Policy Appraisal and Health

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A guide from the Department of Health

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Executive Summary

Introduction

S1. The health of the population is of vital concern to all. The Government has set targets and action plans to both improve health and reduce health inequalities[1]. Achievement of these improvements is significantly affected by the activities of many public bodies, not only those of the health services.

S2. Health effects have not always been taken properly into account in policy making. Considering them at the appraisal stage is an important step towards ensuring that national health targets are met. The purpose of this guide is to explain how this can be done. The main text is intended for anyone who might carry out such an appraisal, while the appendices provide detailed technical guidance and reference sources. This summary is intended for anyone who may need to commission a policy appraisal but would not expect to carry one out personally.

The role of policy appraisal

S3. In order to make the best use of the nation's resources, the costs and benefits of alternative policies, programmes and projects need to be carefully weighed up. HM Treasury's *Green Book: Appraisal and Evaluation in Central Government* (2003)[2] explains how to do this.

S4. Special problems can arise in identifying and weighing up the effects 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.

The role of policy teams

S5. 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 (Chapter 2);

ii) assess their magnitude (Chapter 3);

iii) value them in monetary terms where this is helpful (Chapter 4);

iv) identify the main sources of uncertainty in the analysis (Chapter 5); and

v) present the results clearly for decision makers (Chapter 6).

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[1] See ***Choosing Health: making healthier choices easier***, CM 6374, 2004 [at: http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4094550&chk=aN5Cor] and ***The NHS Improvement Plan***, 2004, ch.4 [http://www.publications.doh.gov.uk/nhsplan/nhsimprovementplan-ch4.htm]).

[2] Available at: http://greenbook.treasury.gov.uk/

Step (i) will normally be the responsibility of the policy leads (consulting stakeholders and specialists), at least initially, whereas steps (ii) to (iv) are more likely to involve specialists and analysts.

How to identify health impacts

S6. Chapter 2 sets out in more detail how to go about identifying health impacts. The main steps are described briefly here.

A brainstorming session is often a fruitful way of making a start. It may be useful to identify the major health risk factors associated with the policy, programme or project. These could be:

- diet (choice, availability)
- lifestyle (exercise, sexual behaviour)
- tobacco and alcohol consumption
- psycho-social environment (exposure to stress, crime, etc)
- housing conditions (cold, damp, sanitation, food storage, waste disposal, air quality, etc)
- accidents and safety
- pollution
- exposure to chemicals (drugs, industrial products)
- infection
- geophysical factors (uv light, radon)
- economic factors (poverty, employment).

S7. A useful way of noting these impacts is to list all the actions that a policy involves down one side of a grid, then list along the top all the risk factors that could occur. This is outlined in Appendix 2.

S8. Check that you have thought of indirect health effects, for example changes in consumer behaviour or production patterns, as well as direct ones. These may be less obvious – e.g. arising through changes in regulations, or taxes or subsidies which alter the relative prices of goods and services.

S9. It is important to realise that health impacts can be either changes in the quality and quantity of life or changes in health expenditures, or more likely both.

S10. Finally, try to identify any major uncertainties. These will need further investigation and should be highlighted in the final appraisal.

How specialists can help

S11. You may need to draw on advice from a range of others such as stakeholders, epidemiologists, economists, clinicians, safety experts, toxicologists, researchers, and others. Evidence may be available from the Health Development Agency, DH and other sources.

S12. Some of the main problems in carrying out an economic appraisal of health costs and benefits arise from the need to measure health itself. A lot of effort has been put into designing suitable techniques, combining changes in the length and quality of life, either or both of which may be affected by a policy, programme or project. Such techniques are now widely accepted, though they still need to be applied with care.

S13. Chapter 7 of the main text describes a particular case study which illustrates the use of a range of appraisal techniques relevant to health.

Conclusion

S14. All policy, programme and project options in the public sector should be systematically appraised. This means identifying and weighing up all important costs and benefits. Health is important and is affected by many different areas of public policy. Health impacts should therefore be fully considered when carrying out policy appraisal, beginning when options are first considered. Responsibility for this rests with those who will take the final decision as well as all those who contribute advice. This guide gives advice on how to appraise health effects, and should be studied by anyone who will be called upon to carry out such an appraisal.

CHAPTER I

Appraising the health implications of policy

1.1 The Government has set targets and action plans to both improve health and reduce health inequalities (*Choosing Health: making healthier choices easier* CM 6374, 2004 [http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4094550&chk=aN5Cor] and *The NHS Improvement Plan*, 2004, ch.4 [http://www.publications.doh.gov.uk/nhsplan/nhsimprovementplan-ch4.htm]). It recognises that the policies and activities of many Government Departments and public bodies have an impact on health; and that, although in some areas well-developed techniques are used to assess these, health costs and benefits have not always been adequately taken into account when assessing and formulating policy.

Purpose of this document

1.2 This document is designed to give practical guidance to Government Departments and other public sector agencies on how to assess the expected impact of their policies on health - both quantity and quality. It provides guidance on how to incorporate health impacts consistently throughout the public sector into the wider assessments of costs and benefits required for policy development. This document does not address policy evaluation, which occurs after policy implementation. It also does not discuss risk management approaches. It complements other government guidance on appraisal, particularly that from HM Treasury ['*The Green Book*': http://www.hm-treasury.gov.uk/Economic_Data_and_Tools/greenbook/data_greenbook_index.cfm and '*Managing Risks to the Public: Appraisal Guidance*' a consultation draft: http://www.hm-treasury.gov.uk/media/97B/53/97B5344C-BCDC-D4B3-1F12E3FFEB34F0A0.pdf].

The role of policy appraisal

1.3 Appraisal in government is concerned with the best use of the nation's resources. Health is a key aspect of the nation's well-being. Any significant effects on the health of our nation should therefore be included.

1.4 Ministers and decision-makers at local levels make judgements on the public interest in the light of the information with which they are provided. Good policy decisions depend upon having the best available information on alternative options. How deeply you appraise health effects should reflect the importance of the decision and how critical health impacts are to it.

Policy appraisal in practice

1.5 The best way to assess the implications of any policy is systematically to identify, quantify and value the costs and benefits of the proposed measures. This appraisal process has been put into practice on a great number of occasions; it is described in HM Treasury's *Green Book: Appraisal and Evaluation in Central Government* (2003). In summary, it involves the following stages:

- define the objectives;
- identify the options;

- identify and measure the costs and benefits associated with each option, where possible in monetary terms;
- identify and assess the uncertainties of each option;
- assess the balance between the options;
- present the results;
- set up any monitoring that may be necessary to gauge the effects of the policy, and evaluate the policy at a later stage.

1.6 This guide offers additional advice to ensure that health effects are fully considered during policy appraisal. Assessing health effects gives rise to special problems of identification, quantification and valuation. A sense of proportion is important in deciding how much effort to put into this. Sometimes, it may be clear that the health impact need not be fully assessed. This applies if its effect is small compared to other factors so that it would not change the appraisal's outcome, or it simply reinforces the balance on other factors and does not alter the ranking between policy options. For example, it may be unnecessary to go into great detail of the health benefits of improvements in house insulation if the non-health benefits already exceed the costs. Different techniques of appraisal, with particular reference to health, are discussed in Appendix I.

Policies, programmes and projects

1.7 Health implications may be assessed at three different levels:

- At policy level, where government decides on the appropriate method to achieve its objectives. Assessment is needed here to ensure health is integrated into the development of policy options themselves, particularly where policies are not divisible into programmes/projects, e.g. taxation.
- At programme level, where government establishes a set of related activities to implement policy. Assessment is needed here when assessing particular locations and packages of individual projects.
- At project level, where government sets up self-contained activities, often in specific locations, generally as part of a wider programme. Appraisal at this stage may involve, for example in an industrial project, assessing particular production methods and materials where this has not been done at earlier stages.

Summary of Chapter I

- Good policy decisions depend on good appraisals of policy options.
- Policy appraisal requires a systematic assessment following the steps above.
- Assessing the health implications of policy options can give rise to special problems. This document sets out to show how these problems can be overcome.

CHAPTER 2

Identifying health effects

Introduction

2.1 If you are carrying out an appraisal, it is natural to focus on policy objectives and costs that fall within your immediate area of concern. However, the government is interested in *all* the effects of its policy prescriptions, so it is important to consider the potential implications of any policy for the health of our nation.

2.2 So, when starting an appraisal, all the potential health effects should be identified, namely:

- every significant impact that the policy may have on health
- the implications of each health impact.

2.3 This chapter suggests ways to identify the health impacts that might stem from a policy proposal and their implications. Detailed advice is in Appendix 2.

Identifying health impacts

2.4 The first step is to list all the potential impacts on health of the policy options. One way to do this is to set up a brainstorming session with colleagues.

2.5 Rather than trying to link policy and health directly, it is often easier to identify links between policy and risk factors. Risk factors are the things that influence the probability of an individual becoming more or less healthy. For example, smoking is a risk factor for lung cancer and heart disease. Heavy drinking is a risk factor for heart disease. For a condition like back pain, risk factors include driving, sport, smoking, obesity, whole body vibration, psycho-social factors and stress at work.

2.6 Some risk factors such as a family history of heart disease are not influenced by government policy. The following table shows some of the major risk factors which may be affected by policy decisions.

- Diet e.g. choice and availability
- Lifestyle e.g. exercise, reproductive and sexual behaviour
- Tobacco and alcohol consumption
- Psycho-social environment e.g. exposure to stress, crime risk
- Housing and living conditions e.g. cold, damp, noise, sanitation, food storage and preparation, lighting, space, domestic waste, indoor air quality, capacity for self-care
- Accidental injury in the home, at work, on the roads, or from faulty products
- Pollution
- Occupation e.g. exposure to industrial processes
- Geophysical factors e.g. exposure to ultra-violet light, radon
- Economic factors e.g. poverty, unemployment

2.7 A good way to identify health impacts or risk factors is to use a framework. Down one side of a grid, you should list all the actions that a policy involves. Along the top, you should note the different types of health impact (or risk factors) that can occur. Then fill in the cells. An example is given in Appendix 2.

2.8 Some particular types of health impact may be hard to identify and measure.

Ill-health
Lack of reliable data about ill-health is often compounded by the difficulty in distinguishing its contributing causes (risk factors) and the length of time between exposure to the harmful agent and the resulting ill-health. Specialist advice is likely to be required.

Accidents
Sufficiently detailed or reliable data about how policy affects the occurrence of accidents is sometimes unavailable, although aggregate data is usually obtainable.

Low frequency catastrophic events
Because these are rare, historical data may be extremely limited and unreliable. However, statistical techniques can estimate the present risk.

2.9 In addition to direct effects, you should also look at indirect effects, for example changes in consumer behaviour or production patterns. Consumption patterns may be significantly affected by alterations in the relative prices of different goods and services. Changes in taxes, subsidies and regulations may cause indirect effects on health in this way.

2.10 Wide consultation is helpful: with colleagues or experts in other divisions or in other Departments; and with experts from outside, such as medical, public health, epidemiology, engineering, toxicology, and research professionals. For example:

- A change in the tax on cigarettes will change the number of cigarettes smoked, in turn influencing the incidence of diseases, from heart disease to cancer of the throat. For a full list of diseases, you may need medical advice.
- A change in housing regulations may affect the health of people living in housing estates. To identify what aspects of the housing environment matter for health, and what types of health issue are involved, you may need specialist advice.

2.11 Once you have listed all the significant health impacts of a policy option, you should then be able to decide which are beneficial and which harmful, and also identify any health trade-offs (improvements in health that may be offset by a deterioration in some other aspect of health). You will see which seem important, which can be ignored, and which are the areas where uncertainty is likely to be a key issue.

Identifying the types of effects

2.12 Any health impact will usually have two kinds of effect:

- It will change people's quality and quantity of life.
- It will affect resource costs in the health care sector and in other sectors.

2.13 Any policy appraisal should consider both kinds of health effect – unless they are negligible.

Summary of Chapter 2

- Identify as many of the health effects of the policy change as possible – either direct or from changes in risk factors.
- Identify the likely implications for resource costs, risks and loss of quality and quantity of life, consulting widely with other colleagues, stakeholders and experts where that would be helpful.

CHAPTER 3

Quantifying health effects

3.1 The next step is to quantify health impacts wherever possible, by estimating one or more of the following:

- the number of lives lost;
- the number of years of life lost;
- the severity and duration of any distress, discomfort or disability for those directly affected (and for others).

3.2 How much measurement you are able to do depends on the amount of information available. Wherever possible, quality of life should be considered as well as quantity of life. This is addressed from paragraph 3.7.

Lives lost

3.3 Measuring the number of lives lost is appropriate if the health effect is largely one of mortality risks. You should also note which groups are affected.

Years of life

3.4 Rather than merely counting lives lost, it is often more appropriate to consider years of life. (It is conventionally assumed that a year of life is of equal value to all, but other valuations are possible.) To do this, you may need to know:

- 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.

3.5 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 will be necessary.

3.6 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. It cannot properly address health issues of pain and disability – more generally described as health-related quality of life.

Measuring quality of life

3.7 While policy appraisal has tended to ignore pain and/or disability in the past, tools are now available to assess quality of life more rigorously and routinely.

3.8 Disease-specific scales measure the impact of one particular disease or its treatment. Generic scales can be applied to any condition or health status. At their simplest, they assess the effects of poor health in terms of its impact on pain and physical disability. More sophisticated measures assess health across a wider spectrum.

3.9 Though they are the most common way to assess quality of life, both the above present significant problems. First, disease-specific measures cannot be used to compare outcomes across diseases. Second, some generic measures, and disease-specific measures, cannot be aggregated to produce a single quality of life score. Third, combining these quality measures with quantity measures, necessary to quantify health effects fully, is not a straightforward process; composite measures are required.

Measuring both quantity and quality of life

3.10 These problems led to the development of the Quality Adjusted Life Year, or QALY, which allows the health impact on both life years and quality of life to be expressed in a single measure.

3.11 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).

3.12 The QALY approach allows a more 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.

3.13 Although development of QALYs is still going on:

- there is currently no better way to compare the health effects of different policy proposals that change quantity and quality of life;
- QALY values have been estimated for many conditions, so, if used with care, can be applied to policy appraisals.

Distribution of effects and equity

3.14 In addition to the overall impact on health, it is important to assess the health impact on specific individuals or groups – by geographical area, ethnic group, age or gender for example. The impact on people whose health is below average may be particularly important. For example, policies to reduce the levels of pollution in inner city areas may benefit the health of lower income groups who may live there.

3.15 Equity in health and health care is an area of considerable interest to both the public and Ministers – see for example *Tackling Health Inequalities: 2002 Cross-Cutting Review* [http://www.dh.gov.uk/assetRoot/04/06/80/03/04068003.pdf].

Where to get information

3.16 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 of Trade and Industry for the expected emissions from power stations burning specific varieties of coal; experts in the Health and Safety Executive

for the estimated probability of an accident at a nuclear power station and the likely amount of radiation involved.

3.17 You might also look at the effects of past policies in the same area, both at home and abroad, or research by specialists in the topic. Appendix 3 outlines possible sources of information and Appendix 4 discusses health state measures.

Summary of Chapter 3

- 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.
- Identify any distributional or equity issues that may arise.

CHAPTER 4

Valuing health effects

Introduction

4.1 It is now common to estimate the overall costs and benefits of a policy initiative in monetary values. Valuing a health impact in money terms 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 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, blood transfusions, 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 In principle, costing should concentrate on marginal costs such as additional drugs prescribed, excluding overheads. In practice, however, the long-run marginal costs of health care are broadly equal to the short-run average costs. It is therefore acceptable to use data on average costs. These are often readily available – see for example the annual publication *Unit Costs of Health and Social Care* [PSSRU, eg 2003 edition: http://www.pssru.ac.uk/pdf/uc2003/uc2003.pdf]. Appendix 5 gives some useful sources for cost data.

4.7 If appropriate, you should also include the cost of ill-health on other sectors, such as social services, and any administrative costs borne by sectors such as social security, employers and insurance companies who may have to process a different number of claims. Generally, these administrative costs will be small compared to the other costs involved.

4.8 The timing of any expenditure should also be taken into account – with costs discounted, that is given a lower weighting if they occur in the future (see *Green Book: Appraisal and Evaluation in Central Government* HMT, 2003).

Valuing risks to life

4.9 While the overall aim is to measure everything in money terms, it is hard to value life and quality of life.

4.10 One method, the "Human Capital" approach, essentially values a life as the monetary value of an average person's future stream of economic output. This approach is inadequate for valuing health impacts of policy.

4.11 Much better in this context is an approach which measures people's "willingness to pay" to reduce the risk of death. Using various approaches, economists have been able to estimate a value for preventing risks of fatalities. The Department for Transport (DfT), for example, currently estimates the value of preventing a fatality (VPF) at about £1¼ million (see DfT *Highways Economics Note No.1: 2002*) [http://www.dft.gov.uk/stellent/groups/dft_rdsafety/documents/page/dft_rdsafety_026183.hcsp]. The DfT estimate is based on much empirical work. This DfT value for preventing risks of fatalities is specific to road traffic accidents, and it may not be appropriate to use it in all circumstances. It does, however, provide a rough and readily available estimate of the value of changes in risks of fatalities.

Valuing changes in the quality and quantity of life

4.12 However, the VPF is not a measure of quality of life. Where changes in quality of life are involved, a more relevant approach is to value QALYs. A number of techniques have been developed to do this.

4.13 Surveys are one possibility – 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: 2002*). In principle it is possible to conduct similar surveys to uncover the welfare losses associated with any health impact.

4.14 Often, though, surveys will take too long or cost too much. An alternative is to value a QALY by linking it to the VPF. (See Appendix 6).

4.15 Where neither approach is feasible, it might be appropriate to cost the loss of time caused by ill-health, for example the loss of work or leisure time for minor and short-term conditions. Several estimates exist for the value of time under differing circumstances and your economic adviser will be able to provide help. For example, valuations of time are available in the DfT *Transport Analysis Guidance* [http://www.webtag.org.uk/webdocuments/3_Expert/5_Economy_Objective/3.5.6.htm]. (See also Appendix 7).

4.16 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://greenbook.treasury.gov.uk/chapter05.htm#two]

4.17 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 4

- 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.

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 £683,155 for a fatal injury, and £71,100 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.

CHAPTER 5

Quantifying uncertainty and risk

5.1 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.

5.2 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.

5.3 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

5.4 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.

5.5 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.

5.6 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*, §5.9.3 in *Guide to the Methods of Technology Appraisal*, NICE, 2004 [http://www.nice.org.uk/pdf/TAP_Methods.pdf]).

Summary of Chapter 5

- 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.

CHAPTER 6

Reporting the results

6.1 The results of an appraisal of the health effects of a policy initiative should be set out in a report which covers:

- the policy options considered;
- the health impacts identified;
- the costs and benefits of each option;
- 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.

6.2 A health appraisal differs from most other appraisals in the way it reports impacts on the quality and duration of life. Not all costs and benefits may be quantified and valued. 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.

6.3 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

6.4 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.

6.5 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.

6.6 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

6.7 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

6.8 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

6.9 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 6

- 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.

CHAPTER 7

A case study

Introduction

7.1 This chapter describes the work reported in *The Cost to the British Economy of Work Accidents and Work Related Ill-health*, written for the Health and Safety Executive by Davies and Teasdale (1994). Although this is not a policy appraisal, it is summarised here because it provides an illustration of the methods of identification, quantification and valuation of health costs.

7.2 The three main categories of costs covered were:

- the resource costs (NHS and others) used in treating injured or ill people;
- the loss of potential output through short-term absence and long-term redundancy resulting from illness and injury; and
- the pain and suffering (loss of quality and duration of life) caused to the victims and their families.

7.3 The study identified the costs associated with work-related ill-health and, where possible, estimated the monetary value of these costs. In cases where simplifying assumptions were used, a range of estimates was provided.

Identification of work accidents and work-related ill-health

7.4 The starting point was to identify the health conditions to be covered. This involved defining a work accident and work related ill-health. This was more difficult for work-related ill-health because there may be several possible causes of a condition, and there may be a very long time lag between cause and effect.

7.5 Work accidents and work-related ill-health were categorised according to the time off work. The classes used for accidents were: part of a day, 1 to 3 days, 4 to 7 days, 1 to 4 weeks, 1 to 3 months, and over 3 months.

7.6 No attempt was made to identify individual injuries or illnesses, nor to estimate their separate costs. Instead, it was assumed that the costs would be roughly the same for any injury that kept the employee off work for a given length of time.

Quantification of work accidents and work-related ill-health

7.7 The next step was to estimate the likely incidence of work accidents and work-related ill-health of various severities. The main source of information was the Department of Employment's 1990 Labour Force Survey, supplemented by five detailed case studies of accidental losses, carried out by the Accident Prevention Advisory Unit. The total number of accidents in England and Wales in 1990 was estimated at around 1.5 million (nearly 1 in every 16 people in work).

Estimating the cost of work accidents and work-related ill-health in money terms

7.8 The costs were assessed in three categories: resource costs, potential output lost and reduction in the quality and duration of life.

RESOURCE COSTS

7.9 Four main classes of resource costs relating to industrial accidents and illnesses were identified:

- the damage to equipment and material;
- the additional administrative costs incurred by employers and others (i.e. insurers and Social Security);
- the resources used in caring for people injured or ill;
- the loss of potential output.

7.10 The NHS costs of work-related ill-health were assumed to be the cost of GP consultations, prescriptions, and the cost of any treatment required during absence from work. The estimate used for the cost of a GP consultation was the average cost of a consultation, calculated by dividing total GP income by the number of consultations in a year. The cost of one prescription was included.

7.11 Various simplifying assumptions were made to allow a rough estimate of treatment costs to be made. For example, the costs of treatment were assumed to be proportional to the length of incapacity; injuries or illnesses involving longer time off work requiring a greater number of out-patient visits and a longer in-patient stay.

7.12 *Health Service Costing Returns* were used to produce estimates of the marginal cost of each out-patient visit, and each in-patient day in an acute hospital.

7.13 Where simplifying assumptions could have a significant effect on estimates of NHS resource costs this was noted. In particular, the assumption that a fixed annual sum was required to treat those forced to leave the labour force (until retirement age) was highlighted as a possible source of underestimation of resource costs.

7.14 The financial costs incurred by the individual affected by work-related ill-health were included. Four changes in expenditure that individuals may experience due to ill-health were identified, and in each case simplifying assumptions were made to allow these costs to be estimated:

- expenditure on extra purchases of medicine;
- costs of travel to hospital for treatment;
- savings in the costs of travel to work;
- increase in shopping bills, as incapacitated individuals use more expensive local shops.

QUANTIFYING THE LOSS OF OUTPUT

7.15 The cost of the lost output for each affected person was estimated to be the sum of wage costs for the relevant length of time (taken from the *New Earnings Survey*) and non-wage labour costs (estimated at 18 per cent of wage costs). The study makes the assumption that only 50 per cent of the potential extra labour supply would have been employed by the economy in the absence of industrial ill-health. The value of

the output loss included in the study is therefore half of the total estimated in the manner described.[3]

QUANTIFYING THE REDUCTION IN QUALITY AND DURATION OF LIFE

7.16 The value of the loss of duration of life resulting from fatal accidents and illnesses was based on the Department of Transport's value of a statistical life. The resource costs included in that value were subtracted from it to avoid double-counting. The money value of the loss of quality of life during a period of ill-health was based on the QALY approach.

7.17 Four states of health were defined in terms of their different effect on social and physical well-being:

- minor complaints (involving less than 3 days' absence following injury or less than 7 days' absence due to work-related illness);
- moderately serious conditions (over 3 days' absence following injury or over 7 days' absence through work-related ill-health);
- serious injuries (requiring 2 to 7 days in hospital in slight to moderate pain, or several months before full recovery); and
- permanent incapacity.

7.18 A consensus value for the loss of quality of life in QALYs was estimated for each of these health states, using four of the available scales:

- Rosser's Classification of Illness States;
- Torrance's Health Classification System;
- the "EuroQol" Group's Health Description Classification; and
- the York Health Economics Consortium's Revaluation of the Rosser Matrix.

7.19 The last three were found to produce similar scores in virtually all cases and were used as the basis of the values in the appraisal.

7.20 In order to place a monetary value on the loss of quality of life in the different health states, the value of a QALY was calculated from the VPF. The average fatal road accident was assumed to involve the loss of 39 life-years of full health. One QALY was calculated to be equivalent to £27,150 relative to a VPF (£550,000 at 1990 prices), using a discount rate of 4%. (See Appendix 6.)

7.21 The loss of quality of life in each identified health state was assigned a monetary value by multiplying the QALY score by this money value for a QALY. For example, the money value of the quality of life lost due to a "serious injury" that lowers the QALY value of life by an estimated 0.25 was put at £6,800 a year in 1990 prices (the product of the 0.25 and the value of a OALY of £27,150).

The Report

7.22 The report lists all the assumptions made. As well as assessing the costs to the economy as a whole, the study also provides estimates of the costs to employers and also to individual victims and their families, and an analysis of the distribution of the overall costs of accidents and ill-health.

[3] There may be an issue in this type of calculation about the extent to which employment and output adjust to increases in labour supply. This depends on the time period and assumptions about macro-economic relationships.

APPENDIX 1

Economic appraisal

Introduction

A 1.1 Economic appraisal is concerned with identifying efficient ways of using scarce resources. Economists distinguish between productive and allocative efficiency. Productive efficiency involves using the least cost method of achieving a given output. Allocative efficiency involves choosing the outputs that provide maximum benefit. Economic appraisal may be concerned with either or both of these concepts.

Appraisal techniques

A 1.2 A *cost-benefit analysis* (CBA) quantifies in monetary terms as many of the costs and benefits as possible, including items that are not marketed or for which the market does not reflect the true economic value. Where items cannot be valued, an attempt is made to quantify them. Where items can be neither valued nor quantified, they are described and listed.

A 1.3 A special case of a cost-benefit analysis is *cost-effectiveness analysis* (CEA). This method is used when all the options under consideration produce the same or similar kinds of output. (For example, the alternative ways of meeting the demand for electricity, or of treating kidney failure, can be assessed using a cost-effectiveness analysis). An economic evaluation can then be performed simply by comparing the costs of the different options per unit of (non-monetary) outputs. While cost-effectiveness analysis can help determine the best option for a given objective it cannot be used to assess whether any option is actually worthwhile. Where the output from each option is identical then these become *cost-minimisation* studies, where the aim is to minimise the cost of producing a set output.

A 1.4 Most public policies relate to goods or services that are not traded, and appraisals are concerned with the best way to achieve a given end. It is difficult to assign monetary values to health effects or environmental effects. Some of the health effects of policies, such as the NHS resource implications (the need for hospital treatment for instance), can in fact be valued in money terms using the methods discussed in Appendix 5. It is quality and duration of life gained (or lost) that generate most difficulty.

A I.5 In *cost-utility analysis* (CUA) the quality and quantity of life gained/lost is indicated by a measure, such as the Quality Adjusted Life Year (QALY) or Healthy Year Equivalent. Appendix 4 describes the assumptions underlying the QALY approach and explains in detail how QALY measures are constructed and how the approach can be used. With this approach, the implications for the quality and duration of life of policy options can be compared in terms of QALYs, while other factors are compared in monetary terms. The resulting report may contain the results of both comparisons and leave the reader to evaluate the trade-off between money and QALYs.

A 1.6 The QALY concept can also be used in conjunction with a value for a QALY, so that the implications of a policy for the quality and duration of life are expressed in monetary terms. Setting a value on a QALY involves setting a value on life-years gained or lost. This is controversial and many people prefer not to do so. Appendix 6 describes some methods that could be used. Where this is done, the CUA approach becomes a CBA – that is, all costs and benefits will have been given monetary values.

Conclusion

A 1.7 Where a policy is aimed directly at improving a particular aspect of health, then cost-effectiveness, cost-utility or cost-minimisation analysis may be appropriate (although a full cost-benefit analysis may still be considered superior). In such cases the valuation of health effects in money terms may not be necessary. It is when the policy objective is a non-health issue and the implications for health must be weighed against the other non-health implications, that the valuation of health effects in monetary terms may become necessary.

APPENDIX 2

Identifying health impacts

Introduction

A 2.1 Identification of the health impacts of policy involves establishing all the potential effects on the health of the nation, tangible and intangible, direct and indirect, that could occur at each stage of the implementation of a policy. The identification process will often consist of three stages: a literature search; an initial, quick identification of the potential health impacts; and, finally, a more lengthy process of clarification and refinement, which will usually involve consulting experts outside Government. This appendix spells out what is involved in each of these stages. The process of identifying the likely health impacts involved in the choice between building a coal-fired power station and a nuclear power station is used as an example.

Learning from the past

A 2.2 The starting point in identifying the likely effects of a policy initiative is, of course, to seek similar projects that may have been considered or implemented in the past.

A 2.3 For example there will be a mass of literature on past appraisals of the health risks of building a nuclear power station instead of a coal-fired power suction. Some will have been performed inside Government, some by interested parties and pressure groups, and others in other countries. Further, there will be studies evaluating the actual, ex post, health impacts of existing nuclear and coal-fired power stations in the UK, and overseas.

A framework in which to identify health effects

A 2.4 A good way of sorting your health impact identification process is to set up a brainstorming session involving people within your department. The people invited may not be experts in assessing the health implications of policy, but obviously the more relevant knowledge they have the better.

A 2.5 One method of organising this initial session involves listing all the actions required for implementation of the policy down the side of a grid, and all the different types of health effect along the top. Working through each cell in the resulting “matrix” ensures that the brainstorming session systematically assesses all potential impacts. Each identified impact should be classified according to its likely probability and its expected importance.

A 2.6 The fictional table below illustrates the health effects associated with the construction and operation of a nuclear power station. This is on the basis of a policy choice of whether or not to build a nuclear power station. If the policy choice is between a nuclear and a coal-fired station, then a similar table will be needed for the coal-fired option.

A 2.7 In the table, policy implementation is divided into four stages: planning, construction, operation and decommissioning. Possible health impacts are classified into accidents, illnesses and catastrophes. Each might be divided into more specific categories. The mark “C” in a cell indicates a probable cost, that is, an adverse health impact. Thus it has been considered likely that there will be some additional accidents on the roads as a result of the construction of the power station; it is also considered likely that employees at the station will have accidents while it is in operation. The mark “(C)” represents a rather improbable cost. In this table the likelihood of a quarry accident during construction has been deemed improbable, but not negligible. An impact that is highly improbable would pick up the label “None”. The labels “CC” or “(CC)” indicate more sizeable probable and improbable costs. In this table all the sizeable health impacts have been judged improbable except the risk of illness to employees. A question mark is entered where further expert advice is needed before it can be determined whether any impact is likely. If it was thought likely that there would be beneficial health impact these could be categorised in a similar fashion (using “B”, “(B)”, “BB”, and “(BB)”).

	Accidents	Illness	Catastrophes
PLANNING	None	(C)	None
CONSTRUCTION			
• Roads	C	None	None
• Quarries	(C)	?	None
• Building	C	None	(CC)
OPERATION			
• Roads	C	None	None
• Employees	C	CC	(CC)
• Neighbourhood	None	(CC)	(CC)
• Waste Disposal	(CC)	?	(CC)
DECOMMISSIONING			
• Roads	C	None	None
• Building	C	None	(CC)
• Waste Disposal	(CC)	?	?

Key: C means: a probable, moderate-sized cost; (C) means: a less likely, moderate-sized cost; None means: a highly improbable impact; CC means: a probable, large cost; (CC) means: a less likely, large cost; ? means: further expert advice needed

Consulting experts

A 2.8 It will generally be helpful to seek expert advice following this initial identification process. Discussions with a wide group of experts and other interested parties will help to ensure that all potential health effects have been identified, and to refine the initial analysis.

A 2.9 Amongst the experts who can be consulted are:

- scientists, epidemiologists and health experts within Government;
- external experts (scientists, epidemiologists and health experts in universities, or in the private sector);
- other people with special knowledge of the area, such as stakeholders, voluntary organisations or monitoring agencies; and
- health economists who may be working for Government, the NHS, or research.

A 2.10 The Health Development Agency (HDA) website may be useful [www.hda-online.org.uk]. The HDA is a national body that gathers evidence on what improves people's health and reduces health inequalities, and produces advice for policy makers, professionals and practitioners. Evidence may also be available from completed health impact assessments – the HIA Gateway website [www.hiagateway.org.uk] provides toolkits on how to do HIA, lists of experts/consultants/practitioners as well as information and evidence gathered from existing HIAs.

Conclusion

A 2.11 The systematic identification of the health impact of policies will involve learning from past experience, careful consideration of all the processes necessary for implementation of the policy, and consultation with experts in the relevant fields, from both within and outside Government.

APPENDIX 3

Assessing the number of individuals affected and the extent of the effect: some useful information sources

Introduction

A 3.1 Estimation of the number of individuals likely to be affected by some policy initiative will often require information that is not readily available. This appendix lists some sources of information that may prove helpful.

A 3.2 The process of assessing the number of people whose health may be affected and the extent of the effect can often be clarified by splitting it into two stages: an exposure assessment (which assesses the number of people likely to be exposed to some hazard before and after the introduction of policy); and a dose-response assessment (in which the effect of a given degree of exposure on people's health is estimated).

A 3.3 An economic appraisal can only be as reliable as the medical, epidemiological and other evidence upon which it is based. It is important, therefore, that all the technical and medical information that is available and relevant is taken into account. In this appendix, five sources and types of information are suggested. The first two and the last (experts in relevant fields, the effects of past policies and epidemiological and other statistical data) should provide help with both parts of the assessment. Accepted quantitative relationships are most likely to provide help with the exposure assessment. The results of controlled trials and controlled observational studies are more likely to inform the dose-response assessment.

Accessing expert opinion

A 3.4 A thorough search is likely to reveal a great number of experts able to help with both the exposure assessment, and the dose-response assessment. Experts of all sorts will need to be consulted for the exposure assessment. For some issues economists will be able to help, for others it will be necessary to go to engineers or other scientists. It will often be epidemiological experts who are consulted about the dose-response assessment. They are qualified to take a view about, for example, how likely a smoker is to get lung cancer, or how many people exposed to some specific type of radiation will get leukaemia.

A 3.5 It is important to canvas a wide range of expert opinions as this will sometimes reveal whether or not the available information is reliable, particularly where pressure groups are involved. Accessing many views about matters on which there is little hard information can sometimes improve the assessment of the answers.

Examining the number of people affected by a previous, similar policy

A 3.6 An insight into the likely number of people affected by a policy proposal can sometimes be gained from reports on the health consequences of similar policies that have been implemented before, or elsewhere.
Reference should be made to any relevant reports by other Government Departments, overseas administrations, and professional, research or charitable agencies.

Using quantitative relationships

A 3.7 In some situations the quantification of a health impact can be simplified by using a relationship already established within Government for this or some other purpose. For example, HM Revenue & Customs uses an econometric model of the demand for cigarettes to estimate the reduction in cigarette consumption associated with a tax increase. This can be used for the exposure assessment part of an appraisal of the health implications of changing the level of the duty on cigarettes. Similarly, the Department for Transport has a model relating the number and severity of road accidents to the flow of road traffic. This is

used to provide an insight into the number of people likely to be affected by policies concerning roads, thereby providing information about the 'dose-response' relationship.

A 3.8 It may be possible to create a new economic or other type of model especially for the purpose under consideration. Such a model would explain past changes in the number of people affected by some hazard (or the severity of the effect) in terms of the factors thought likely to be relevant. The resulting relationship would then be used to predict the impact that might result from the policy under consideration. Economists and other analysts would be able to help develop such models.

Using the results of controlled trials and observational studies

A 3.9 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.

A 3.10 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.

A 3.12 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.

A 3.11 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. Further details are appended.

Using epidemiological and other statistical data

A 3.13 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.

A 3.14 Department of Health statistics in the following areas are available at http://www.performance.doh.gov.uk/HPSSS/index.htm

- family health services activity;
- NHS hospital facilities, activity and workforce;
- community health services activity and workforce;
- social services activity and workforce;
- public health.

A 3.15 For information on health inequalities and measures to reduce them see, for example, *Tackling Health Inequalities: 2002 Cross-Cutting Review* at http://www.dh.gov.uk/assetRoot/04/06/80/03/04068003.pdf .

A 3.16 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.

A 3.17 Information on population and mortality in Scotland and Northern Ireland are available from the General Register Office for Scotland. (http://www.gro-scotland.gov.uk/) and the General Register Office in Northern Ireland (http://www.groni.gov.uk/index.htm), part of The Northern Ireland Statistics and Research Agency (http://www.nisra.gov.uk/).

A 3.18 ONS conducts and publishes many health-related surveys. It can also provide many other services, besides published data. It can, for example, conduct research projects using the NHS central register and other data. For more information see the ONS Customer services website (http://www.statistics.gov.uk/email.asp).

A 3.19 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: The Scottish Centre for Infection and Environmental Health (http://www.show.scot.nhs.uk/scieh/), 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/).

A 3.20 ISD Scotland, part of the NHS in Scotland, is a useful first point of contact for information and statistics on Scottish health and NHS services (http://www.isdscotland.org/isd/index2.jsp?p_applic=CCC&p_service=Content.show&pContentID=1&). It publishes data relating to use of hospital services and costs. It also has access to communicable disease information, data on prescriptions and on use of dental and optical services; special tabulations from the *General Household Survey* on morbidity, use of GP services, outpatient consultations and prevalence of smoking; the *Scottish Cancer Registration Statistics* and the *Scottish Drug Misuse Database*. The General Practice Administration System for Scotland holds data on morbidity from the GPASS system (http://www.gpass.co.uk/).

A 3.21 Information on health and health services in Wales can be obtained from the National Public Health Service for Wales (http://www.wales.nhs.uk/sites/home.cfm?OrgID=368).

A 3.22 Health and health services statistics for Northern Ireland can be obtained from the Department of Health, Social Services and Public Safety Information and Analysis Directorate (http://www.dhsspsni.gov.uk/stats&research/index.asp).

A 3.23 The Department for Transport publishes data on injuries from road accidents (http://www.dft.gov.uk/stellent/groups/dft_control/documents/contentservertemplate/dft_index.hcst?n=7432&l=2); the Department for Trade and Industry on injuries from accidents at home and during leisure pursuits (http://www.dti.gov.uk/homesafetynetwork/gh_stats.htm); the Health and Safety Executive on injuries from accidents at work (http://www.hse.gov.uk/statistics/).

A 3.24 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.

Conclusion

A 3.25 Estimation of the number of people whose health is likely to be affected by some policy initiative and the extent of the effect can be tackled in two stages: first, the number of people exposed to the hazard needs to be estimated, then the probability and likely severity of a health effect, given exposure, needs to be assessed. Information and assistance can be gathered from appropriate experts, past policy appraisal, models of the relationships, controlled trials, observational studies and epidemiological and other statistical data.

SOME EVIDENCE SOURCES

Cochrane Collaboration evidence of effectiveness for evidence-based medicine http://www.update-software.com/cochrane/content.htm	The Cochrane Library consists of a regularly updated collection of evidence-based medicine databases, including The Cochrane Database of Systematic Reviews, which provide high quality information to people providing and receiving care and those responsible for research, teaching, funding and administration at all levels.
Cochrane Reviews http://www.update-software.com/abstracts/crgindex.htm	Cochrane Reviews are full text articles reviewing the effects of healthcare. The reviews are highly structured and systematic, with evidence included or excluded on the basis of explicit quality criteria, to minimise bias. Data are often combined statistically (with meta-analysis) to increase the power of the findings of numerous studies, each too small to produce reliable results individually.
Campbell Collaboration "what works" in the areas of education, crime and justice, and social welfare. http://www.campbellcollaboration.org/	The international Campbell Collaboration (C2) is a non-profit organization that aims to help people make well-informed decisions about the effects of interventions in the social, behavioral and educational arenas. ▪ C2's objectives are to prepare, maintain and disseminate systematic reviews of studies of interventions. ▪ C2 acquires and promotes access to information about trials of interventions. ▪ C2 builds summaries and electronic brochures of reviews and reports of trials for policy makers, practitioners, researchers and the public.
http://geb9101.gse.upenn.edu/	C2-SPECTR: the Social, Psychological, Educational, and Criminological Trials Register
http://www.campbellcollaboration.org/Fralibrary2.html	C2-RIPE: Register of Interventions and Policy Evaluation.
NHS Centre for Reviews & Dissemination University of York http://www.york.ac.uk/inst/crd/crddatabases.htm	The Centre for Reviews and Dissemination (CRD) was established in January 1994, and aims to provide research-based information about the effects of interventions used in health and social care. It helps to promote the use of research-based knowledge, by offering: ▪ rigorous and systematic reviews of research on selected topics

	▪ scoping reviews which map the research literature ▪ three databases: DARE, NHS EED and the HTA database [see below] ▪ 'Hitting the Headlines' ▪ publications ▪ a dissemination service ▪ an information and enquiry service.
http://www.york.ac.uk/inst/crd/nhsdhp.htm	NHS Economic Evaluation Database (NHS EED)
http://www.york.ac.uk/inst/crd/darehp.htm	Database of Abstracts of Reviews of Effects (DARE)
http://www.york.ac.uk/inst/crd/htahp.htm	Health Technology Assessment (HTA) Database
NICE: The National Institute for Clinical Excellence http://www.nice.org.uk/pdf/ppt/CD_rom_presentation.ppt	NICE's fundamental objective is to improve standards of patient care, and to reduce inequities in access to innovative treatment, by establishing a process which will ▪ (i) identify those new treatments and products which are likely to have a significant impact on the NHS, or which for other reasons would benefit from the issue of national guidance at an early stage ▪ (ii) enable evidence of clinical and cost effectiveness to be brought together to inform a judgement on the value of the treatment relative to alternative uses of resources in the NHS ▪ (iii) result in the issue of guidance on whether the treatment can be recommended for routine use in the NHS (and if so under what conditions or for which groups of patients) together with a summary of the evidence on which the recommendation is based ▪ (iv) avoid any significant delays to those sponsoring the innovation either in meeting any national or international regulatory requirements or in bringing the innovation to market in the UK.
http://www.nice.org.uk/catta1.asp?c=153&msrt=1&dir=ASC	NICE's guidance documents on completed technology appraisals
Health Technology Assessment programme a national R&D programme for the NHS, funded by DH http://www.hta.nhsweb.nhs.uk/	The HTA programme is a national programme of research established and funded by the Department of Health's Research and Development programme. The purpose of the programme is to ensure that high quality research information on the costs, effectiveness and broader impact of health technologies is produced in the most effective way for those who use, manage and provide care in the NHS.
http://www.hta.nhsweb.nhs.uk/ProjectData/3_publication_listings_ALL.asp	HTA publications list

APPENDIX 4

Quantifying health status

Introduction

A 4.1 The quantification of changes in health status for policy appraisal purposes can take many forms. Some feel that little more can be done than to present a description of the discomfort or pain and disability (physical or social) that is associated with some health condition. Some are prepared to go further, either using a measure designed specifically to gauge the impact of one disease on an individual, or using general health measures which can apply to any state of health.

A 4.2 In recent years the medical profession and health economists have made considerable efforts to develop a more precise methodology than this, and to quantify health states by rating them on a cardinal scale. This allows numerical values to be put on health states. Full health is conventionally rated at unity and death at zero. On this scale, for example, insomnia might be rated at 0.92 and arthritis at 0.69, say – these values are actually taken from the WHO's QALY health state ratings (see: WHO *Health Systems Performance Assessment, Debates, Methods and Empiricism*, 2003, table 32.9 [http://www.who.int/publications/2003/hspa/en/]).

A 4.3 This appendix describes one approach that can be used to quantify the change in quality of life associated with health impacts. Other approaches are described in *The Measurement of Health Related Quality of Life* (by P Dolan, chapter 32 of *Handbook of Health Economics*, eds AJ Culyer & JP Newhouse, Elsevier, 2000 [http://www1.elsevier.com/hes/books/17/1b/032/c171b032.htm]

Quantifying health status

A 4.4 Quantifying the loss or gain in health status following the implementation of a policy initiative involves five steps outlined below. Often there is a choice of methodology and/or a need for judgement. As a result, the quantification is subject to uncertainty.

CHOOSING THE METHODOLOGY

A 4.5 All of the different measure of health status developed by health economists have the same objective: to provide a quantitative indicator of the value to society of a change in the health of a population group. The key measure is the Quality Adjusted Life-Year (QALY) (see chapter 6 of *Methods for the Economic Evaluation of Health Care Programmes* (M Drummond *et al*, 1997, 2nd ed., OUP, Oxford [http://www.oup.co.uk/isbn/0-19-262773-2]).

A 4.6 The QALY is the measure that has been most highly developed. It is the one used here as an example. It is predicated on the assumption that society values the health of its members in terms of the quality of life that is implied by their health status, and the number of years for which that health status is enjoyed. Consider an individual who becomes a drug addict after living for several decades in full health. Suppose that, on some chosen scale (eg that of WHO – see above) the quality of life with excessive and uncontrollable drug use is rated at one half of that of full health (health-related quality of life rated at 0.5) and that the person lives for 10 years in this state of drug dependence. The total, undiscounted, figure for these 10 years would then be put at 5 QALYs (0.5 times 10); or put another way, preventing 10 years of drug dependence would bring a gain felt to be equivalent to gaining 5 years in full health.

CHOOSING A SCALE

A 4.7 The second step in quantifying health status is to choose the scale on which the quality of life associated with any condition will be valued. There are a number of different scales available. Some have been developed for specific areas, others are for general use. Not all commonly used methods to assess quality of life can be converted into a QALY; for example SF-36 is a popular tool with researchers but, by itself, does not give QALY values. For use in QALYs a scale needs to consist of two parts: a classification of different states of health (for

example pain and disability) that can arise, and a number that indicates the quality of life associated with each of these states.

A 4.8 The EuroQol EQ-5D is the one that has been most used in the UK. It is summarised below. Respondents are asked to rate their health in terms of severity of problems against five different dimensions of health. With 3 levels on 5 dimensions, this classification system produces 243 different health states. For a full description see the EuroQol website page "What is EQ-5D?" [http://www.euroqol.org/] and also the *Health Survey for England* 1996, ch.5 [http://www.archive.official-documents.co.uk/document/doh/survey96/ehch5.htm].

Table A4.1: EuroQol EQ-5D health states: summary

	No problems	Some problems	Severe problems
Mobility	☐	☐	☐
Self-care	☐	☐	☐
Ability to perform usual activities	☐	☐	☐
Pain/discomfort	☐	☐	☐
Anxiety/depression	☐	☐	☐

DESCRIBING THE ILL-HEALTH

A 4.9 The third step in forming a quantitative estimate of an individual's loss or gain in quality of life is to describe the health situation of the patient before and after the change. This process will usually require advice from medical practitioners.

TRANSLATING THE ILL-HEALTH INTO THE CATEGORIES USED IN THE SCALE

A 4.10 In order to use the EQ-5D or other scale to indicate a QALY value, the description of the individual's condition will have to be re-expressed in terms of the categories used in the scale. The loss or gain in quality of life compared with some alternative can then be estimated.

ADDING UP THE TOTAL

A 4.11 Each health state classification, in a cardinal system, will have a rating on a 0 - 1 scale. For example, the 243 health states in the EQ-5D system have ratings from the British general public (see *Health Survey for England* 1996, ch.5 [http://www.archive.official-documents.co.uk/document/doh/survey96/ehch5.htm].

A 4.12 The total effect of a proposed policy initiative on the health of the nation can be calculated by adding up, for each individual affected in a specified manner, the quality of life (the QALY value) associated with each year in each expected health state. The result is multiplied by the number of people estimated as likely to be affected in this manner and repeated for all health impacts of all severities.

Example of quantifying health states

A 4.13 The following examples indicate some of the issues arising in practical applications.

EXAMPLE 1: ESTIMATION OF THE QALY VALUES OF A HEALTH CARE INTERVENTION

A 4.14 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 [see Table A4.2 below], 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.

A 4.15 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.

A 4.16 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.

EXAMPLE 2: THE USE OF QALYS IN POLICY APPRAISAL

A 4.17 Mauskopf and French (1991) used QALYs in an assessment of the value of avoiding morbidity and mortality from foodborne illnesses.

A 4.18 First, they estimated the duration of health impairment and the reduction in life expectancy associated with different severities of various foodborne diseases. Second, they took information on the sates of health caused by the various diseases and converted it into two generic health status indices: the Rosser Index and, in sensitivity analysis, the Quality of Well-Being Index. For example, a description of the sate of health associated with botulism was reprocessed into the distress and disability categories of the Rosser scale.

A 4.19 The profile for botulism produced using the Rosser Index is shown in Table A4.2.

Table A4.2: Rosser Profile for Botulism

Severity	Disability Index	Distress Index	Duration (*days*)
Mild	4	B	5
Moderate	7	C	7
	6	C	7
	4	B	7
Severe	7	D	90
	6	C	30
	4	B	60

A.4.20 Mauskopf and French used this to estimate the loss of QALYs associated with fatal and non-fatal cases of the diseases. For this they made the simplifying assumptions that exposure occurs at 30 years old (with remaining life expectancy of 46 years) and that individuals are in full health prior to exposure. The estimated loss of QALYs associated with botulism is shown in Table A4.3.

Table A4.3: Estimated Loss of QALYs from a future case of Botulism

Severity of Illness	Fatality Rate	QALY Loss from Morbidity (*undiscounted*)	QALY Loss from Mortality (*discounted at 3%*)	Weighted Average Loss
Mild	0.0%	0.00055	n/a	0.00055
Moderate	0.0%	0.0263	n/a	0.0263
Severe	22.5%	0.647	25.5	6.24

A 4.21 They then estimated the monetary value of the welfare lost from each illness. To do this they first calculated the monetary value of an individual QALY. Their estimate was based on a VPF estimate of $5 million (value of avoiding premature death at age 40 years, derived from a wage-risk study by Moore and Viscusi, 1989). Given that the average remaining life expectancy at age 40 is 36 years and that these are spent in full health, this represents a monetary value of $138,000 per QALY, undiscounted (or $222,222, discounted at 3 per cent).

Should QALYs be discounted?

A 4.25 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/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.

Criticisms of the QALY approach

A 4.26 Those undertaking appraisal involving QALYs should be aware of the problems and limitations of the approach, which include the following:

- Estimates of the QALY values of health states may be based on responses by people with inadequate information about (or experience of) the health conditions on which they are asked to pass judgement.

- The loss of quality of life associated with a disability may depend on whether the individual was initially in good health or already suffering from some disease (that is, the disutility of health changes may be subject to diminishing marginal returns).

- The loss of quality of life associated with some health condition may depend on its expected duration (see Sackett and Torrance, 1978).

- QALY valuations may differ between individuals because of differences in age, education, risk aversion or time preference.

- Some view the QALY approach as being “ageist” because it implies that, if two people are suffering from the same condition, improving the health of the one with the longer life expectancy is likely to generate more QALYs, other things being equal. Whether this is ageist can be debated, as one QALY is assumed to be of equal value to all ages (though age-weighting is possible). Indeed some have countered with the “fair innings” argument (*Intergenerational Equity: An Exploration of the ‘Fair Innings’ Argument*, A Williams, Health Economics, vol.6 no.2, March 1997 [http://www3.interscience.wiley.com/cgi-bin/abstract/14639/ABSTRACT]).

APPENDIX 5

Valuing the resource costs

Introduction

A 5.1 This appendix explains how to quantify and value the resource costs of a policy. The first part of the appendix is concerned with methodology, the second with data sources.

Methodology

A 5.2 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

A 5.3 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.

A 5.4 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

A 5.5 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.

A 5.6 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

A 5.7 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.

MONEY TRANSFERS DO NOT CONSTITUTE COSTS

A 5.8 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

A 5.9 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 A5.1: Pay and Prices Indices: percentage change over previous year

		HCHS		PSS
1999/2000		4.5		3.4
2000/01		4.2		4.7
2001/02		5.1		4.4
2002/03		3.6		4.8 (estimate)
2003/04		n/a		n/a

TODAY'S COSTS ARE GIVEN GREATER WEIGHT THAN FUTURE COSTS

A 5.10 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.

A 5.11 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:

$$£2{,}000 + £2{,}000/(1.035)^{1} + £2{,}000/(1.035)^{2} + \ldots + £2{,}000/(1.035)^{20} = £30{,}425$$

A 5.12 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.

A 5.13 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

A 5.14 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.

A 5.15 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* [eg 2003 edition: http://www.pssru.ac.uk/pdf/uc2003/uc2003.pdf] (Ann Netten & Lesley Curtis (eds), Personal Social Services Research Unit, University of Kent). This has costs for care in different settings and for the time of different sorts of staff.

A 5.16 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

A 5.17 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* [eg 2003 edition: http://www.pssru.ac.uk/pdf/uc2003/uc2003.pdf] (Ann Netten & Lesley Curtis (eds), Personal Social Services Research Unit, University of Kent).

COSTS TO PATIENTS AND THEIR FAMILIES

A 5.18 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.

A 5.19 Direct costs include the costs of travelling to visit relatives in hospital – see the *Unit Costs of Health and Social Care* [2003 edition: http://www.pssru.ac.uk/pdf/uc2003/uc2003.pdf]. 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.

APPENDIX 6

Estimating the value of risks to life

Introduction

A 6.1 The monetary valuation of health and life is one of the more complex and controversial areas in economic appraisal. It raises ethical issues and involves value judgements.

A 6.2 Even if a monetary value is not assigned to health states, it will rarely be possible to avoid value judgements. All policy decisions involving health effects implicitly contain judgements about the value put on risks. When a policy concerned with safety is not carried out this implies that the Government values the risk reductions at less than the cost of the resources required. On the other hand, the resources committed following the Ronan Point disaster implied that the Government should be willing to pay £20 million for each life saved.

A 6.3 Judgements about the values of risks of fatalities cannot be avoided but at least economic appraisal can make them systematic and explicit. This appendix 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*' a consultation draft: http://www.hm-treasury.gov.uk/media/97B/53/97B5344C-BCDC-D4B3-1F12E3FFEB34F0A0.pdf].

A 6.4 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. There are two ways of estimating willingness to pay: revealed preference and stated preference.

A 6.5 The willingness to pay approach is the currently recommended method for estimating the value attached to altering the fatal risks. Recently, the resulting value has been used to estimate indirectly the money value of a QALY. Willingness to pay estimates of non-fatal road injuries have been used by the Department for Transport.

The human capital approach

A 6.6 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.

A 6.7 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

A 6.8 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

A 6.9 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).

A 6.10 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.

"*If cost benefit analysis is to be employed and the consumer's surplus adopted for those goods for which market information is available then consistency would seem to demand the development of procedures for eliciting some indication of the sums individuals would be prepared to forfeit to effect changes in the level of provision of those goods for which market information is not available*." (Jones-Lee (1976))

A 6.11 The WTP approach explores the payments people are willing to make for small changes in the probability of death or injury. The approach either addresses individuals' willingness to pay (WTP) for a reduction in the risk of death, or it addresses their willingness to accept (WTA) an increase in risk in exchange for monetary compensation. Theoretically, WTP should equal WTA for small changes. There are two methods that can be used to establish the WTP and WTA valuations of fatal risks – one looks at revealed preferences, the other at stated preferences.

A 6.12 The revealed preference approach assumes that by examining people's behaviour in situations in which they trade risk of death for money or other benefits, a monetary valuation of a reduction in the risk of loss of life can be obtained. (For example, people often save time by walking across a road, risking an accident, rather than using an underpass; people change their car tyres less frequently than is said to be needed to minimise the risk of an accident because this saves money.) These situations can be used to generate estimates of the money value of preventing a fatality (VPF)[4]. Such estimates infer a value from behaviour which may be motivated by factors other than risk assessment, and which may be based on inadequate information. These difficulties may be avoided by using stated preference techniques, in which surveys are carried out which ask respondents to state what they would be willing to pay for a specified hypothetical risk reduction.

A 6.13 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

A 6.14 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.

A 6.15 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).

[4] The value of preventing a fatality, or VPF, is based on the public's willingness to pay for a risk reduction (divided by the size of that risk reduction). For example if, on average, people are willing to pay £125 to reduce a fatality risk by 1 in 10,000, then the VPF is £125 divided by 1/10,000, which equals £1.25 million.

A 6.16 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

A 6.17 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.

A 6.18 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.

A 6.19 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 VPF

A 6.20 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.

A 6.21 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 £1¼ million, which includes a small addition for resource costs and net output losses on top of WTP (see DfT *Highways Economics Note No.1: 2002*)
[http://www.dft.gov.uk/stellent/groups/dft_rdsafety/documents/page/dft_rdsafety_026183.hcsp].

A 6.22 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

A 6.23 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 QALYs

A 6.24 Where a policy initiative is expected to affect mortality but not health status, a financial valuation of the welfare gain or loss can be obtained by using the VPF. However, if a policy also has an impact on health status, a monetary value may need to be put on the associated change in the quality of life.

A 6.25 Under certain restrictive assumptions, a money value for a QALY could be derived from the VPF. The VPF could be viewed as the present value of the QALYs expected to be enjoyed over the lifetime of the individual. This allows the value of a QALY to be derived from the VPF given the appropriate discount rate, the number of years remaining in a statistical life and the QALY profile in those years. However, WTP estimates for the VPF are derived largely in contexts related to accidental death, where a number of factors other than the health of the person at risk may be confounded, for example the WTP to avoid a painful or terrifying end, which is not a consideration in constructing QALYs. For an example of this approach see Ives, Soby et al (1993).

A 6.26 Apart from this difficulty, if the VPF was estimated by establishing the WTP of a population with an average age of 40 years and an average life expectancy of 76, then immediate death would, on average, result in the loss of 36 life years. Suppose the average person could expect 26 years of full health, each rated at 1.0 QALY, and 10 years of sickness rated at 0.5 QALYs each then, with no discounting, immediate death would entail the loss of 31 QALYs. The VPF would then imply a value for a QALY of about £40,000.

A 6.27 An estimate of the monetary value of the change in health status occurring following policy implementation can be obtained by taking the product of the change in QALYs as a result of policy, and the estimated cost per QALY.

A 6.28 Before this approach can be undertaken with any degree of confidence a reasonable level of agreement is needed on the following issues:

- the QALY value of various health conditions;
- the money value of VPF;
- the number of QALYs in a statistical life.

A 6.29 The Health and Safety Executive's document *The Cost to the British Economy of Work Related Accidents and Work Related Ill Health* (Davies and Teasdale, 1994) calculates the money value of a year of ill-health as the product of the number of QALYs lost and the money value of a "full health life year". (The counterfactual assumed full health in each year). The 1990 value of a QALY is based on an assumed value of £550,000 for the pain, grief and suffering element of a statistical life. In making the calculation it was assumed that the average fatal road accident involves the loss of 39 years of perfect health (a stream of 39 QALYs), and that the appropriate discount rate is 4 per cent (pure time preference). An annuity of £27,150 (1990 prices) over 39 years, discounted using a 4 per cent discount rate, would be worth £550,000. For a further example of placing money values on QALY changes see the work by Mauskopf and French (1991).

Direct valuation of willingness to pay for health

A 6.30 The Department for Environment, Food and Rural Affairs (DEFRA) commissioned a study of willingness to pay for better health in the context of air quality. The report of the study has now been published: *Valuation of Health Benefits Associated with Reductions in Air Pollution*. The study specifically focussed on an air pollution context, and elicited people's WTP for reductions in four adverse health effects of air pollution:

- Chronic mortality – the impact on life expectancy of long-term exposure to average levels of pollutants in the air;
- Acute mortality – the deaths brought forward (particularly among those in poor health) by episodes of high pollution;
- Emergency admissions to hospital occasioned by such episodes; and
- Days of breathing discomfort caused or aggravated by raised levels of pollution.

This study has overcome some of the problems of trying to infer values of longer life and better health indirectly from VPF figures, by eliciting directly the public's WTP for such benefits. See *Valuation of Health Benefits Associated with Reductions in Air Pollution, Final Report*, S Chilton *et al*, DEFRA, 2004 [http://www.defra.gov.uk/environment/airquality/airpoll_health/airpollution_reduction.pdf]

Direct evaluation of willingness to pay for health care

A 6.31 Donaldson (1993) contains a review of 18 published studies of peoples' willingness to pay for health care. In some circumstances this approach may be preferable to measuring health gains in QALYs and assigning a money value per QALY. An individual's willingness to pay for health care will indicate the value that they derive from all aspects of health care, not just from an improvement in health status. This would be important if people realised other benefits from medical treatment (information, dignity and autonomy) or from having medical treatment available (option values and externalities), besides the health gain that is measured by the money value put on a QALY.

Valuation of non-fatal injuries

A 6.32 The Department for Transport has produced willingness to pay estimates for non-fatal road casualties. A survey-based method was used, using the standard gamble technique. This produced estimates for a range of non-fatal injuries relative to the value for a fatality. The advantage of the standard gamble approach is that it avoids the need for respondents to give money values and ensures consistency between the fatal and non-fatal values.

A 6.33 The standard gamble approach adopted asked respondents to estimate the acceptable probability of success or failure of a medical intervention following injury in a road accident. They were asked to consider that they had been injured and left in a specified health state and that treatment was offered which would, if successful, return them to normal health but, if a failure, make their condition worse (a worse specified health state or in some cases death). They were asked what probability of success would be required to accept the treatment. From the responses it was possible to calculate the values for non-fatal injury types relative to the value of a fatality. These values were then weighted according to the incidence of the injury types, and an average value for serious injuries was calculated. Estimates for medical costs and loss of output due to time off work were added to this willingness to pay value to produce a total value for non-fatal injuries. (See DfT *Highways Economics Note No.1: 2002*) [http://www.dft.gov.uk/stellent/groups/dft_rdsafety/documents/page/dft_rdsafety_026183.hcsp].

APPENDIX 7

Estimating the value of time

Introduction

A 7.1 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

A 7.2 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

A 7.3 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.

A 7.4 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.

A 7.5 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

A 7.6 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) for further details).

A 7.7 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* [2003 edition: http://www.pssru.ac.uk/pdf/uc2003/uc2003.pdf].

Conclusion

A 7.8 Where it is not possible to derive direct measures of health benefit and the illness is of short duration the value of time lost can be a reasonable substitute measure of welfare loss.

A 7.9 The usual approach is to value the time lost by patients and others due to illness. The DfT provides estimates of the value of one hour lost for working time and for own time. The figure for own time may need to be adjusted for the relative value of visiting the sick and travelling.

A 7.10 The resulting figures should be upgraded to current prices, in line with changes in average employee earnings. They can then be used to form estimates of the value of total time lost, by multiplying by the number of people affected (see Appendix 3) and the number of hours lost per person (see above).

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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.