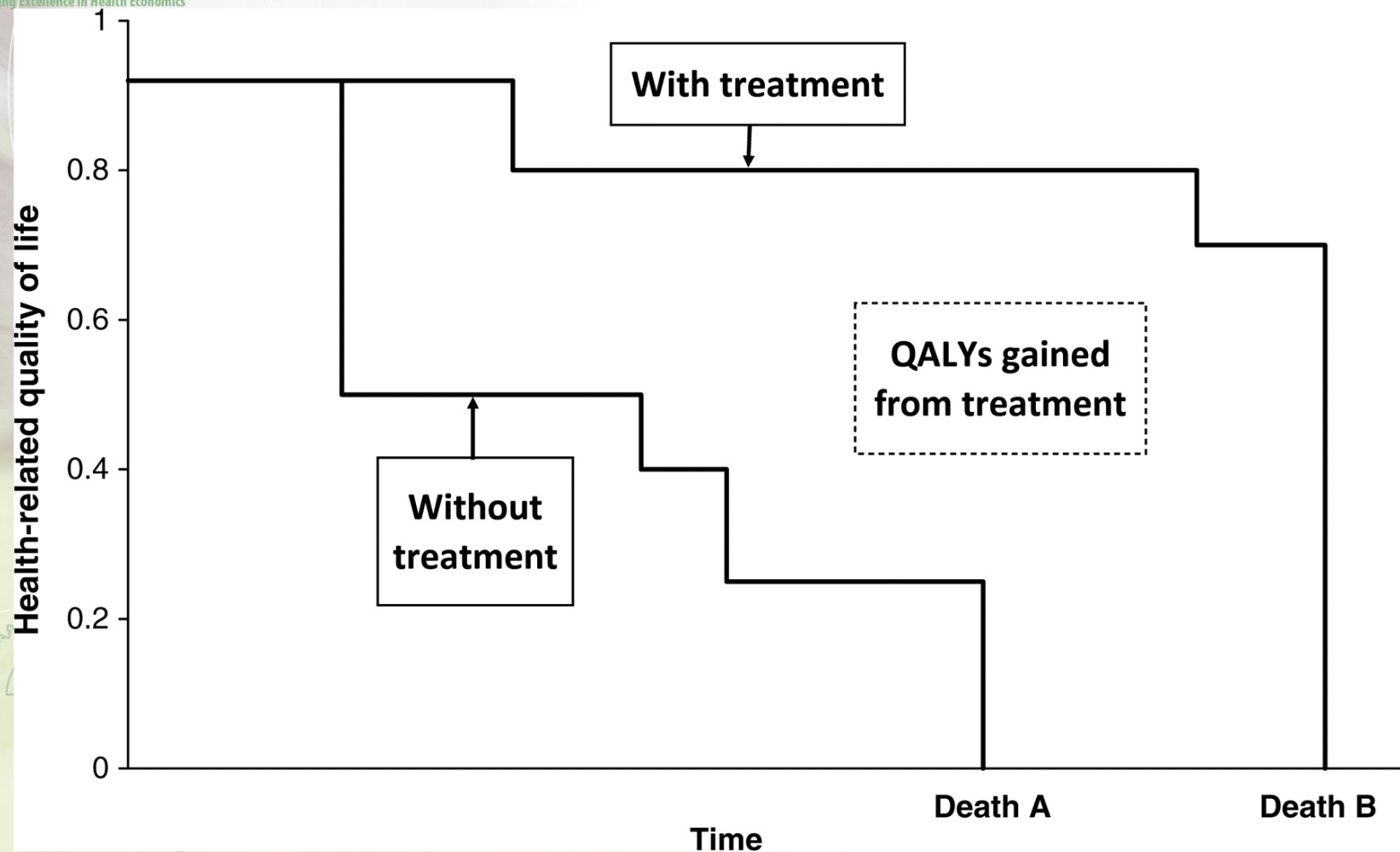
- $ICER = (C_2 - C_1) / (E_2 - E_1)$
- ICER = the extra costs it takes to achieve one additional unit of an outcome

- C_2 = costs of new policy
- C_1 = costs of current policy
- E_2 = outcomes of new policy
- E_1 = outcomes of current policy

Quality Adjusted Life Years (QALYs)

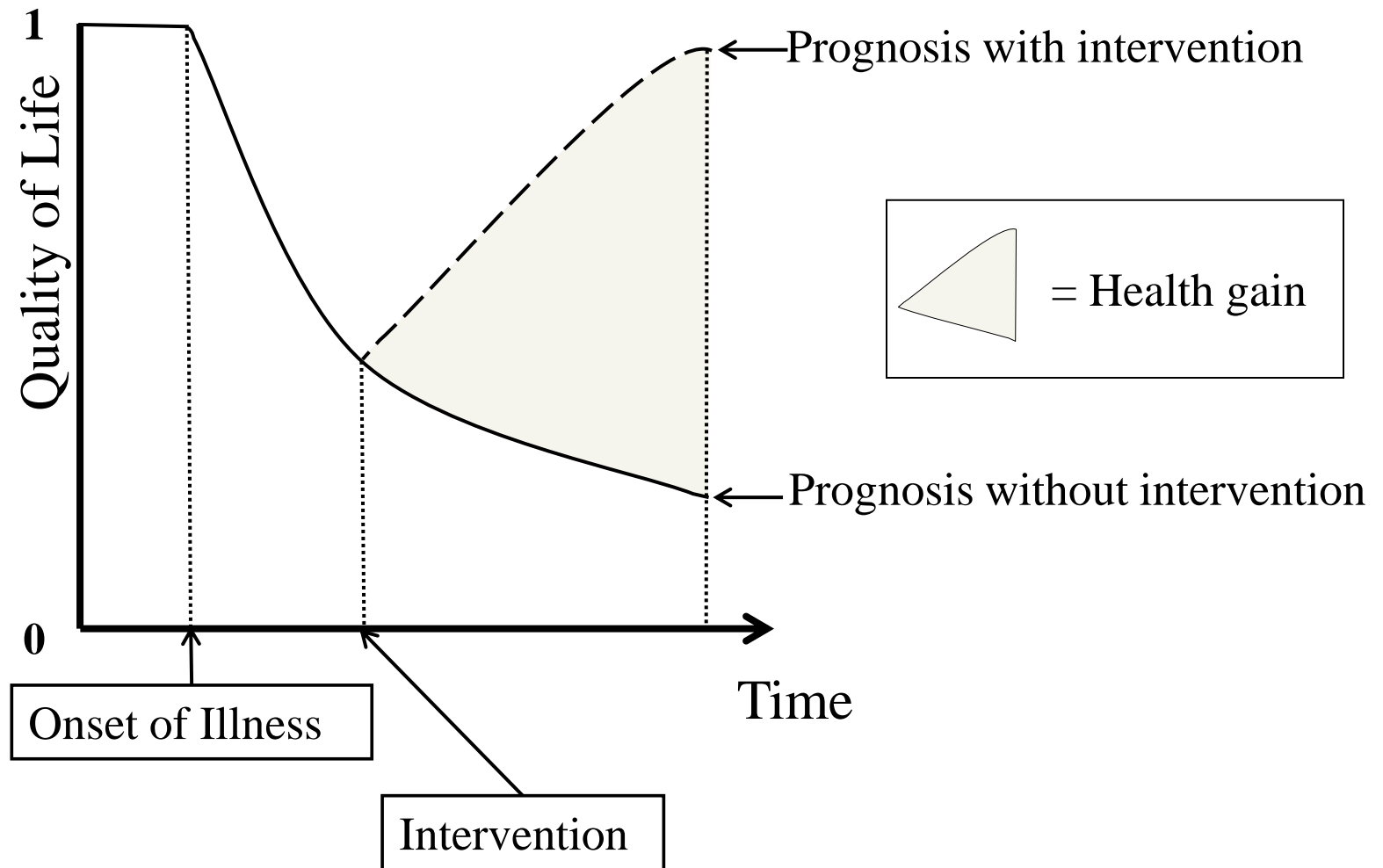
- Concerned with both how long you live and how good that life is
- How long you live (e.g. 10 years)
- Quality/utility weight = 0.85
scale 0-1, 0=dead; 1=perfect health
- $\text{QALYs} = 10 \times 0.85 = 8.5$

QALYs gained from treatment

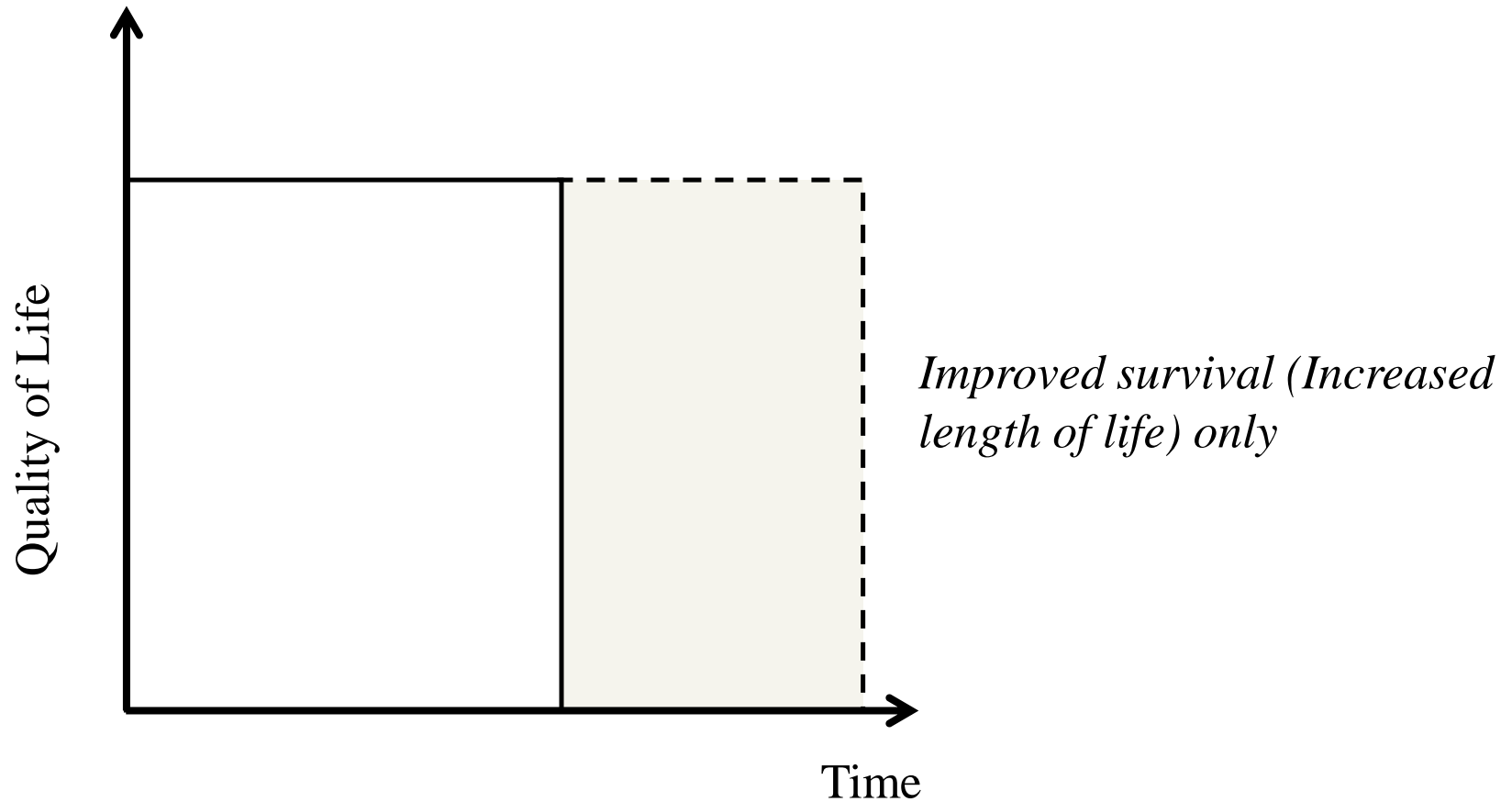


Whitehead S J , Ali S Br Med Bull 2010;96:5-21

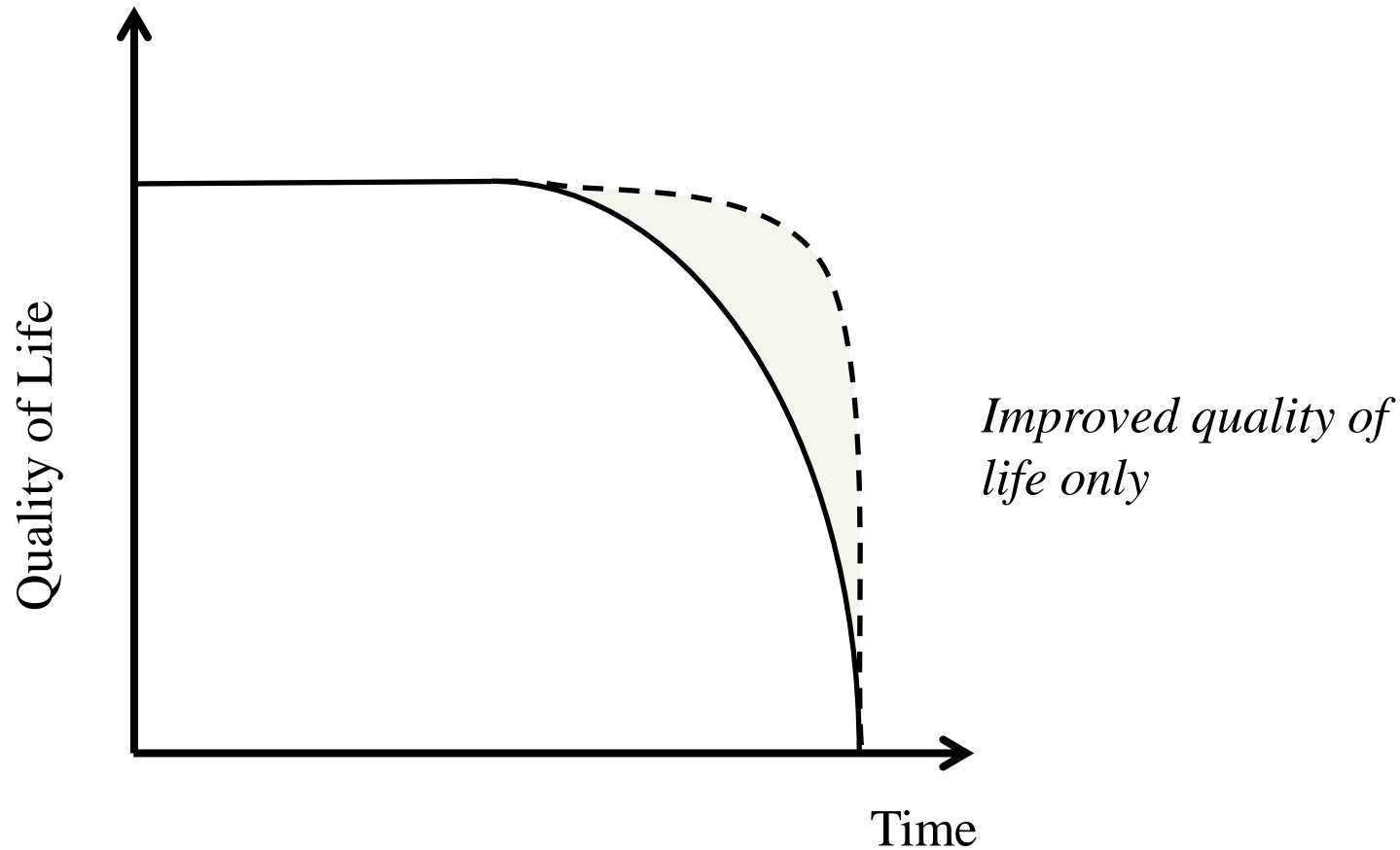
Measuring the health gain from interventions



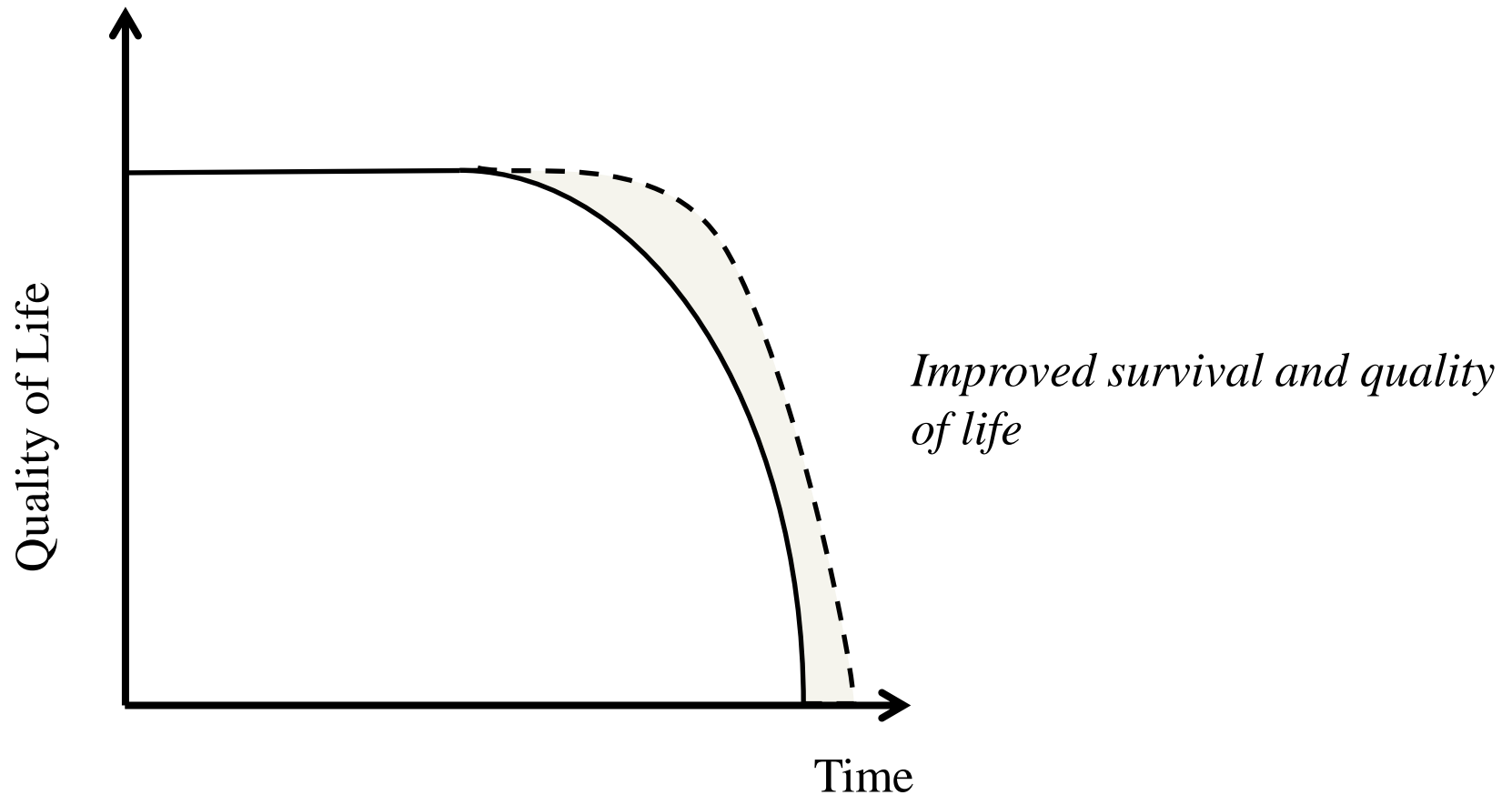
Measuring gains from different types of intervention



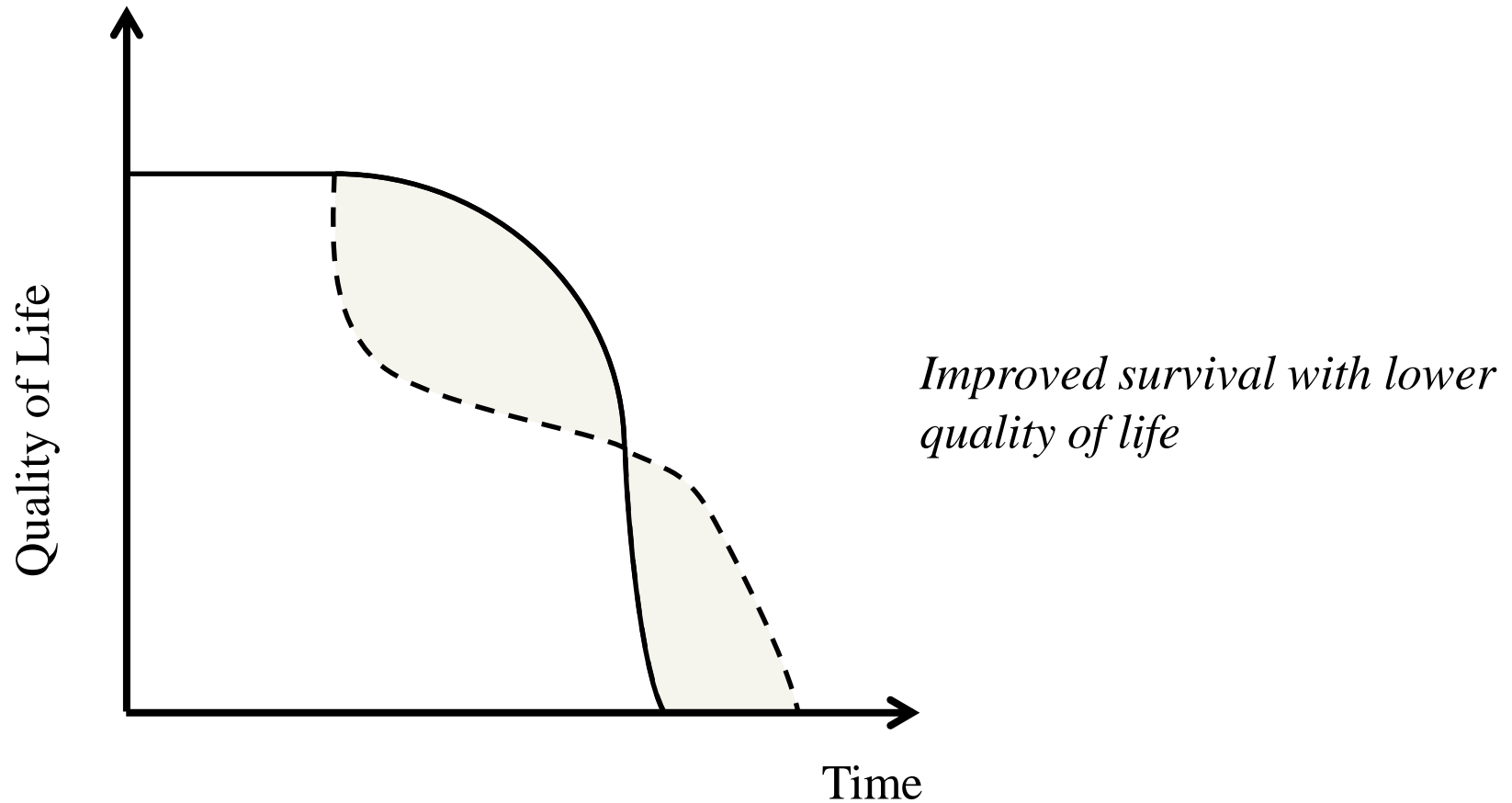
Measuring gains from different types of intervention



Measuring gains from different types of intervention



Measuring gains from different types of intervention



Generic utility-based quality of life tools

Short Form Health Survey instruments

EQ-5D

Your Health and Well-Being

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. *Thank you for completing this survey!*

For each of the following questions, please mark an in the one box that best describes your answer.

1. In general, would you say your health is:

Excellent	Very good	Good	Fair	Poor
▼	▼	▼	▼	▼
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Compared to one year ago, how would you rate your health in general now?

Much better now than one year ago	Somewhat better now than one year ago	About the same as one year ago	Somewhat worse now than one year ago	Much worse now than one year ago
▼	▼	▼	▼	▼
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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(SF-36 Standard, US Version 1.0)

By placing a check-mark in one box in each group below, please indicate which statements best describe your own state of health today.

Mobility

- I have no problems in walking about
- I have some problems in walking about
- I am confined to bed

Self-Care

- I have no problems with self-care
- I have some problems washing or dressing myself
- I am unable to wash or dress myself

Usual Activities (e.g. work, study, housework, family or leisure activities)

- I have no problems with performing my usual activities
- I have some problems with performing my usual activities
- I am unable to perform my usual activities

Pain/Discomfort

- I have no pain or discomfort
- I have moderate pain or discomfort
- I have extreme pain or discomfort

Anxiety/Depression

- I am not anxious or depressed
- I am moderately anxious or depressed
- I am extremely anxious or depressed

Cost Effectiveness Plane

New policy less effective and more costly

$C_2 - C_1$

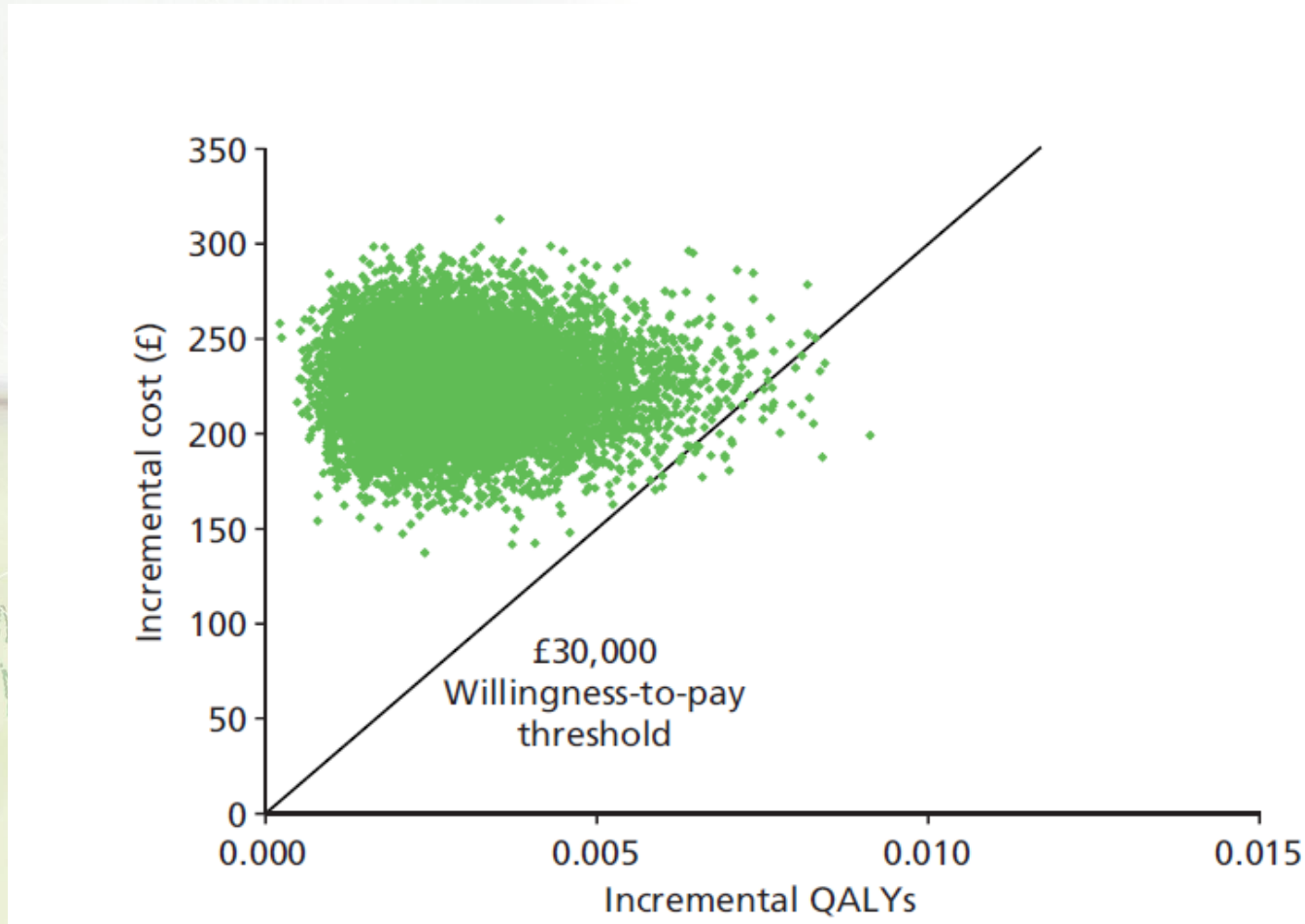
New policy more effective but more costly

$E_2 - E_1$

New policy less effective but less costly

New service more effective and less costly

Cost per QALY gain threshold



Perspective in economic evaluation

Societal

Costs to patients and their caregivers

Productivity costs

Costs to government payer (beyond health care)

Costs to private insurer

Non-health effects relevant to patients and caregivers

Payer

Public health care payer

Costs to publicly funded health care system

All health effects relevant to patients and caregivers

Resource use

- Need to consider the resource use associated with identified interventions and associated outcomes
 - Initial treatment/intervention
 - Downstream events (e.g. hospital admissions)
 - Continuing use of health care associated with health outcomes
 - Social care and other public sector costs associated with outcomes
 - Time of patients/carers
 - Production losses

Broad approaches to economic evaluation

- Economic evaluation can take two stylised forms

[1] Using patient level data - often alongside a randomised controlled trial

[2] Using decision analytic modelling - combining different sources of evidence

Why economic evaluation alongside RCTs?

- RCTs have very high internal validity
- Provide a vehicle for data collection
- Facilitates handling of some types of uncertainty

Limitations of RCTs

- RCTs are often not based on the most appropriate comparison
- More rigorous follow-up and outcome assessment
- Focus on intermediate rather than final health outcomes
- Inadequate patient follow-up & sample sizes
- Protocol driven costs and outcomes
- Issues of patient selection & generalisability

“Modelling, an unavoidable fact of life”

- Need to:
 - Compare of all relevant alternatives
 - Extrapolate beyond follow-up period of trial
 - Reflect all appropriate evidence
 - Link intermediate endpoints to health outcomes (e.g. reduction in BMI to morbidity, mortality, HRQoL)
 - Make results applicable to decision making context
 - Capture wider benefits

Buxton et al. 1997. Health Economics; 6: 217–227

Cost-Benefit Analysis

- Comparison of costs and benefits of different policy options
- Benefits are measured and *valued in monetary terms*
- Allows consideration of all relevant outcomes, not only restricted to health-related quality of life and length of life
- Decision rules clearer compared with other evaluation methods (e.g. cost-utility analysis) – if benefits exceed costs, implement

Well-Being valuation

- Has been applied to derive monetary values for a range of goods & services where no market value exists, e.g. pollution, crime, floods, life events (marriage etc.)
- Individual j *with* an illness & level of well-being, W_j
- Individual k *without* an illness & a higher level of well-being W_k
- $W_k > W_j$
- The aim is to find a hypothetical sum of money Y^* that, if given, would increase W_j so that $W_k = W_j$

Well-Being valuation

- Estimate the following equation:

$$W^* = \beta_0 + \beta_1 \log Y + \beta_2 C + \beta_3 X + \varepsilon$$

- The Y^* is found using:

$$CIV = \left[\exp \text{abs} \frac{\beta_2}{\beta_1} - 1 \right] * Y$$

Challenges

- Is life satisfaction a good measure of well-being?
- Not always clear what the responses are based on – potential for measurement error – potential therefore for association between health and life satisfaction to be small to non-existent, especially if there is adaptation
- Valuation also very dependent on measuring income accurately and it having a positive effect on life satisfaction
- Large sample sizes required for stable / robust estimates

Office for National Statistics - UK

Next I would like to ask you four questions about your feelings on aspects of your life. There are no right or wrong answers. For each of these questions I'd like you to give an answer on a scale of 0 to 10, where 0 is "not at all" and 10 is "completely".

Measure	Question
Life Satisfaction	Overall, how satisfied are you with your life nowadays?
Worthwhile	Overall, to what extent do you feel that the things you do in your life are worthwhile?
Happiness	Overall, how happy did you feel yesterday?
Anxiety	On a scale where 0 is "not at all anxious" and 10 is "completely anxious", overall, how anxious did you feel yesterday?

Source: Office for National Statistics

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- 1. Introduction

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2. Surveys that include the four Office for National Statistics personal well-being questions

A list of surveys that include the four Office for National Statistics (ONS) personal well-being questions is provided in this section. Information for each survey has been collected by engaging with the users of our personal well-being data and publications and researching the internet.

Table 2: List of surveys that include the four ONS personal wellbeing questions

Organisation	Survey	Topics covered	First asked	Frequency of update
	Annual Population Survey	Labour market data including employment and unemployment, as well as housing, ethnicity, religion, health and education.	April 2011 to March 2012	Annual
		Level of assets, savings and debt;	July 2011	

Summary

- Economic evaluation is a tool that can be used to inform decision-making over how to best use scarce resources
- Choice of which technique to use depends on policy question and intended outcomes, including whether there are potential changes in wider outcomes such as well-being
- Wider determinants of health and well-being are important and can influence how effective and cost-effectiveness interventions and policies within a particular setting