Department of Health

Quantifying health impacts of government policies

A how-to guide to quantifying the health impacts of government policies

Quantifying health impacts of government policies

A how-to guide to quantifying the health impacts of government policies

Quantifying health impacts of government policies

Authors: David Glover, John Henderson

Publication date July 2010

Part of a series:

Health Impact Assessment of Government Policy: A guide to carrying out a Health Impact Assessment of new policy as part of the Impact Assessment process

Health Impact Assessment – case studies from government departments

Health Impact Assessment – evidence on health

Contents

1.	**Introduction to quantifying health impacts**	**2**
2.	**Quantifying health effects**	**4**
3.	**Distribution of effects and equity**	**10**
4.	**Valuing health effects – resource costs**	**15**
5.	**Valuing health effects – the value of a life**	**20**
6.	**Quantifying uncertainty and risk**	**27**
7.	**Third sector issues**	**29**
8.	**Reporting the results**	**32**
Bibliography		**34**
Useful reading		**37**
Glossary		**40**

First published by Department of Health in 1996 as "Policy Appraisal and Health".

Re-issued as a new draft with amendments, April 2009.

1. Introduction to quantifying health impacts

1.1 Health Impact Assessment (HIA) forms part of the mandatory 'Impact Assessment' required by Government for all relevant policies. It is a means of developing better, evidenced-based policy by careful consideration of the impact on the health of the population.

1.2 A good health impact assessment will guide policymakers to consider the positive and negative impact of their proposed policy on health. It will identify any unintended health consequences that may either lend support to the policy or suggest improvements to it. It will also contain a clear analysis of whether the health of the whole population or just certain sections within the population will be affected.

1.3 This document offers practical guidance to policy-makers and analysts in Government Departments and other public sector agencies on how to quantify the expected impact of their policies on health. It is intended to be useful to both the policy lead and the lead analyst on how quantification of health impacts might be undertaken.

1.4 **For the policy lead:**

- When designing policies, programmes and projects, it may be necessary to think about possible implications for health. The amount of effort this requires will vary according to the magnitude of any likely effects and the difficulty of assessing them. You may need advice from health experts and economists. In general, the procedure to follow is:

  i) identify any health impacts;

  ii) assess their magnitude and distribution (Chapters 2 and 3);

  iii) value them in monetary terms where this is helpful (Chapters 4 and 5);

  iv) consider uncertainty risk and third party issues (Chapters 6 and 7);

  v) present the results clearly for decision makers (Chapter 8).

- Stage (i) will at least initially be the responsibility of the policy lead (in consultation with stakeholders and specialists), whereas Stages (ii) to (iv) are more likely to involve specialists and analysts.
- These Stages are helpfully and simply described in the publication in this series *Health Impact Assessment of Government Policy: A guide to carrying out a Health Impact Assessment of new policy as part of the Impact Assessment process.*

1.5 **For the lead analyst/specialist:**

- Special problems can arise in identifying and weighing up the impacts on health and health services, of policies, programmes and projects. This guide provides specific advice in the health field to add to that contained in the more general HM Treasury guidance (HM Treasury's *Green Book: Appraisal and Evaluation in Central Government* 2003)[1].
- You may be a government analyst (economist, operational researcher or statistician) or belong to a different profession. You will need some analytical capabilities. This guide is aimed at providing the specific technical, information that is needed to assess the health impacts of a government policy in line with good practice from the Department of Health and HM Treasury. Some background in economics is desirable, but not essential.
- You will need to draw on advice from a range of others such as stakeholders, epidemiologists, economists, clinicians, safety experts, toxicologists, researchers and others.

1.6 Also available are a number supporting publications that provide more detailed advice on specific aspects of HIA. These include:

- *Health Impact Assessment of Government Policy: A guide to carrying out a Health Impact Assessment of new policy as part of the Impact Assessment process*
- *Health Impact Assessment – case studies from government departments*
- *Health Impact Assessment – evidence on health*

These are referred to at appropriate places within this guidance.

1 Available at: http://www.hm-treasury.gov.uk/data_greenbook_index.htm See also and '*Managing Risks to the Public: Appraisal Guidance*' (2005): http://www.hm-treasury.gov.uk/consult_greenbook_index.htm

2. Quantifying health effects

2.1 The ability to quantify a health impact is clearly reliant on the availability of data and evidence of the potential causes and effects of the policy in question. This chapter introduces the different ways health is measured and provides some potential sources of information which may help with this.

2.2 There are different *currencies* in which health effects might be quantified. Which is the most suitable depends on the nature of the policy in question. For example:

- A policy that reduces the number of road accident fatalities will be best quantified in terms of the number of fatalities prevented which in turn can be converted into the number of years of life lost.
- A policy which reduces exposure to carcinogenic materials might be quantified in terms of number of future cases of cancer.
- A policy that reduces workplace stress might be quantified in terms of the number of people who experience a reduction in stress and a measure of the average reduction in severity of the stress experienced.
- Where possible, the choice of measure of health impact should also consider whether it is possible to assign a *monetary value* to the health impact. This is explored further in Chapter 5.

Options for quantifying health impacts

2.3 For most policies it will make sense to estimate one or more of the following:

- the number of lives lost
- the total number of years of life lost
- expected increase/decrease in the number of incidents of disease (e.g. heart attacks, incidence of lung cancer)
- Quality Adjusted Life Years (QALYs). This is a measure that combines the impact on total life years and the impact on quality of life into a single measure. This might be more difficult to measure than some of the other measures but it has a number of key advantages which are explored more in Chapter 5.

Lives lost

2.4 Measuring the number of lives lost is most appropriate if the health effect is largely one of mortality risks such as reducing fatal road accidents or suicide rates.

Years of life

2.5 Rather than merely counting lives lost, it is often more appropriate to consider the total years of life lost. To do this, you may need to estimate:

- the average age of those affected by the policy, and
- the age to which they would be likely to live in the absence of this policy.

2.6 While the second figure will often equal the average life expectancy of the age group affected (published by ONS), this will not necessarily be the case if the policy affects people who already suffer health problems and who may therefore have worse life expectancy. Here, reference to medical or epidemiological data would be necessary.

Change in the number of incidents of a disease

2.7 Policies that impact on the risk of particular diseases or health events can be quantified in terms of a change in the number of incidents of disease. For example, a policy that increases exercise will reduce the risk of heart attacks. Quantifying the number of health events will often require some clinical evidence of the likely knock-on impact of the policy on health which may or may not be readily available or easy to assess, and may require some additional clinical expertise.

Measuring quality of life and Quality Adjusted Life Years (QALYs)

2.8 Though years of life lost is a more sophisticated measure than lives lost, it is still only relevant to conditions where the prime outcome is death and it does not properly address health issues of pain, disability and mental distress. These aspects of health, which we will term *health-related quality of life* will be more important than years of life lost in many policies.

2.9 The measure Quality Adjusted Life Year ("QALY") allows the health impact on both life years and quality of life to be expressed in a single measure. The QALY approach weights life years (saved or lost) by the quality of life experienced in those years. Years of good health are more desirable than years of poor health. Poor health is described in terms of the mix of effects on the individual. This mix may include, for example, not only pain and disability but also other dimensions such as anxiety or the ability to carry out usual activities. All these different dimensions are then summarised in a weight, which is applied for the duration of the poor health (or until death).

2.10 The QALY approach allows a sophisticated measurement of health impact, including measurement in cases where life expectancy does not change. For example a policy that reduces attacks of asthma may not lead to a major increase in life years, but it will lead to considerable improvements in QALYs. QALY values have been estimated for many conditions and there is an agreed methodology for estimating QALY impacts for other conditions

2.11 Because the QALY measure provides a single *currency* for measuring any health impact, it has a number of distinct advantages. Firstly, it means that if there are a number of different health benefits to a policy (e.g. preventing both heart attacks and cases of cancer) they can be

summarised into a single measure and hence options can be more easily compared to each other. Secondly, this feature also allows comparison with other policies that may have a very different health benefit e.g. reduction in stress. Finally, there is guidance on how a *monetary value* can be applied to a QALY estimate (see chapter 5). By assigning a monetary value it is possible to include health impacts into the overall cost benefit analysis of the policy and hence to weigh up health impacts against other impacts such as monetary cost and other factors.

2.12 The following example indicates some of the issues arising in practical applications. Williams (1985) used a QALY-based approach to assess the effectiveness of the different treatment options available for patients with angina. He asked three well-informed cardiologists to give judgments regarding the quality and duration of life of various patients with angina who had or had not undergone coronary artery bypass grafting. On the basis of their views, and using the Rosser scale, he was able to estimate the expected change in the quality and length of life for patients with severe angina and left main vessel disease who had coronary artery bypass grafting compared with those who had not.

2.13 A successful bypass operation (67 per cent of cases were then successful) results in an increased life expectancy of 6 years. Initially the quality of life for such a patient is close to unity ("full health") but later it tails away. For 30 per cent the operation produces a situation similar to that which would have pertained with no operation. For 3 per cent the operation proves fatal. The expected value of coronary artery bypass grafting in terms of QALYs is therefore estimated at 0.67 times the gain in quality/duration of life for those for whom it is successful minus 0.03 of the loss of quality/duration of life for those for whom it is fatal.

2.14 The fact that the three cardiologists complained about the difficulty they experienced in establishing the QALY values with any confidence suggests that the values may not be reproducible by other observers. The approach used involves an element of judgement

Should QALYs be discounted?

2.15 A technical issue in the economic appraisal of health policies concerns the treatment of costs and benefits that arise at different points in time. The appropriate discount rate for health benefits has been the subject of considerable debate (see for example, Parsonage and Neuberger, 1992). In general, monetary values occurring in the future are discounted to reflect both pure time preference and the diminishing marginal utility of income (combined with the assumption that real incomes rise over time). If health effects are measured in quantities – e.g. quality adjusted life-years – and the value of health effects is increasing over time, discounting the volume of health effects at a lower rate than costs is a valid method of taking account of the increase in the future value of health effects (*Discounting for Health Effects in CBA and CEA*, H Gravelle & D Smith, University of York, 2000, *CHE Technical Paper 20* [http://www.york.ac.uk/inst/che/pdf/tp20.pdf]). In practice the only reason to discount quantities of health is the existence of pure time preference and it is suggested that this is around 1.5% in real terms (HM Treasury, *Green Book: Appraisal and Evaluation in Central Government*, 2003). Sensitivity analysis should be conducted around this rate. When health effects are valued in monetary terms, they should be discounted at the same rate as other monetary values – i.e. at 3.5% in real terms. The future real values attached to health effects should, though, also be inflated to reflect

rising real incomes. For example, the Department for Transport uprates the VPF by the increase in GDP per capita (2% per annum). This too would give a net rate of 1.5% for the health effects.

Where to get information

2.16 Your first port of call should be specialist advisers in your own and other Departments. For example, economists in HM Revenue & Customs for a view about the effect a given change in the duty on cigarettes will have on smoking; scientists in the Department for Environment, Food and Rural Affairs for the expected emissions from sources of pollution; experts in the Health and Safety Executive for the estimated probability of an accident at a workplace and the likely numbers at risk. A common starting point is to look at the effects of past policies in the same area.

2.17 Once the existing knowledge on the policy from within the department has been understood it may be necessary to consider outside sources. Typical sources include:

- Expert opinion
- Results from controlled trails and observational studies
- Epidemiological and other statistical data

Expert Opinion

2.18 Experts with useful advice come from a wide range of disciplines including economics, science, engineering as well as health. They can be found in academia, industry and within many Government Departments. Experts are particularly good at identifying the core published knowledge on a topic and where published evidence does not exits taking a view on a sensible approach.

Controlled trails and observational studies

2.19 Controlled trials and observational studies provide information that can be used in a dose-response assessment. They provide an estimate, based on experience, of the likely effect on the health of an individual of a specific health intervention or of a given degree of exposure to some hazard. For example, clinical trials have consistently demonstrated that levels of dental decay are reduced by up to 50 per cent when fluoride is present in drinking water at a level of one part per million.

2.20 Controlled trials are often expensive and it can take a long time for useable results to become available. It is therefore unlikely that a new trial, tailor-made to answer the questions that arise in some policy appraisal, can be performed within the necessary time-scale. In the main, therefore, it will be the result of trials and studies that have been performed in the past that are used in policy appraisal to quantify the likely health effects on individuals. In any event, it is important that a systematic critical review of the literature be commissioned before a new trial is undertaken.

2.21 The Cochrane Collaboration is concerned with reviews of evidence of interventions' effects on health – much of it from randomised controlled trials. A similar organisation, the Campbell Collaboration is concerned with reviews of evidence of interventions' effects in the social, behavioral, crime and justice, and educational arenas. Further details are appended.

2.22 The NHS Centre for Reviews and Dissemination can provide information from a number of databases, as follows:

- NHS Economic Evaluation Database (NHS EED);
- Database of Abstracts of Reviews of Effects (DARE);
- Health Technology Assessment (HTA) Database.

Also the National Institute for Clinical Excellence and NHS Health Technology Assessment research programme publish much useful information.

Epidemiology and other statistical data

2.23 Epidemiological and other statistical data provide information concerning the occurrence and distribution of disease, the numbers of people exposed to particular risk factors and the numbers of people receiving particular health care interventions. There is a wide range of sources for such information. The next few paragraphs, while not comprehensive, outline some potentially useful sources.

2.24 Department of Health statistics in the main statistical work areas in the DH (healthcare, workforce, public health, and social care) are available at: http://www.dh.gov.uk/en/Publicationsandstatistics/Statistics/StatisticalWorkAreas/index.htm

Additional data is also available, covering data on: Accident and Emergency, Beds, Cancelled operations, Waiting Times, Diagnostics, Hospital Activity and Primary care at:

http://www.dh.gov.uk/en/Publicationsandstatistics/Statistics/Performancedataandstatistics/index.htm

2.25 For information on health inequalities and measures to reduce them see, for example, *Tackling Health Inequalities: A Programme for Action* at http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4008268

2.26 ONS (http://www.statistics.gov.uk/) publishes a range of national statistical data including:

- population by age, sex and area, and population projections by age and sex;
- mortality by cause, age, sex and area;
- morbidity in general practice from the 1991 *Morbidity Statistics from General Practice*;
- long-standing illness by age and sex from the *General Household Survey* and the 2001 Census;
- infectious diseases, etc;
- occupational health and child health;

- conceptions: numbers and rates;
- migration: internal and international.

2.27 Information on communicable diseases is available from the Health Protection Agency (http://www.hpa.org.uk/). The Agency publishes the Weekly Communicable disease report (http://www.hpa.org.uk/cdr/index.html). Similar information for Scotland, Wales and Northern Ireland is available from: Health Protection Scotland (http://www.hps.scot.nhs.uk/), The National Public Health Service for Wales (http://www.wales.nhs.uk/sites/home.cfm?OrgID=368), and the Communicable Disease Surveillance Centre Northern Ireland (http://www.cdscni.org.uk/).

2.28 The Department for Transport publishes data on injuries from road accidents (http://www.dft.gov.uk/pgr/statistics/datatablespublications/accidents/); the Royal Society for the prevention of accidents on injuries from accidents at home and during leisure pursuits (http://www.hassandlass.org.uk/query/intro2.htm); the Health and Safety Executive on injuries from accidents at work (http://www.hse.gov.uk/statistics/).

2.29 Other useful sources of relevant statistical information include departments of public health at regional and district level, public health observatories, university departments of public health, institutes of public health, and voluntary organisations

Summary of Chapter 2

- Acquire a central estimate of the number of people affected by each health impact of the policy measure, and their likely demographic characteristics. Note the timing of the effect. Note any plausible upper and lower values for these estimates.
- Decide whether the health effects of the policy are to be presented in a judgmental manner, or whether quantification is possible.
- Assess which form of quantification (lives, life years, QALYs) is most appropriate and feasible. Quality of life should be considered wherever possible and QALYs have a number of advantages over other measures.

3. Distribution of effects and equity

3.1 The Health Impact Assessment requires consideration is given to distributional effects; that is, whether the policy will impact differently on the health of different groups of society. Policies may impact differently by, for example:

- Age
- Gender
- Race
- Socioeconomic group
- Geographical positioning

3.2 The quantified health effects that were discussed in Chapter 3 should, where possible, be broken down further into the relevant groups for which the policy is likely to have distributional differences. There may be more than one breakdown required: for example, a policy may impact differentially by socio-economic groups and by age, so breakdowns on both dimensions should be attempted where the data allows. This is so that the distribution of health effects is made explicit in the policy making process.

3.3 Health inequalities exist across a number of dimensions. For example, men have lower life expectancy than women on average; which is due to biological reasons but may be exacerbated by lifestyles and work conditions. Different ethnic groups experience different levels of disease in their populations, due to both genetic and exposure to risk factors.

3.4 All public bodies have a legal duty to promote equality and eliminate discrimination, as well as specific duties with regard to equality by race, gender and disability. For policies with a significant impact on these dimensions, these should be covered in the Equality Impact Assessment. Your Government Department may also have a commitment to consider discrimination issues on other dimensions such as age, sexual orientation and religion or belief (these are both required in the Department of Health).

3.5 For many policies, one of the most important distributional effects is by socioeconomic group, and health inequalities by socioeconomic group are a high priority for the government. Therefore, for the remainder of this chapter, we will consider the specific issue of differential health impacts by socioeconomic group.

Health Inequalities by socioeconomic group

3.6 Socioeconomic inequalities in health typically take the form of a 'social gradient', in which those in higher socioeconomic groups have better health and fewer disabling conditions than groups below them. Table 1 below gives life expectancy by socioeconomic group, demonstrating the difference between the highest and lowest social classes is a life expectancy gap of 7.3 years for men and 7 years for women:

Table 1: Life Expectancy at Birth by Social Class[2]

Social class	Men	Women
I	80.0	85.1
II	79.4	83.2
IIIM	78.4	82.4
IIIM	76.5	80.5
IV	75.7	79.9
V	72.7	78.1

3.7 Research suggests that socioeconomic position affects health indirectly, by influencing a set of intermediary factors which take a more direct toll on health. These factors include environmental exposures and health-damaging behaviours. Environmental risks can be both physical (e.g. poor housing conditions, work-based hazards and pollutants, traffic danger etc) and psychosocial (e.g. unsupportive family relationships, stressful life events). These intermediary factors are unequally distributed with children and adults in poorer circumstances more exposed to health-damaging environments and more likely to engage in health-damaging behaviours.

3.8 All areas of government policies can potentially impact on health inequalities, including policies on housing, employment and benefits, education, environment, crime and transport. It is important to try to quantify the impact on health inequalities for many policies, and it is important to do so if the policy expects to have a direct impact on health. For example, if a new policy is introduced on sex education in inner-city schools to help reduce teenage pregnancies and STDs, it should be attempted to estimate the differential impact by socioeconomic group, by considering the breakdown of the school's students by socioeconomic group and any data available on rates of teenage pregnancies and STDs by socioeconomic group.

3.9 However, for many policies the impact may be so indirect that it is not possible to assess quantitatively with any meaningful level of accuracy. For example, any change to tax policy that changes household incomes will have an indirect effect on health inequalities. It may, for example, change the food that is considered affordable and the level of psychological stress from financial concerns. However, depending on the policy, these changes may be so marginal and/

2 Source: Trends in Life Expectancy by social class 1972-2005: http:/www.statistics.gov.uk/downloads/ theme_population/ Life_Expect_Social_class_1972-05/life_expect_social_class.pdf

or have so little evidence as to make quantification impossible. In such cases it is important that they are still given attention in the Health Impact Assessment test but quantification may not be possible or deemed worthwhile.

Distributional Weights by Socioeconomic Group

3.10 Distributional weights by socioeconomic group are a way to weight effects in different social groups differently from each other. There are two relevant sets of distributional weights to consider here:

1. The individual's valuation of a commodity

2. Society's valuation for reducing health inequalities.

Individuals' valuation of a commodity

3.11 The first is considered in the Green Book. The Green Book states that "the impact of a policy, programme or project on an individual's well-being will vary according to his or her income; the rationale being that an extra pound will give more benefits to a person who is deprived than to someone who is well off". It goes on to state that: "broadly the empirical evidence suggests that as income is doubled, the marginal value of consumption to individuals is halved: the utility of a marginal pound is inversely proportional to the income of the recipient". In other words, an extra £1 of consumption received by someone earning £10,000 a year will be worth twice as much as when it is paid to a person earning £20,000 per annum.

3.12 In relation to health, these distributional weights are only applied in relation to a policy that has a *financial* impact on citizens, for example a policy which includes some fee for usage. As health services are generally free at the point of delivery this is not often necessary to consider, but a policy that indirectly impacted on the out-of-pocket costs to health care patients should be weighted in this way.

3.13 These weights should **not** be applied to health gains that are achieved in relative socioeconomic groups. That is, the health gains to any two individuals should be valued the same regardless of their income (except where Equity weights are relevant, see below).

Equity Weights

3.14 As stated above, generally speaking, health gains are valued equally regardless of who is benefiting from them. However, there is some evidence that, as well as the value placed on individuals achieving better health, society places a value on achieving a more equal distribution of health. This can be quantified by the use of *Equity Weights* which have been estimated in a recent study by Dolan et al[3]. However, equity weights are controversial and there is no consensus currently on what values to use and where they are appropriate to apply. Therefore

3 Dolan P. et al (2008), The relative societal value of health gains to different beneficiaries

we recommend that careful judgement is used to decide if equity weights are appropriate. It may be valuable to subject policy choices to sensitivity analysis using equity weights, but we do not recommend at this stage that they be mandatory in decision making.

Box 2 – Equity weightings for different beneficiaries

Evidence from "The relative societal value of health gains to different beneficiaries" Paul Dolan et al. 2008

The aim of this study was to generate a set of equity weights for QALYs from the preferences of the UK general population, which could be fed into a social welfare function (SWF).

The SWF allows QALYs to be weighted differently for two reasons: first for the degree to which inequalities in health matter, i.e. we may be willing to sacrifice some overall health for more equal distribution of health, and second is the degree to which responsibility for health matters, i.e. we may be willing to give greater weight to illness that results from bad luck as opposed to bad choices.

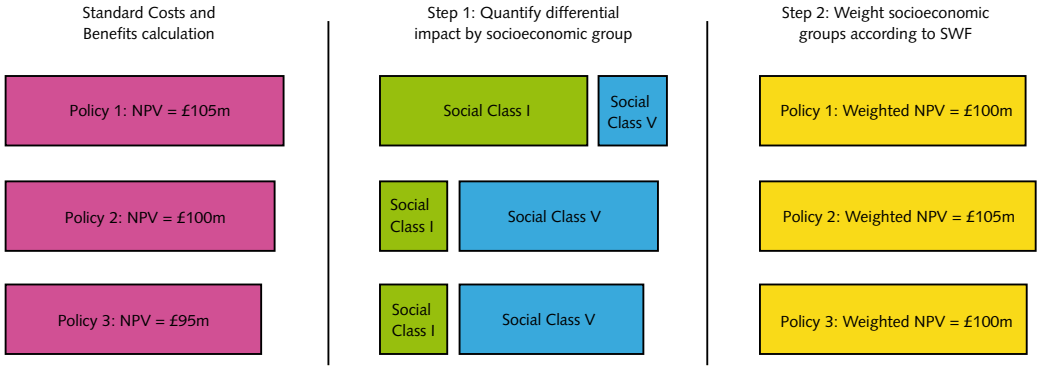
Based on analysis of results from 688 respondents:

- There is a general aversion to inequality. The marginal benefit to a group with a life expectancy of 75 is worth about 30% more than the same benefit to a group with a life expectancy of 82.
- There is a general preference to take account of responsibility: if "bad luck" is given an weight of one, then "some bad choices" is given a weight of 0.92 whilst "NHS causes" is given a weight of 1.23.
- Labelling has some effect with obesity-related conditions receiving less weight than some bad choices: about 0.80 compared to 0.92.
- As life expectancy varies by social class, the inequality aversion weights could be applied to the different social classes to generate implied weights for inequality by social class. This generates the following weights relative to social class V:
- The extent to which lower social groups would receive more weight for a particular intervention depends also on whether lifestyle choices are a factor, although even in the most extreme examples, classes II to V will be favoured over social class I.

3.15 This study provides one set of potential *equity weights* with which it would be possible to represent the trade-off between maximising overall health and achieving a more equitable distribution of health.

3.16 Figure 1 below shows how the weightings can change the option that is chosen. In this example, Policy 1 would be preferred under the standard costs and benefits calculation because it gives the greatest net benefit but Policy 2 would be preferred if equity weightings were taken into account.

Figure 1: Apply Trade-off Weights to account for Inequalities



NPV = Net Present Value. Here a positive value is assumed to represent a benefit.

SWF = Social Welfare Function. This reflects the equity weightings given to adjust for aversion to inequalities.

3.17 While the use of equity weights may be desirable to include the value of achieving a more equitable distribution of health, they are still controversial and there is no consensus on the values which should be used or where they are appropriate to apply. Therefore, we recommend that, if a policy is expected to have an impact, positive or negative, on the distribution of health, equity weights are considered, but if they are used, extensive sensitivity analysis is performed to demonstrate the extent to which they influence the outcome.

Summary of Chapter 3

- Identify any distributional or equity issues that may arise. Where possible, quantify the health benefits separately by relevant sub-group e.g. socioeconomic bands, age bands.

4. Valuing health effects – resource costs

Introduction

4.1 It is now common to estimate the overall costs and benefits of a policy initiative in monetary values. Clearly, any costs or savings in terms of health care resources must be included wherever possible to do so. Valuing a *health impact* in money terms is also desirable as it will help you to compare it to other economic and social impacts. In practice however, this may not be possible, because valuing health benefits is difficult and can be controversial. This chapter aims to guide the valuation process.

Valuing health care resource costs

4.2 HM Treasury's *Green Book: Appraisal and Evaluation in Central Government* (2003) gives clear guidance on the handling of resource costs in any appraisal.

4.3 Having estimated the number of people affected by a health impact and its severity, you also need to estimate the average cost in money terms of health care resources to treat fewer or more people with the condition under consideration.

4.4 For example, a costing could involve totalling, for each extra person affected, the estimated costs of:

- a GP consultation, multiplied by the expected number of consultations;
- an out-patient consultation, multiplied by the expected number of consultations:
- an in-patient day, multiplied by the expected number of in-patient days;
- any drugs and medical aids and appliances;
- other health care required, including ambulance trips, etc.

4.5 To reach the total health care resource cost of the policy option, this cost per person should be multiplied by the number of people affected.

4.6 The following is based on HM Treasury's *Green Book: Appraisal and Evaluation in Central Government* (2003). It also draws on a paper by Ludbrook (1990).

All resource costs should be included, regardless of who incurs them

4.7 Economic appraisal aims to identify the best use for society's resources. Consequently it should take account of all the resource costs and savings due to implementation of a policy. In the case of health, this would include resource costs incurred by other support services (including

voluntary services), by patients, by their relatives and friends, as well as the costs borne by the NHS. It is often helpful to identify the costs borne by each group separately as well as quantifying the overall resource costs.

4.8 Good examples are the Buxton and West (1975) cost-benefit analysis of long-term haemodialysis for chronic renal failure, which took into account the costs of home conversion for patients who received dialysis at home; and a study by the HSE (1989), *Implementation of EC Directive on protection of workers from noise: cost benefit assessment*, which included the reduction in hearing aids prescribed, as well as the savings in GP consultations, in time spent in hearing aid clinics, and in the use of batteries.

The costs included should be marginal costs

4.9 What is relevant is the cost of treating, or ceasing to treat, those whose health will be affected by the policy measure. These costs will therefore be incremental. If the effect is temporary, they will be short-run marginal costs; if the effect is expected to endure, it may be necessary to expand the capital base to allow for them in the longer term so the costs would be long-run marginal costs. In health care there are generally little or no economies of scale (at least at existing scales of operation) and, where this is the case, average costs are the same as long-run marginal costs.

4.10 Estimating the costs due to a policy initiative entails a description of the counterfactual, the costs that would have been incurred in the absence of the policy. For example if the policy brings forward the treatment that an individual would otherwise have required at a later date, then only the change in timing should be considered to be the result of policy.

The relevant concept of cost is opportunity cost

4.11 Opportunity costs are relevant because it is the fact that resources can be put to other uses that means there is a cost to using them. Generally the opportunity cost of a resource is indicated by its market price (the cost of employing nurses is determined in a market in which they might be employed in some other occupation). However, this is not always the case. Sometimes the use of an existing resource involves no payment. If the assets have an alternative use, then their value in that alternative use should be included in the appraisal. Conversely, if a resource is underutilised and there are no competing demands for its use (there is spare capacity), such as when some piece of equipment is only used for part of the time, then there is no opportunity cost in using it. If a policy will impact positively or negatively on NHS funding then this needs to be addressed slightly differently.

Money transfers do not constitute costs

4.12 Some cash transactions, such as the payment of sickness benefit, have no implications for the use of resources (apart from the small transaction cost involved). These are not costs. They are transfers of spending power from one section of society to another. (Transfer payments may change the distribution of income or wealth, though. See HMT's *Green Book*, 2003, ch.5: http://greenbook.treasury.gov.uk/chapter05.htm#two]

Inflation

4.13 It is important that all costs (and monetary benefits) in an appraisal be expressed at a consent general price level. As different data sources on costs of healthcare (and other costs) may relate to different years, uprating to a constant price base is likely to be necessary. Health care costs should be uprated using the hospital and community health services (HCHS) pay and prices index, and social care costs using the personal social services (PSS) pay and prices index. Figures for recent years are shown in table A5.1.

Table 2: Pay and Prices Indices: percentage change over previous year

	HCHS	PSS
2000/01	4.2	n/a
2001/02	5.1	n/a
2002/03	3.5	6.1
2003/04	5.2	4.3
2004/05	3.3	4.3
2005/06	3.7	3.7
2006/07	3.2	4.4
2007/08	3.3	5.1

[Source: http://www.pssru.ac.uk/]

Today's costs are given greater weight than future costs

4.14 Costs and benefits often occur at different points in time. It is often the case that costs occur today and the benefits accrue some years later. In order to make benefits and costs accruing at different times commensurate for the purposes of economic appraisal, the basic economic principle of discounting should be used. Discounting scales down future costs and benefits to reflect the general preference for enjoying benefits sooner rather than later, and incurring costs later rather than sooner. A real discount rate of 3.5 per cent is used for financial values in central Government projects.

4.15 The discount rate can be crucial in determining whether benefits exceed costs. Consider, for example, a local authority that is converting houses to provide accommodation for care in the community. It has to be decided whether to undertake energy saving improvements with an estimated cost of £25,000 and which is expected to yield (real) savings of £2,000 per annum in each of the next 20 years. Using a 3.5 per cent discount rate the present value of the savings is:

£2,000 + £2,000/(1.035)1 + £2,000/(1.035)2 +... + £2,000/(1.035)20 = £30,425

4.16 The present value of the costs savings, therefore, is slightly more than the cost of the improvements, after the timing of the two flows has been taken into account. If a slightly higher discount rate were used the present value of the cost savings would be less than the cost. The discount rate which should be applied to quantitative measures of health gain or loss (such as QALYs) is discussed in Appendix 4.

4.17 A full explanation of the use of discount rates can be found in the HM Treasury's *Green Book: Appraisal and Evaluation in Central Government* (2003), Annex 6 [http://greenbook.treasury.gov.uk/annex06.htm].

Data Sources

Health care costs

4.18 The Department of Health and the other UK health departments can help estimate the resources consumed in treating additional patients, or saved through treating fewer patients, as a result of policy. Often it will be sufficient to establish the approximate costs of additional treatment without establishing the exact resources likely to be required.

4.19 A useful and comprehensive source of unit costs for both healthcare and social care is the annual publication *Unit Costs of Health and Social Care* [http://www.pssru.ac.uk/]. This has costs for care in different settings and for the time of different sorts of staff.

4.20 Costs of English NHS hospital care by clinical sub-specialty (or cases grouped by type) are given by the new NHS national price tariff. This is based on average costs across English NHS hospitals and other provision. The published schedule shows the national average cost for a range of treatments and procedures – it covers services provided in hospitals, in the community and in a number of other settings including by ambulance services. The services included range from a visit by a district nurse to the provision of high-level secure placements for mental health patients, and from x-rays to renal dialysis and transplant surgery. See [http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4070195&chk=UzhHA3]. Any remaining uncertainties over the exact level of costs can then be considered in sensitivity analysis.

Costs of other services

4.21 Economic appraisal should also take account of the costs incurred by local authority services such as Social Services and by voluntary services. As the costs of these services are often likely to be small in comparison with the other costs of policy, a rough approximation of their costs will suffice for most appraisals. Where these costs are significant and a more detailed analysis is justified, discussion with social services or other service providers and inspection of detailed accounts might be useful. Average unit costs for social care are published in the annual publication *Unit Costs of Health and Social Care* [http://www.pssru.ac.uk/].

Costs to patients and their families

4.22 Patients and their families incur costs, directly and indirectly, as a result of health care. However, as the direct costs incurred by patients and relatives are likely to be small relative to the total costs of policy, detail will usually be unnecessary. Rough estimates of direct costs can

be generated on the basis of sensible assumptions and information available in The *Family Expenditure Survey* (HMSO) and *Social Trends* (HMSO), or directly from the *Surveys of Disability in Great Britain* (OPCS, 1988, vol. 2). Reference can also be made to existing examples of economic appraisal of health effects. However, when more detailed analysis is likely to be justified, this should be carried out as outlined below.

4.23 Direct costs include the costs of travelling to visit relatives in hospital – see the *Unit Costs of Health and Social Care* [http://www.pssru.ac.uk/ for years up to 2005]. They also include the costs of drugs, dressings and special diets that are required during recuperation at home. Theoretically all additional costs incurred should be considered, such as extra expenditure on telephones, laundry, and electricity. In some cases capital costs may be incurred if continued treatment needs to be provided in the home. The indirect costs incurred by patients include the loss in productive output as a result of treatment and recuperation, although this would already be accounted for where a VPF is incorporated into the appraisal. Relatives also incur the indirect costs of time spent visiting patients or caring for them in the community. Costs incurred through time lost are covered in Appendix 7.

Opportunity cost of nhs resources

4.24 Opportunity cost should be calculated at twice the present value of exchequer costs. This reflects the estimated shadow price arising from the NHS budget constraint: it is estimated that marginal extra spending from the DH budget can achieve benefits at around a QALY for every £25,000. It also reflects societal willingness to pay. This assessment of the opportunity cost of DH spending foregone is consistent with NICE practice. It is assumed that OGDs have the same shadow priced to their programme as does DH.

4.25 The consequence of the inclusion of opportunity cost is that when calculating the net benefit of a policy proposal, the figure from the Total Benefit box should be twice the figure included in the Total Cost box. Policies should not be recommended without additional justifying reasons unless net benefits exceed net exchequer costs by a ratio of two or more.

5. Valuing health effects – the value of a life

Introduction

5.1 In recent years much effort has been made to estimate a monetary valuation of health and life. It is a complex and controversial areas in economic appraisal. It raises ethical issues and involves value judgements.

Valuing risks to life

5.2 Judgements about the values of risks of fatalities cannot be avoided but at least economic appraisal can make them systematic and explicit. This chapter presents the methodologies that have been used. It complements the new guidance document issued for consultation by HM Treasury '*Managing Risks to the Public: Appraisal Guidance*': http://www.hm-treasury.gov.uk/media/8AB/54/Managing_risks_to_the_public.pdf].

5.3 Three main approaches have been used to estimate the value of life: human capital, restitution cost and willingness to pay. Willingness to pay is the only one that is fully consistent with the principles of welfare economics that underlie the standard approach to economic appraisal and has been used to estimate indirectly the monetary value of a QALY, as described later.

The human capital approach

5.4 The human capital approach is based on the discounted value of an individual's future income stream. It therefore values a person's life in terms of the value of the production that would be lost if the person were to die.

5.5 There is a great deal wrong with this approach. First, it values livelihood rather than life. Second, it implies that the lives of those who earn little or nothing have little value. Third, it totally ignores the fact that people are willing to pay, or to risk their own lives, to save the lives of others, whereas economic theory requires that this fact should be recognised in economic appraisal. As a consequence the human capital approach is now generally considered inadequate.

The restitution cost approach

5.6 The restitution cost approach values a drop in health status at the cost of the resources required to restore a victim and his/her relatives to the earlier state. It has been suggested that it can be proxied by the compensation allocated in a court judgement. However, court awards tend to follow rules of thumb (previous rulings) and aim to cover financial losses to dependents (hence mimicking the human capital approach to some extent) and, possibly, a supplement for distress

suffered. They do not systematically aim to provide an estimate of the value, either to an individual or to society, of a life lost. In any case, courts are increasingly seeking advice from economists, so do not necessarily represent a source of independent expertise.

Willingness to pay techniques

5.7 Unlike the two approaches described above, the willingness to pay (WTP) approach to valuing fatal risks has a firm grounding in economic theory. It is based on the principle that what the consumer is willing to pay for a good represents its economic value (under certain conditions).

5.8 Estimates of the amounts people are willing to pay at the margin for marketed goods are easy to establish (the market price) and incorporate in cost-benefit analysis. However, special techniques have to be employed to derive WTP for goods, like fatal risks, for which there is usually no market.

5.9 A problem arises with using the results of these studies in situations that are different from those in which the estimates were obtained. It cannot necessarily be assumed that estimates derived from one scenario can be transferred to another.

Revealed preference

5.10 Revealed preference techniques involve the observation of market situations in which people trade wealth or income against the risk of death or injury. Multiple regression is typically used to isolate the risk effect from all the other factors that vary, and to provide an estimate of the market value of the risk of death.

5.11 One approach is the "hedonic wages" method, an example of which is a study by Marin and Psacharapoulos (1982) which estimated the implicit premia on UK wages for occupations subject to unusually high risks. They examined a variety of industries, and standardised for other factors that influence wage levels (type of job, education, union status and so on) using econometric methods. They concluded that the premium paid to workers facing an additional risk of fatality of 1 in 10,000 each year was around £60 to £70 a year (1975 prices). On a simple interpretation, this implies that these people value the remainder of their lives at about £600,000 or £700,000 (calculated by multiplying £60 or £70 by 10,000).

5.12 There are many econometric and data difficulties involved in undertaking a revealed preference analysis such as this. For example, workers in risky jobs are self-selected, may have only imperfect information about the risks associated with different jobs, and may have different risk preferences from other groups of people.

Stated preference

5.13 Stated preference, or contingent valuation (CV), methods are also used to estimate individual willingness to pay for or accept changes in risk of death. These involve using surveys to establish peoples' preferences by hypothesising a market in which they may "purchase" a reduction in the probability of an accident or "sell" an increase in that probability.

5.14 CV surveys are sometimes designed to reveal the maximum the respondent is willing to pay for a change in the risk of death through a "bidding game" interview. Here, the individual is offered successively higher or lower prices until the maximum he/she is willing to pay is

reached. An alternative approach involves respondents either accepting or rejecting a single bid, with discrete regression analysis being used subsequently to estimate the percentage of respondents who would be willing to pay different prices for a given reduction in risk.

5.15 Various problems arise with CV surveys. Surveys use hypothetical scenarios, so respondents have only a weak incentive to state their true preferences. There are many potential sources of bias; Johannesson and Jönsson (1991) identified five in their CV study. These included incentives for participants to misrepresent preferences, cues which distort behaviour, and non-random selection of participants. However, Johannesson and Jönsson took the view that these biases will not usually lead to overall bias in the estimates of the VPF, but will increase the range of statistical uncertainty surrounding the estimates.

Estimate of the value of a prevented fatality (VPF)

5.16 Contingent Valuation (CV) surveys generate a wide range of values of life. Jones-Lee et al (1985) list a number of stated preference surveys, in which the value of a statistical life ranges from $72,000 to $4,320,000 (1983 prices). WTP estimates generally come out lower than the WTA ones, which is a common result in CV surveys.

5.17 The Department for Transport (DfT) stopped using the human capital approach for valuing risks in 1988, and now uses a value based on the WTP approach. An estimate for the VPF, based on a consensus evaluation of existing research findings that used this approach, was £500,000 (in 1987 prices). This value was updated annually by the increase in per capita money GDP. Based on much empirical work, DfT currently estimates the VPF at about £1.722 million (2008 prices), which includes a small addition for resource costs and net output losses on top of WTP (see DfT *Highways Economics Note No.1: 2004*) [http://www.dft.gov.uk/stellent/groups/dft_rdsafety/documents/page/dft_rdsafety_610642.hcsp].

5.18 A Department of Transport review of 53 studies of the valuation of life (Dalvi, 1988) found a wide range of results, and the chosen value of £500,000 in 1987 prices was at the lower end of the range. The following table from Pearce (1992) shows the results from different types of WTP studies in 1991 sterling prices:

	£ million	
	UK	US
Wage risk methods	2.0 – 2.5	2.5 – 3.9
Other revealed preference methods	0.5 – 2.4	0.7 – 0.8
Stated preference methods	2.9 – 4.5	1.0 – 1.8

5.19 A reasonable approach to take in policy appraisal would be to use the Department for Transport figures but undertake sensitivity analysis using other values.

Valuing changes in the quality and quantity of life using QALYs

5.20 When a policy affects the quality and/or quantity of life, ideally the value of this would be determined through a willingness to pay survey – for example, the DfT has commissioned survey-based estimates of the public's willingness to pay to avoid non-fatal road accidents (also reported in the DfT *Highways Economics Note No.1: (various years)*). In principle it is possible to conduct similar surveys to uncover the welfare losses associated with any health impact.

5.21 However, a survey will often take too long or cost too much to be a feasible option. An alternative is to calculate the QALY impact and then apply a value to a QALY by linking it to other studies. The Department of Health estimates that a QALY has a monetised value of £60,000 at 2009 prices, rising thereafter on the assumption that the relative value of a QALY will rise in line with GDP. (However, use of a 1.5% discount rate for future QALYs already incorporates this projected value rise).

5.22 The estimate of the value of a QALY draws on work by the Department for Transport (DfT) to estimate the value of a prevented fatality (VPF) in a road traffic accident using a stated preference technique of willingness to pay. In England & Wales, the average age of people killed in motor vehicle traffic accidents is about 40 for men and 49 for women. At these ages, remaining life expectancies are 45.2 years and 39.1 years respectively (using cohort life expectancies[4] for 2009). Survival profiles from which these life expectancies are calculated are published by ONS.

5.23 These future life-years can be quality-adjusted using average UK values for health-related quality of life, derived from surveys of self-reported health status for different age respondents.[5] After discounting (at 1.5%), the quality adjusted life expectancy at ages 40 for men and 49 for women is respectively 23.8 and 27.6 respectively. These can be aggregated using the ratios of men to women killed in road accidents – ie 2023:674 in England and Wales in 2005. On this basis, the average loss from deaths in road accidents is estimated as 26.7 QALYs.

5.24 When £1,637,420 is divided by 26.7 QALYs, the result is £61,346 per QALY. This figure conveys a spurious impression of accuracy. Thus an estimate rounded to £60,000 is used.

4 Cohort life expectancies are calculated using age-specific mortality rates which allow for known or projected changes in mortality in later years and are therefore regarded as a more appropriate measure of how long a person of a given age would be expected to live, on average, than period life expectancy. (Although the survival curve shown above uses period mortality rates.) See: http://www.statistics.gov.uk/cci/nugget.asp?id=1898

5 See Paul Kind, Paul Dolan, Claire Gudex, Alan Williams, 'Variations in population health status: results from a United Kingdom national questionnaire survey', BMJ, 1998; 316: 736-741. http://www.bmj.com/cgi/content/full/316/7133/736 This summarises the findings shown in detail in P Kind, G Hardman & S Macran, 'UK Population Norms for EQ-5D', CHE, University of York, 1999, DP 172, at: http://www.york.ac.uk/inst/che/pdf/DP172.pdf

Other methods for valuing changes in the quality and quantity of life

5.25 In some instances it will be too difficult or expensive to derive QALY measures, or to value ill-health directly. It may then be appropriate to value health effects by reference to the value of time lost, which will reflect wage rates. These circumstances will be:

- where it has not proved feasible to derive QALY measures;
- where the ill-health is of short duration and does not impose substantial pain or disability.

In these cases the effects of ill-health will mainly be the loss of work and leisure time involved; including values based upon such measures will capture the main welfare effects.

Valuing lost time in money terms

5.26 Money values for an hour spent travelling are available: see the DfT *Transport Analysis Guidance* [http://www.webtag.org.uk/webdocuments/3_Expert/5_Economy_Objective/3.5.6.htm]. This distinguishes between the value of employers' time and the value of non-working time. In certain circumstances it may be possible to use this to value time lost by patients, relatives, friends and voluntary workers.

Employers' time

5.27 Employers' time, or working time, is valued at its cost to the employer at the margin. This is on the grounds that the working time lost would have been used to produce output, and that the value of that output would have been at least equal to the cost to the employer of hiring the labour. The value of an employee's time to the employer at the margin consists of his/her wage before income tax, employer's National Insurance Contributions plus any other relevant labour costs such as employers' pension contributions.

5.28 The DfT uses estimates of the money value of working time. It puts an average price of £22.11 (2002 prices and values) on one hour of work. However, DfT uses a specific category of worker whenever possible and only uses the average worker when no other data is available.

5.29 The use of earnings in the valuation of employers' time lost is predicated upon the assumption that the labour market works, in the sense of ensuring that appropriate values are put on labour. Labour market imperfections may mean that individuals receive earnings in excess of, or below, their marginal productivity. Further, if there is substantial unemployment, the opportunity cost where an individual does not work through illness may be less, as they can be replaced by another person with little loss to society. For this reason, some studies (Davies and Teasdale, 1994, for example) have lowered the value of the time lost by a factor (two in the Davies and Teasdale example) when there is high unemployment.

Own time

5.30 As the marginal value of own (non-working) time cannot be derived directly from labour market data, DfT used stated preference techniques to estimate the money value of savings in travel time for various different modes of transport. For example, research has investigated how

people choose to travel when faced with a choice between a slow, cheap travel mode and a fast, expensive one or between a short expensive car route (over a tolled bridge) and a long, but cheaper one (see MVA (1987[6]) for further details).

5.31 The latest DfT estimate of the average value of one hour of own time spent travelling instead of on chosen leisure activities is about £5 (2002 prices and values). However, it is difficult to justify using this figure to value time lost by patients, relatives, friends and voluntary workers which would not have been spent in paid employment. First, the people concerned may feel very differently about spending their time in this way rather than spending their time travelling; second, the characteristics of the group may not be similar to those on whom the DfT's analysis was performed. An adjustment based on the relative value of travelling and visiting the sick is required. See also the *Unit Costs of Health and Social Care* [http://www.pssru.ac.uk/]

5.32 Financial payments, such as the cost of sickness benefit, should not be included. These are transfers of spending power from one sector of the community to another. So long as the value of time lost through sickness is included, inclusion of the cost of sickness benefit would lead to double counting. (Transfer payments are those for which no good or service is obtained in return; they may change the distribution of income or wealth, but do not give rise to direct economic costs. See HMT's *Green Book*, 2003, ch.5: http://www.hm-treasury.gov.uk/data_greenbook_index.htm]

5.33 Even where you cannot reach a specific money value, an upper or lower value will be implied by the eventual policy decision itself. Making that valuation explicit promotes transparency and consistency of decision-making and hence efficiency in the use of resources.

Summary of Chapter 5

- Estimate the average money value of the health care resources required (or saved) for each person affected. Multiply by the number of people affected. Include any other resource costs, such as those falling upon employers, social services, or other sectors of the economy.
- Make an estimate of the likely loss of quality/duration of life for each person.
- Explore the possibility of including the monetary value of the pure health effects in the analysis to enable the purely health consequences of the policy to be weighed against the other costs and benefits.

6 MVA Consultancy, Institute for Transport Studies, University of Leeds, Transport Studies Unit, University of Oxford. The Value of Time Savings. *Policy Journals*, 1987

An Example

A study on road safety for the Department of Transport by the Transport Research Laboratory, *Costs and Benefits of the European Experimental Vehicles Committee Pedestrian Impact Requirements*, illustrates how such valuations of mortality and ill-health can be integrated into appraisals.

Background

Approximately 10,000 pedestrians are killed and 90,000 seriously injured each year in road accidents in the EU. On average, approximately 60% of these casualties are struck by the fronts of cars. The design of car fronts can be improved to reduce the frequency and severity of pedestrian injuries, and the European Experimental Vehicles Committee proposed a set of performance requirements, based on tests.

The TRL report considered the injury reduction benefits which could be expected in the EU, assuming implementation of the proposed requirements as an EU Directive, and the cost implications these requirements would have for the automotive industry producing cars for sale in the EU.

The values used for injuries were based on those used by the Department of Transport for UK Personal Injury Accidents, calculated on a willingness to pay basis. The values used were about £683,000 for a fatal injury, and £71,000 for a serious injury, both at 1991 prices. The expected reduction in the number of injuries was calculated for each year from 2000 to 2010 as:

Predicted number of casualties

x Proportion of improved cars on the road

x Proportion saved (mix of estimated rate of fatal and serious injury reductions)

The injury costs of the reductions were then calculated for each year over the ten year period, and discounted back to 2000.

Key Results

1. Changes in vehicle design to comply with the proposed requirements would produce reductions of 7% in the number of fatal pedestrian injuries, and 21% for serious pedestrian injuries.

2. The extra cost to the automotive industry of cars produced for sale in the EU in 2000 would be £172 million.

3. The reduction in fatal and serious pedestrian injuries resulting from vehicle design changes would produce an estimated discounted benefit over ten years of £1,293 million. This implies a benefit to cost ratio of 7.5 : 1.

6. Quantifying uncertainty and risk

6.1 Policy appraisal should take account of any uncertainties in the estimates of costs and benefits. It is important that decision-makers should be made aware of any significant sources of uncertainty in the expected outcome and should be given an estimated range of the likely outcomes. HM Treasury's *Green Book: Appraisal and Evaluation in Central Government* (2003) gives more detailed guidance on handling risk and uncertainty.

6.2 Key potential areas of uncertainty in health impacts may be identified by applying the following framework.

CIRCUMSTANCES How many people will be affected and to what extent?	e.g. How many people regularly drink excess units of alcohol?
TIMING What is the length of time between exposure to some hazard and the effect on health?	e.g. How long after moving to live in radon-affected premises does the increased incidence of cancer become significant?
BEHAVIOUR How will affected people behave in given circumstances?	e.g. What average reduction in cigarette smoking follows a given rise in the real price?
SCIENTIFIC UNCERTAINTY How precisely known is the medical or scientific effect of a given situation?	e.g. What is the effect on heart attacks of reduced consumption of saturated fats?
NATURAL VARIABILITY Given knowledge of the average scientific effect, the actual effect on any given occasion will still vary around the average.	e.g. The effect of exposure to exhaust fumes will vary from one sample to another.

6.3 The term "risk" is used to describe situations where it is possible to estimate probabilities with reasonable accuracy. Appraisal can then be based on these probabilities. Uncertainty describes the more common situation where probabilities cannot be accurately estimated. Even in uncertain cases, however, judgments about probabilities (whether explicit or implicit) are usually used as the basis of appraisal.

Dealing with risk/uncertainty

6.4 In most appraisals, the best approach is to estimate plausible ranges for the important uncertainties. Where, for example, there is uncertainty about the number of people whose health will be affected, a range of values should be considered as well as a central estimate. It is possible, in some cases, to reduce the range of uncertainty by research; but this is often too costly to justify.

6.5 Sensitivity analysis is a valuable method of handling risk in an appraisal. This involves a systematic examination of how changes in particular assumptions affect the overall outcome of the appraisal. This process should reveal which, if any, of the assumptions are crucial to the outcome of the appraisal.

6.6 Probabilistic sensitivity analysis is a more rigorous approach, which involves being explicit about the probabilities assigned to the likelihood of different outcomes within each sensitivity analysis range – e.g. the probabilities of the central estimate, worst case and best case. It is particularly useful when many factors are uncertain. (See *Dealing with parameter uncertainty in cost-effectiveness analysis*, §5.9 in *Guide to the Methods of Technology Appraisal*, NICE, 2008 [http://www.nice.org.uk/aboutnice/howwework/devnicetech/technologyappraisalprocessguides/guidetothemethodsoftechnologyappraisal.jsp]).

Summary of Chapter 6

- Identify the major uncertainties and estimate the range of outcomes together with a best central estimate.
- Perform sensitivity analysis to reveal the consequences of varying the main assumptions on which the appraisal is based.

7. Third sector issues

7.1 The third sector consists of a range of organisations including voluntary and community organisations, social enterprises, mutuals and co-operatives. The Treasury publication, 'Exploring the role of the third sector in public service delivery and reform: A discussion document' [http://www.hm-treasury.gov.uk/media/34C/1D/vcs_thirdsector210205.pdf] outlines the benefits associated with increased third sector involvement in public service delivery.

7.2 The document argues that the characteristics associated with the third sector result in it being better at delivering public services in certain circumstances, particularly where government and market failures exist. The benefits include:

- a strong focus on the needs of service users;
- knowledge and expertise to meet complex personal needs and tackle difficult social issues;
- an ability to be flexible and offer joined-up service delivery;
- the capacity to build users' trust; and
- the experience and independence to innovate.

7.3 Third sector involvement in the design, commissioning and evaluation of services can also lead to wider benefits resulting from the fact that the third sector 'sometimes delivers services in a different way'. These include:

- involving local people to build community 'ownership';
- building the skills and experience of volunteers – especially the young; or by
- increasing trust within and across communities, thereby building social capital.

7.4 Due to a lack of reliable data related to the third sector, quantifying the benefits associated with third sector involvement in the delivery of public services has proved to be challenging. However, where a policy option deals with third sector involvement the relevant benefits listed here and in the tables below should be included in a health impact assessment.

7.5 The first table below illustrates how third sector strengths would meet the requirements of successful public service delivery and why. The second table links third sector organisational characteristics to its strengths.

Table 3: Matching public service requirements with third sector organisations' strengths

Public service requirement	Third sector strength	Reason
The quality of service being provided is difficult to specify, measure and monitor	User focus	Private providers may have an incentive to reduce quality to increase profit. The third sector has no such incentive
The demands of service users are highly differentiated	Flexibility, innovation and 'joining up'	Public and private providers are geared to provide services for large numbers of people. The third sector has the flexibility to deal with individual needs
When services have to be directed at localities or sections of the community that have been excluded from traditional service provision	Knowledge, expertise and experience	Third sector organisations are often established by members of the excluded community in response to a perceived gap or inadequacy in service provision
Labour-intensive services where the flexibility and commitment of volunteers can be an asset	User focus	Volunteers tend to spend more time providing a higher quality service, especially for disadvantaged people
Services directed at users that do not trust businesses or the government	Trust and accessibility	Third sector providers have no hidden agendas and higher credibility with disaffected users
Service users are likely to require a coordinated portfolio of services	Flexibility and 'joining up'	Third sector providers spend more time on bringing services together for the user
Users often have difficulty engaging with service providers (multiple disadvantages)	Flexibility and 'joining up'	Wider stakeholders allow the third sector to focus on overlapping disadvantage

Table 4: Linking the third sector's strengths to specific organisational characteristics

Third sector strength	Organisational characteristic	Reason
User focus	Principally reinvesting surpluses Loosely defined goal or goals Informal accountability to multiple stakeholders	Wide goals and stakeholder interests tend to prevent organisations from capture by a strong set of views
Knowledge, expertise and experience	Loosely defined goal or goals Informal structure Informal accountability to multiple stakeholders High proportion of volunteers	Informal organisations tend to attract people with personal experience of problems who wish to help others
Flexibility, innovation and 'joining up'	Loosely defined goal or goals Informal structure Informal accountability to multiple stakeholders High proportion of volunteers Local coverage	Joining up needs to be done at a local level. Smaller and more informal organisations tend to be more flexible
Trust and accessibility	Reinvesting of most surpluses Informal accountability to multiple stakeholders Multiple sources of finance	Reduced self-interest and the user focus of multiple stakeholders allows organisations to speak with more credibility. Having many sources of finance reduces dependency on public sector contracts

8. Reporting the results

8.1 The results of an appraisal of the health effects of a policy initiative should be set out in the health impact assessment section of the main impact assessment. As far as is practicable the assessment should include the following:

- the policy options considered;
- the health impacts identified;
- the costs and benefits of each option, and their distribution;
- the sensitivity of these results to changes in key assumptions;
- how the results of one option compare with those of the alternatives;
- any monitoring required to enable the policy to be evaluated.

8.2 While every attempt should be made to quantify and value the costs and benefits, this may not always be possible. Sometimes, the effects on quality and duration of life will be described judgmentally. In other cases, a QALY analysis may quantify health effects but not give these a monetary value.

8.3 Even if quantification and valuation are not possible, it is important to note all relevant effects in the report and assess their importance.

Presenting health costs and benefits

8.4 It is only when considering options that have different costs but the same effect on health that results can easily be presented in purely monetary values. This is rarely the case for policies put forward by most Government Departments.

8.5 Sometimes the results can be expressed using some measure related to money, for example:

- the expected cost per life saved;
- the cost per QALY gained; or
- some other measure such as the cost of a unit reduction in blood pressure.

8.6 Usually, there will be many different health effects to be reported. It may not be possible to weight and sum these into one figure. In this case, the report will generally need to summarise the various costs and benefits in tables and assess the trade-offs implied by the different decisions.

Reporting sensitivity analysis

Sensitivity analysis should always be used to test the robustness of the preferred choice of option to changes in key assumptions. Its results will usually be summarised in tables, and assessed in the accompanying text.

Key assumptions and recommendations

Key assumptions, such as the value given to preventing risks of fatalities, should be noted openly. The recommended course of action should be stated clearly along with the most important facts and assumptions upon which it rests.

Monitoring and evaluation

Evaluation of past decisions is central to good policy making. Monitoring and evaluation should be used both to confirm the policy choice and to inform future decisions. The appraisal should establish the necessary monitoring and evaluation procedures. The nature and scope of the evaluation should reflect the importance and likely costs and benefits of the policy. As a minimum, the evaluation should cover the impact of the policy on the desired outputs and outline the main costs and non-monetary benefits. Further, more detailed, information is given in HM Treasury's *Green Book: Appraisal and Evaluation in Central Government* (2003).

Summary of Chapter 8

- Report the results of the policy appraisal, covering the main points noted above, and giving the best attempts at quantification and valuation of the impacts.
- Use tables to summarise the different effects. Note also the effects that do not lend themselves to monetary valuation.
- Display in summary form the outcome of the sensitivity analysis.
- Present succinctly any judgements which are key to the assessment of the options, such as the value given to preventing risks of fatalities.
- State your recommendation, along with any key reasons or qualifications.
- Establish the monitoring necessary to enable future evaluation of the policy decision.

Bibliography

Bergner M, Bobbitt RA, Kressel S, Pollard WE, Gibson BS, Morris JR. The sickness impact profile: conceptual formulation and methodology for the development of a health status measure. *Int J Health Serv* 1976; 6: 393-415.

Brazier JE, Harper R. Jones NM *et al.* Validating the SF-36 Health Survey Questionnaire: New Outcome Measure for Primary Care. *BMJ* 1992; 305: 160-4.

Buxton MJ, West RR. Cost benefit analysis of long-term haemodialysis for chronic renal failure. *BMJ* 1975; 2: 376-9.

Cohen DR. *The Benefits and Costs of a Ban on the Sale of Non-Pasteurised Milk in Scotland.* Aberdeen: University of Aberdeen, 1982. (Health Economics Research Unit; Discussion paper no. 08/82).

Culyer AJ, Wagstaff A. QALYs Versus HYEs; *A Theoretical Exposition.* York: Centre for Health Economics, 1992. (Discussion paper; No 99).

Dalvi MQ. *The Value of Life and Safety: A Search for a Consensus Estimate.* London: Department of Transport, 1988.

Davies NV, Teasdale P. *The costs to the British economy of work accidents and work-related ill health.* London: HMSO, 1994.

Department of Employment. *Labour Force Survey.* London: HMSO.

Department of Health. *Centrally commissioned research programme.* Heywood (Lancashire): Department of Health, 1995.

Dodd CE, Stewart GS, Waites WM, *et al.* Biotechnology-based methods for the detection, enumeration and epidemiology of food poisoning and spoilage organisms. *Biotechnolgy and Genetic Engineering Review* 1990; 8: 1-52.

Donaldson C. *Theory and practice of willingness to pay for health care.* Aberdeen: University of Aberdeen Health Economics Research Unit, 1993. (HERU working paper; 01/93).

Drummond MF. *Principles of economic appraisal in health care.* Oxford: Oxford Medical Publications, 1980.

Drummond MF. *Studies in economic appraisal in health care.* Oxford: University Press, 1981.

Drummond MF, Ludbrook A, Lowson KV, Steele A. *Studies in economic appraisal in health care: Volume Two.* Oxford: OUP, 1986.

EuroQol Group. EuroQol: A New Facility for the Measurement of Health Related Quality of Life. *Health Policy* 1990; 16: 199-208.

Family Expenditure Survey. London: HMSO.

Fenton FR, Tessier L, Contariddriopoulos AP, Nguyen H. Struering EL. A comparative trial of home and hospital psychiatric treatment: financial costs. *Can J Psychiatry* 1982; 27: 177-87.

Gafni A. The quality of QALYs: do QALYs measure what they at least intend to measure? *Health Policy* 1989; 13: 81 -3.

Gibbins FJ, Lee M, Davison PR *et al*. Augmented home nursing as an alternative to hospital care for chronic elderly invalids. *BMJ* 1982; 284: 330-3.

Gudex C, Kind P. *The QALY Toolkit*. York: Centre for Health Economics, 1988. (Discussion paper; No 38).

Gudex C, Kind P. Van Dalen H. Durand MA, Morris J. Williams H. *Comparing scaling methods for health state valuations: Rosser revisited*. York: Centre for Health Economics, 1993. (Discussion paper; No 107).

Health Service Trends: Health Database. London: Chartered Institute of Public Finance and Accountancy, 1992.

HM Treasury. *Policy evaluation: a guide to managers*. London: HMSO, 1988.

HM Treasury. *Economic appraisal in central government: a technical guide for government departments*. London: HMSO, 1991.

Hospitals and health services yearbook: 1993. London: Institute of Health Services Management, 1993.

Hunt SM, McEwen J. McKenna SP. *Measuring Health Status*. London: Croom Helm, 1986.

Ives D, Soby B. Ball D, Kemp R. Revaluation of non-fatal casualty costs: a report of the application of the relative utility loss approach (RULA). *TRL Contractor Report* 1993; 329.

Johannesson M, Jönsson B. Economic evaluation in health care: Is there a role for cost-benefit analysis? *Health Policy* 1991; 17: 1-23.

Jones-Lee MW. *The Value of Life: An Economic Analysis*. Martin Robertson, 1976.

Jones-Lee MW. *The Economics of Safety and Physical Risk*. Oxford: Blackwell, 1989.

Keeler EB, Cretin S. Discounting of Life-Saving and other non-monetary Effects. *Management Science* 1983; 29: 300-6.

Kind, P. *The Design and Construction of Quality of Life Measures*. York: Centre for Health Economics, 1988. (Discussion paper; No 43).

Ludbrook A. Using economic appraisal in health services research. *Health Bull* 1990; 48: 81-90.

Marin A, Psacharapoulos G. The Reward for Risk in the Labour Market: Evidence from the United Kingdom and a Reconciliation With other Studies. *Journal of Political Economy* 1982; 90: 827-853.

Mauskopf JN, French MT. Estimating the value of avoiding morbidity and mortality from foodborne illnesses. *Risk Analysis* 1991; 11: 619-31.

Mooney GA. *The valuation of human life*. London: Macmillan, 1977.

Moore. M. and Viscusi, W. Doubling the Estimated Value of Life Results Using New Occupational Fatality Data. *Journal of Policy Analysis and Management* 1989: 7(3): 476-490.

Mowat IG, Morgan RT. Peterborough hospital at home scheme. *BMJ* 1982; 284: 641-3.

MVA Consultancy, Institute for Transport Studies, University of Leeds, Transport Studies Unit, University of Oxford. The Value of Time Savings. *Policy Journals*, 1987.

Netten A, Dennet J. *Unit Costs of Community Care 1995*. Canterbury: University of Kent, PSSRU.

Nord E. An alternative to QALYs: the Saved Young Life Year Equivalent (SAVE). *BMJ* 1992; 305: 875-7.

Parsonage M, Neuberger H. Discounting and health benefits. *Health Economics* 1992; 1: 71-6.

Patrick DL, Bush JW, Chen MM. Methods for measuring levels of well-being for a health status index. *Health Services Research* 1973; 8: 228-45.

Pearce D, Bann C, Georgiou S. *The social cost of fuel cycles*. London: HMSO, 1992.

Rosser R. Kind P. A scale of states of illness: is there a social consensus? *Int J Epidemiol* 1978; 7: 347-58.

Sackett DL, Torrance GW. The utility of different health states as perceived by the general public. *J Chronic Disease* 1978: 31: 697-704.

Social Trends. London: HMSO.

Spackman M. *Discount rates and rates of return in the public sector: economic issues*. London: HM Treasury, 1991. (Government Economic Service Working Paper; 113).

Torrance GW. Measurement of Health State Utilities for Economic Appraisal. *Journal of Health Economics* 1986; 5: 1-30.

Weinstein MC, Stason WB. Foundations of cost-effectiveness analysis for health and medical practices. *N Engl J Med* 1977; 296: 716-21.

Williams A. Economics of coronary artery bypass grafting. *BMJ* 1985; 291: 326-9.

Wilkinson G. Williams B. Krekorian H. McLees S. Falloon I. QALYs in mental health: a case study. *Psychol Med* 1992; 22: 725-31.

World Bank. *World development report* 1993. Oxford: University Press, 1993.

Yule B. Forbes G. MacLeod A, Sharpe J. *The Costs and Benefits of Preventing Poultry-Borne Salmonellosis in Scotland by Irradiation*. Aberdeen: University of Aberdeen, Health Economics Research Unit. 1986. (HERU Discussion paper; No 05/86).

Useful reading

- **Economic Appraisal**

  HM Treasury. *Economic Appraisal in Central Government: A Technical Guide for Government Departments*. London: HMSO, 1991.

  Layard R (ed). *Cost-benefit analysis*. London: Penguin, 1972.

  Mishan EJ. *Cost-Benefit Analysis*. London: Routledge, 1988.

- **Economic Appraisal in Health Care**

  Drummond MF. *Studies in Economic Appraisal in Health Care*. Oxford: University Press, 1980.

  Drummond MF. Principles of economic appraisal in health care. Oxford: Oxford Medical Publications, 1980.

  Gerard K. *A Review of Cost-utility Studies*: Assessing their Policy Making Relevance. Aberdeen: University of Aberdeen, Health Economics Research Unit, 1991.
  (HERU Discussion paper; No 11/91).

  Ludbrook A. Using Economic Appraisal in Health Services Research. *Health Bull* 1990; 48: 81-90.

  McGuire A, Henderson J. Mooney G. *The Economics of Health Care*. London: Routledge, 1988.

  Mooney G. *Economics, Medicine and Health Care*. Hemel Hempstead: Harvester, 1992.

  Mooney G. Russet E, Weir R. *Choices for Health Care: A Practical Introduction to the Economics of Health Provision*. 2nd ed. Basingstoke: MacMillan, 1986.

  Robinson R. Economic Evaluation and Health Care: what does it mean? *BMJ* 1993; 307: 670-3.

- **Measuring Health States**

  McDowell I, Newell C. *Measuring Health: A Guide to Rating Scales and Questionnaires*. Oxford: University Press, 1987.

- **QALYs**

  Coast J. Reprocessing data to form QALYs. *BMJ* 1992; 305: 87-90.

  Gudex C, Kind P. *The QALY Toolkit*. York: Centre for Health Economics, 1988. (Discussion paper; No 38).

  Kind P. *The design and construction of quality of life measures*. York: Centre for Health Economics, 1989. (Discussion paper; No 43).

  McGuire A, Henderson J. Mooney G. *The Economics of Health Care*. London: Routledge, 1988.

- **The Valuation of Life**

Jones-Lee MW. *The Value of Life: An Economic Analysis*. London: Martin Robertson, 1976.

Miller, T. The Plausible Range for the Value of Life: Red Herrings among the Mackerel. *Journal of Forensic Economics,* 1990.

Mooney G. *The Valuation of Human Life*. London: Macmillan, 1977.

Pearce D, Bann C, Georgiou S. *The social cost of fuel cycles*. London: HMSO, 1992.

- **Data Sources**

Annual Report of the Registrar General for Scotland. Edinburgh: General Register Office for Scotland.

Central Statistical Office. *Guide to Official Statistics*. London: HMSO, 1990.

Common Services Agency. *Cancer Registration Statistics, Scotland*, 1981-1990. Edinburgh: Scottish Health Service.

Common Services Agency. *Scottish Health Service Costs*. Edinburgh: Common Services Agency.

Department of Employment. *Labour Force Survey*. London: HMSO.

Department of Health. *Centrally commissioned research programme*. Heywood (Lancashire): Department of Health, 1995.

Department of Health. *Health of the Nation: One Year on: a report of the progress of the health of the nation*. London: Department of Health, 1993.

Department of Health. *Health and Personal Social Services Statistics for England*. London: HMSO

General Register Office for Scotland. *Occupational Mortality for Scotland*. Edinburgh: HMSO.

Health Database 1991: *Health Service Trends*. London: Chartered Institute of Public Finance and Accountancy, 1992.

Hospitals and Health Services Yearbook. London: Institute of Health Services Management, 1993.

Immunisation against infectious diseases. London: HMSO.

Local Government Financial Statistics for England and Wales. London: HMSO.

Netten A. *Unit Costs of Community Care*. Canterbury: University of Kent, PSSRU.

Occupational Mortality: the Registrar General's decennial supplement for England and Wales. London: HMSO.

OPCS. *Cancer Statistics: registrations: England and Wales*. London: HMSO. (Series MB1)

OPCS. *Morbidity Statistics from General Practice: Fourth National Study, 1991-92*. (MB5; 3). London: HMSO.

OPCS *Monitor: Deaths by Cause*. London: HMSO. (Series DH2).

Padden SCR (ed). *A Guide to Health Service Statistics*. Cheadle, IFM Healthcare, 1993.

Public Health Common Data Set incorporating indicators from the Health of the Nation. Guildford: Institute of Public Health, University of Surrey.

Social Trends. London: HMSO

Scottish Health Statistics. Edinburgh: ISD Publications.

Scottish Office. *Scottish Local Government Financial Statistics*. Edinburgh: Scottish Office The Family Expenditure Survey. London: HMSO

The Registrar General's Quarterly Return for England and Wales. London: HMSO.

Welsh Office. *Health and Personal Social Services Statistics for Wales*. Cardiff: Welsh Office.

Welsh Office. *Key Statistical Indicators for Health in Wales*. Cardiff: Welsh Office.

Glossary

Allocative Efficiency: Occurs when the mix of goods produced and consumed is such that the benefit obtained from the available resources is maximised.

Appraisal: The process of defining objectives, examining options and weighing up the costs and benefits before a decision is made.

Average Costs: Total production costs per unit of output.

Clinical Trials: Organised studies which provide clinical data for the statistical evaluation of medical interventions. They usually involve comparing the outcomes of patients randomly allocated between the study group (who receive the treatment under question) and a control group (who do not).

Cost-Benefit Analysis (CBA): The most comprehensive form of economic appraisal which seeks to quantify in money terms as many of the costs and benefits of a proposal as possible, including items for which the market does not provide a satisfactory measure of economic value.

Cost-Effectiveness Analysis (CEA): The comparison of alternative ways of producing the same or similar outputs. which are not normally given a monetary value. Often used to find the option that meets a predefined objective at minimum cost.

Cost-Utility Analysis (CUA): A form of economic appraisal particular to the analysis of health effects, in which changes in health are expressed in terms of QALYs (or other generic health state measure) rather than monetary values, but the tangible resource consequences are expressed in monetary terms. In CUA the overall effects of projects are expressed and compared in terms of the "cost per QALY".

Contingent Valuation: A technique used to elicit people's valuations of a good for which there is no market price (or when the market price is not a good indicator of economic value). it uses direct survey questions to establish people's willingness to pay for the good, or the amount of compensation people would be willing to accept to compensate for the loss of the good. Also called "stated preference".

Day-Case: Patients admitted electively to a hospital bed during the course of a day with the intention of receiving care which can be completed in a few hours, so that they do not require to remain in hospital overnight.

Discounting: The technique of converting future monetary amounts into their equivalent value in today's terms by applying a discount rate. Used to make streams of benefits and costs comparable for the purposes of appraisal.

Discount Rate: The annual percentage rate at which the present value of a future £ is assumed to fall away through time.

Dose-Response Relationship: The relationship between the level of exposure to a health hazard and the resultant impact on people's health. Often needs to be estimated as part of the process of quantifying the health impacts of policy.

Dynamic Efficiency: Occurs when the right share of resources is allocated to investment and research and development to improve and maintain the efficient allocation of resources over time.

Economic Cost: See opportunity cost.

Econometric Model: An attempt to capture the fundamental features of a system in terms of mathematical equations representing the relationship between variables in that system, e.g. modelling the incidence of a disease would involve formulating a statistical equation containing the variables believed to influence incidence.

Epidemiology: The study of the occurrence, distribution and causes of disease in mankind.

Externality: Externalities occur when the actions of one agent affect another agent in ways not reflected by monetary transactions in the market place, (for example when the polluter does not pay).

Exposure Assessment: Estimation of the level of exposure to a health hazard that is likely to result following the implementation of policy. Required along with an assessment of the dose-response relationship if the health effects of policy are to be quantified.

Ex ante: Expected or intended; before the event.

Ex post: The result; after the event.

Evaluation: A review of a project or policy after its implementation to assess the degree to which objectives have been achieved and how efficiently, and what lessons can be learnt for the future.

Healthy Years Equivalent (HYE): A measure of health status which express the value of a profile of years of less than full health in terms of the equivalent number of years of full health. The approach establishes the number of years of full health which an individual values the same as a (greater) number of years in less than full health.

Human Capital Approach: A method for estimating the value of human life in terms of the value of future output lost if the person were to die.

In-Patient: Patients who are admitted to a hospital or other health care facility for at least an overnight stay.

Imputed Value (or Shadow Price): The figure derived, or used as a proxy for, the economic value of a resource for which there is no market price or the market price is inappropriate.

Market Value: The value of a commodity indicated by its market price. This need not necessarily represent the opportunity cost of the commodity.

Marginal Cost: The additional cost incurred in producing an extra unit of output (for example, in treating an additional patient).

Morbidity: A measure of the extent to which an illness or abnormality occurs within a given population.

Mortality: The death rate, reflecting the number of deaths within a given population.

Net Present Value (NPV): The difference between the present values of a stream of benefits and a stream of costs over time.

Opportunity Cost (or Economic Cost): The costs of a given economic action in terms of the benefits of the next best alternative foregone. This may or may not be expressed in monetary terms.

Option Value: The value derived from the possibility of using an asset at some future date.

Out-Patient: A patient who does not occupy a hospital ward bed, but who receives treatment in an ambulatory care facility.

Pivotal Value: The "critical" value of a parameter, such that values above and below it will result in different decisions concerning the implementation of policy.

Present Value: The capitalised value of a stream of future costs or benefits – that is to say the stream discounted and summed.

Productive Efficiency (or X-Efficiency): Occurs when producers use the least-cost combination of inputs to achieve a given output.

Quality-Adjusted Life Years (QALYs): A measure of health status in terms of the quality of life associated with a state of health, and the number of years for which that health status is enjoyed.

Real Terms: The value of expenditure at a specified general price level: that is a cash expenditure divided by a general price index.

Regression Analysis: A form of statistical model which relates a dependent variable to one or more independent or explanatory variables which are believed to determine it.

Restitution Cost Approach: A method for estimating the value of a drop in health status in terms of the costs of resources required to restore the victim to his/her original state.

Risk: The probability of an adverse outcome, or the likelihood attached to different outcomes, which can be estimated with reasonable accuracy.

Rosser Scale: A scale widely used to value the quality of life associated with a given condition. It defines health status in terms of two dimensions: distress and disability.

Saved Young Life Equivalent (SAVEs): A measure of health status in which the unit of value is society's valuation of saving the life of a young person and restoring him or her to full-health.

Sensitivity Analysis: Analysis of the effects on an appraisal of varying the projected values of certain key variables or assumptions.

Standard Gamble: A method of establishing the quality of life associated with given health states. Respondents are asked to choose between remaining in their current health state and taking a risky therapy which has a given probability of restoring them to full health but also involves a risk of instant death. Stated Preference: See Contingent Valuation.

Statistical Life: The value of a statistical life measures society's willingness to pay (ex ante) to reduce risks of death or its willingness to accept compensation to tolerate small changes in risk. This is distinct from the (ex post) value of avoiding certain death. For example, there is likely to be a maximum amount that society would be willing to pay for a new technology which could reduce the average number of deaths in coal mines by one person per year. This is the value of a statistical life. In contrast, if an accident actually occurs and an individual is trapped, society is usually prepared to take any action required to free that persons, whatever the cost.

Time Trade-Off: A method of establishing people's valuation of health states which involves asking people to compare living in a shorter period in perfect health with a longer period in a state of ill-health.

Transfer Payments: Payments not made in return for a productive service, such as social security payments. These should not be included as a cost to society in economic appraisal.

Uncertainty: The situation where an unanticipated outcome is possible, but the probability of it occurring cannot be estimated with any reasonable accuracy.

Value Judgement: A subjective proposition that cannot be reduced to an arguable statement of fact.

Visual Analogue: A method of establishing the quality of life in which respondents are asked to relate their current health status to a drawn line, usually with two fixed endpoints equating to full health and death.

Willingness to Pay (WTP) or Willingness to Accept (WTA): Economic concepts which refer to the value that people place on commodities by reference to their preferences for receiving goods and services, or for accepting compensation if commodities are lost.

401334C 1p July 10
Produced by COI for the Department of Health

www.dh.gov.uk/publications