The Initiative for Sustainable Healthcare Financing in Europe

SECOND REPORT

SECURING EUROPE'S HEALTHCARE FUTURE: CHRONIC DISEASE MANAGEMENT AND HEALTH TECHNOLOGY ASSESSMENT

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Securing Europe's Healthcare Future' presents the results of two in-depth studies into subjects at the heart of the debate on sustainable healthcare financing in Europe: Chronic Disease Management and Health Technology Assessment. It is endorsed by the Czech Presidency of the EU and the Czech Ministry of Health and sponsored by Pfizer Inc.

The views expressed in this work are those of the authors and do not necessarily represent the views and policies of the organisations to which they belong. The independence of the authors, and of all other parties who contributed to this work, is absolute. Pfizer's intention in partnering this initiative was to stimulate novel thinking and to contribute to finding solutions for sustainable healthcare financing in Europe.

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THE INITIATIVE FOR SUSTAINABLE HEALTHCARE FINANCING IN EUROPE

The Initiative for Sustainable Healthcare Financing in Europe was established in 2005 in the context of Luxembourg's EU Presidency and its priority of sustainability. Its aim has been to sponsor new forward-looking and practical research into the sustainability challenges facing healthcare in Europe.

With the endorsement of Luxembourg's Ministry of Health and Finland's Innovation Fund SITRA, four reports were written and delivered as one policy document - the first Cox Report - at a Conference in Helsinki in February 2007.

The two papers unveiled at the 'Securing Europe's Healthcare Future' conference in Prague – *Managing Chronic Disease in Europe* by Dr. Reinhard Busse and *The Future of Health Technology Assessment in Europe* by Dr. Panos Kanavos – represent a more in-depth follow up to that research. These two pieces of original research feed directly into the current high-profile debates on the future of European healthcare - both at Member State and EU level - as European societies face the increasing challenge of ageing populations and the quest to ensure value in healthcare.

The Steering Committee is grateful for the support the Czech Presidency of the EU, under the auspices of which the launch conference was staged, and the Czech Ministry of Health, and for the ongoing sponsorship of the project's founding partner Pfizer Inc.

These two papers and the Initiative's previous reports are available to download at www.sustainhealthcare.org

INTRODUCTION TO THE REPORT

Setting the Scene

Securing Europe's Healthcare Future is the theme of our two day conference to be held under the auspices of the Czech Presidency of the European Union in Prague on 17- 18 February 2009. This is the third in a series focused on the question of sustainable healthcare financing in Europe, financially supported by Pfizer and presenting research led by leading independent academic researchers and institutions. Our policy research programme began under the Luxembourg Presidency of the EU in 2005. It continues to enjoy the support of the Grand Duchy's Health Ministry through our steering committee. Our work progressed in partnership with the Finnish innovation fund, SITRA, presented at a conference in Helsinki in February 2007. Later this year the Czech Presidency itself will host a high level conference on the Financial Sustainability of Health Systems on 10-12 May in Prague focusing on the macroeconomic aspects of the sustainability challenge. On this occasion our focus is complementary, microeconomic in its orientation, concentrating on two research papers: '**The Future of Managing Chronic Disease in Europe**' presented by Dr. Reinhard Busse, Berlin University of Technology and '**The Future of Health Technology Assessment in Europe**' presented by Dr. Panos Kanavos, London School of Economics. The objective of this exercise is to assist the policy making community to pick its way through a vast amount of research and practice related to chronic disease management (CDM) and health technology assessment (HTA) and to direct its attention to key issues requiring future policy choices.

Chronic disease is the leading cause of mortality and illness in Europe today, a cause that on current projections is set to get worse in the coming decades. It has been estimated that in 2005 77% of all Disability-Adjusted-Life-Years, measuring the consequences of chronic illness, and 86% of premature deaths in the World Health Organisation European region are related to non-communicable diseases. Our report evaluates the present situation and proposes steps for future policy directions. While many chronic diseases are related to ageing they are by no means confined to the elderly. Lifestyle choices such as tobacco and alcohol consumption and abuse, sexual behaviour, diet and exercise all confirm that high income countries are paying for the excesses of the downside of the affluent society. The term 'high income country' masks a wide diversity of personal and household income and employment circumstances. The evidence reveals that the poor carry a higher burden of chronic disease than the rich in high income economies. Affluence clearly has its counterpart of affluenza.

Tobacco use is still the leading avoidable cause of premature deaths even though the number of smokers has declined from 45% to 30% of the population in the past three decades. In spite of all that is known about its negative health consequences the number of smokers in Eastern Europe in general and the Baltic States in particular is on the rise, especially among women and the young. Alcohol related chronic disease also registers regional variations with significantly higher illness rates in Eastern Europe. Some of the country variations in chronic disease are staggering, for example the cardiovascular disease rate in the Russian Federation is ten times higher than that in France. It is sobering to note that suicide from depressive disorders is the third leading cause of death among young people in Europe today.

As to the future, chronic disease will continue to be the biggest contributor to mortality and disability in Europe. While deaths from strokes are expected to decline for both men and women, deaths associated with chronic pulmonary conditions, diabetes and dementia are expected by 2030 to rise by 25%, 33% and more than 50% respectively. All of these point to serious economic costs and consequences in terms of poorer quality of life, lower productivity, higher absenteeism, lower participation in the labour force, falling earnings, earlier retirement and rising healthcare costs as a share of GDP. Through an extensive literature review these costs are reported on and explored in the current research paper.

The paper comes into its own when it examines strategies for the management of chronic disease from the point of view both of effectiveness and cost effectiveness. This is not just a question of reviewing academic evidence on individual interventions but also of recognising the necessity for policy makers to appreciate the institutional, organisational and incentive conditions that favour successful chronic disease management. The need to act is emphasised. Better co-ordination, it is argued, will not emerge spontaneously, nor is it likely to generate short term savings. While recognising the propensity of healthcare professionals to emphasise professional ethos, motivation, adequate staff levels and education and training the role of financial incentives to change behaviour is stressed with an introduction to new tools to encourage a focus on outcomes and not just process and designed to encourage continuity of care and cooperation rather than resource rivalry and power struggles between competing professionals.

The potential of new pharmaceutical products, especially personalised medicine is recognised as are the associated challenges of licensing and reimbursement policies. Preventing or controlling symptoms or lowering the frequency of acute incidents while not constituting a cure nevertheless can assist chronic disease management through adding to the patient's quality of life, which is itself no small consideration. The possible contribution of information and communications technology to chronic disease management solutions is observed but the authors comment on the relatively high costs, budget overruns and unforeseen difficulties often experienced by health policy makers with such initiatives and remark on the need for standards setting, interoperability and not just for masses of information but for the capacity to extract the kind of information relevant to healthcare professionals.

For all its quality in terms of literature review and policy perspective perhaps the most disturbing finding of this research paper for the non specialist is the revelation not of how much we know in Europe about chronic disease management but rather how little is known in terms of high quality randomised, population-wide and longitudinal studies. The authors' appeal to build measurement and evaluation systems into all our disease management programmes is well made, not to secure the future of health policy researchers but all the more to secure the sustainable financing of our healthcare systems to ensure accessible, affordable and equitable quality outcomes for all.

Over the past two decades one evaluation technique that increasingly has been used to compare and contrast various health policy options is Health Technology Assessment (HTA), the subject of our second research paper. This examines the state of the art and practice in nine EU states and elucidates a series of principles and propositions considered by the authors as important for the future of HTA in Europe. These amount to a statement of and a plea for the emergence of a sense of good if not best practice. In the light of the earlier discussion above it is interesting to note that to date the role of HTA in public health as regards prevention or promotion activities has been limited, although specific public health interventions from England, Denmark and Sweden are cited as examples of a step in this direction. Also a population health outcomes approach over a ten year period in New Zealand is reported. This contrasts with a silo based logic of some healthcare care budgeting systems whose response is more calibrated to short term political pressures for early results than structural perspectives for long term impact.

The paper is strong in its preference for HTA to act at arm's length from payment authorities. HTA should make recommendations and not funding decisions. It should guide but not decide. Much HTA concentrates on pharmaceuticals and new technologies at the expense, in the authors' view, of examining existing drugs and devices and of failing to devote sufficient attention to the evaluating disinvestment decisions in healthcare. On the topic of pharmaceutical related HTA there is a call for ex post as well as ex ante evaluation, permitting real world outcomes to be taken into account in final decisions as regards access and remuneration, while facilitating early market access to treatments through conditional reimbursement at the outset. The paper notes the paucity of developed national e Health strategies with virtually none having an integrated approach to assessing the usefulness, effectiveness and cost effectiveness of such initiatives.

Notwithstanding its analytical foundations public trust in and acceptance of the evidence produced by HTA and in the recommendations that flow from it are by no means universal. The independence, objectivity and transparency of HTA agencies can contribute to consensus building but so too can the extent of stakeholder engagement. The OECD in 2005 noted that patient and consumer groups were the least involved. While our research suggests that several countries have opened up to citizen and patient groups and panels, few support a formal or integral role. Stakeholder involvement is resource intensive but it is a platform for building greater trust and confidence in the system. If HTA gets the popular reputation of merely being a cost containment tool designed to deny access for patients to innovative new treatments it could ultimately undermine what is one of the most widespread and useful assessment and evaluation techniques increasingly used in Europe and throughout the world.

In the past several years I have had the privilege to chair our steering committee and wish to take this opportunity to express my gratitude to all who serve and have served on it for their commitment, their guidance and their insights. In particular I wish to thank Dr. Rheinhard Busse and Dr. Panos Kanavos and their colleagues for the excellence of their research work. I wish to acknowledge our sponsors, Pfizer, whose financial support and respect for the independent integrity of this exercise have been indispensible. Finally, I wish to express our gratitude to the Czech Presidency for their participation in and patronage of our conference.

Pat Cox

4 February 2009

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MANAGING CHRONIC DISEASE IN EUROPE

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LIST OF ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
AOK	General regional health funds
BMI	Body mass index
CAD	Coronary artery disease
CCM	Chronic care model
CDSS	Computerised clinical decision support
CDM	Chronic disease management
CEDIT	Comité d'Évaluation et de Diffusion des Innovations Technologique
CHF	Congestive heart failure
COPD	Chronic obstructive pulmonary disease
CVD	Cerebrovascular disease
DACEHTA	Danish Centre for Evaluation and Health
DALY	Disability-adjusted life year
DM	Diabetes mellitus
DMP	Disease management programme
DNA	Deoxyribonucleic acid
EPC	Enhanced primary care
ELSID	Evaluation of a Large Scale Implementation of Diseases Management Program
FFS	Fee-for-service
GBD	Global burden of disease
GDP	Gross domestic product
GP	General practice/practitioner
HIV	Human immunodeficiency virus
HPV	Human papilloma virus
HSR	Health services research
HTA	Health technology assessment
ICM	Integrated care model
ICT	Information and communication technologies
IQWIG	Institut für Wirtschaftlichkeit und Qualität im Gesundheitswesen (German Institute for Quality and Efficiency in Health Care)
NHS	National Health Service
PAL	Physical activity level
PCT	Primary care trust
PUFA	Polyunsaturated fatty acids
QALYs	Quality-adjusted life years
QOF	Quality and outcomes framework
RCT	Randomised controlled trial
WHO	World Health Organization

EXECUTIVE SUMMARY

Chronic conditions and diseases are the leading cause of mortality and morbidity in Europe, and research suggests that complex conditions such as diabetes and depression will impose an even greater health burden in the future. It has been estimated that in 2005 77% of all Disabiliy-Adjusted-Life-Years (DALYs) and 86% of premature deaths in the WHO European region are related to non-communicable diseases. The condition expected to increase most dramatically is dementia. The main risk factors for chronic disease are tobacco use, overweight and obesity, hypertension, alcohol abuse, and a sedentary lifesstyle. Some years ago chronic diseases were meant to be a problem of the rich and elderly population. Today we know that within high income countries, poor as well as young and middle-aged people are affected by chronic conditions.

The economic implications are serious from a macroeconomic perspective as well as from a microeconomic perspective. Chronic diseases depress wages, earnings, workforce participation, labour productivity and hours worked - and they may also lead to early retirement, high job turnover and disability. Disease-related impairment of households' consumption and educational performance impacts on the gross domestic product (GDP) and on its growth rate. Spending on chronic care is rising across Europe and consuming growing portions of public and private budgets. The cost of chronic diseases and their risk factors, as measured by cost-of-illness studies, is sizeable, ranging up to 6.77% of a country's GDP.

Policy makers in Europe need to take action if they want to improve chronic disease management. This report aims to inform decision-making by giving an overview of the available strategies and interventions as well as empirical evidence on their effectiveness and cost-effectiveness. The report also focuses on five areas of managing chronic disease where policy makers must act. Recommendations are given in each area.

Prevention and early detection

To combat chronic conditions, most countries in Europe are applying various approaches of disease prevention and early detection. Prevention includes primary, secondary, or tertiary approaches that differ in aims and target groups. Research indicates that broad approaches combining several interventions are most effective. New Zealand's diabetes prevention programme is an example of a successful multi-level approach. New Zealand's cancer control strategy integrates all those involved and has been implemented across different health care sectors. Many prevention programmes tackle tobacco, alcohol consumption, obesity or hypertension. Cost-effectiveness for tobacco control is clear, but results for interventions to reduce and prevent obesity are inconclusive. Overall, analyses indicate that efficient strategies for prevention and early detection are available for many chronic conditions. Nevertheless, policy makers have to be cautious: cost-effectiveness varies considerably according to regional context and different populations. This means that for each intervention they must examine carefully regional factors and specifically define their target groups. Overall, prevention and early detection programmes are promising, but far from well developed in most countries. Given severe medical, social and economic consequences of chronic diseases, more effort and resources need to be invested in prevention.

New provider qualifications and settings

Health care has recently seen the emergence of new providers, settings and qualifications. Once it became clear that traditional demarcation lines between physicians and nurses could harm quality of care, new professions - such as nurse practitioners, liaison nurses and community nurses - were set up. The tasks and responsibilities of existing professional groups have been shifted and expanded. For example, physicians now have a coordinating role by guiding patients through the health system. Over the past 10 years new ways of providing services have been set up. Collaborative models - such as group practices, medical polyclinics and nurse-led clinics - are more patient-oriented. A key challenge is to support health workers in carrying out their new duties and responsibilities. There is a need for well-targeted training, particularly for those at the lower levels of the professional hierarchy. Evidence on these new qualifications and settings is limited, but pilot studies suggest that primary care nurses with more qualifications and responsibilities provide better care. New qualifications, structures and settings can help to improve the management of chronic diseases. Nevertheless, future research must build on these early results to see whether improvements justify investment, and also to inform future decisions.

Disease management programmes

Disease management programmes (DMPs) have been introduced by many European countries to improve chronic care and contain costs. The aim is to improve coordination by focusing on the whole care process, building on scientific evidence and patient involvement. There are still insufficient rigorously designed large-scale population-based evaluations, but smaller studies suggest that these programmes may improve care. Several studies have shown the benefits of providers following evidence-based guidelines. Patients' behaviour has also changed, as expressed in greater patient satisfaction and adherence to treatment. Generally, the evidence suggests an improvement in the care process. The evidence on medical outcomes, however, is still inconclusive. Only a few studies have shown that disease management programmes affect mortality and other health-related outcomes. The evidence on cost-effectiveness is similarly inconclusive. Economic evaluation studies look only at costs and do not consider the relation of costs and benefits. Providers and insurers must make the data they collect available for research, and evaluation must become an integral part of these programmes.

Integrated care

Integrated care models respond to the fact that chronic diseases can rarely be treated in isolation. Patients often have several chronic diseases or conditions at a time and need care from different providers. These models organise treatment (and prevention) so that services are better integrated across the whole range of care. Examples in Europe are the introduction of case management by the National Health Service (NHS) in the UK, or the pilot projects in Spain in which the whole care process is provided by only one source. All over Europe various forms of provider networks and interventions have been set up to close the gap between primary and hospital services. Between 2004 and 2008, 1% of all payments for physicians and hospitals were earmarked for investing in integrated-care projects. The effectiveness of these projects remains uncertain because so far the evidence is limited. Several components - such as self-management support, delivery system design and decision support - seem to be effective, but there is a lack of large-scale population-based studies. Some of the preliminary results give cause for optimism, but, given the complexity of integrated care models, implementation will be challenging and future studies should focus on this. As for cost-effectiveness, early results are inconclusive. Policy makers must ensure that costs, savings and benefits are studied in more detail.

Given these findings, this report suggests that policy makers should consider the following recommendations if they wish to improve the management of chronic disease in an effective and sustainable manner:

(1) *New pharmaceuticals* and medical devices can help to improve treatment for the chronically ill but will bring new difficulties in terms of marketing authorisation and reimbursement.

(2) Properly applied *financial incentives* can be powerful tools to bring about effective and rapid change. Policy makers need to pay attention to operational aspects, such as the size of variable compensation or funding and issues in goal-setting. In chronic care, benefits tend to appear only after several years, which means that policy makers must realise that often the quality of care will only be improved if providers are confident that they will able to benefit from their investments. Hence they need to look carefully at which strategy to follow with regard to 'continuity of care'.

(3) Policy makers should recognise that reforms intended to improve *coordination* must be well-prepared and supported by strong political will. They should map out clearly the responsibilities of all the individuals and groups involved. The balance between local autonomy and central authority must be carefully defined. Policy makers will need to provide enough funding to enable reform while at the same time setting up compensation schemes that will encourage professional groups to cooperate. Finally, health workers need adequate training and mutual learning and communication

(4) To release the full potential of *information and communication technology* (ICT), agreement must be reached on international technical standards. Solutions must be found for translating the vast amounts of data into meaningful information that health professionals can use.

(5) *Evaluation* should be an integral part of programmes to improve the management of chronic disease. The process should not block effective patient-oriented innovations, which is a dilemma for which new approaches need to be developed and agreed. Because policy makers need better evidence in order to make informed decisions, they should immediately make existing data available for research.

INTRODUCTION 1

European societies face various health care challenges, such as increasing longevity, changing life-styles and advances in medical technology.

Potentially the most important challenge will be managing chronic diseases – the 'ongoing management of conditions over a period of years or decades'. They are already the leading cause of mortality and morbidity in Europe, and research suggests that complex conditions such as diabetes and depression will impose an even larger burden in the future.

The economic implications are serious. Chronic diseases depress wages, earnings, workforce participation and labour productivity, and they increase early retirement, high job turnover and disability. Disease-related impairment of households' consumption and educational performance has a negative effect on the gross domestic product (GDP). As expenditure on chronic care rises across Europe, it takes up increasingly greater proportions of public and private budgets.

Chronic diseases have traditionally been cardiovascular disease, diabetes, and asthma. As survival rates and times have improved, they now also include many types of cancer, HIV/AIDS, mental disorders (such as depression, schizophrenia and dementia) and disabilities such as sight impairment and arthroses. Many chronic diseases and conditions are linked to an ageing society, but also to lifestyle choices such as smoking, sexual behaviour, diet and exercise.

What they have in common is that they need a long-term and complex response, coordinated by different health professionals with access to drugs and equipment, and extending into social care. Most health care today, however, is still structured around acute episodes.

Because policy makers in Europe need to make decisions on how to manage chronic disease, this report evaluates the current situation and proposes future directions. It relies on published sources but is not a 'systematic review' (the authors do not claim to have searched for all available pieces of evidence). An important source of information, which the authors gratefully acknowledge, is *Caring for People with Chronic Conditions: A Health System Perspective*, edited by Ellen Nolte and Martin McKee in 2008 by the European Observatory on Health Systems and Policies' OUP series.

The report consists of three parts (figure 1). The first outlines the burden of chronic disease on patients, groups and societies in Europe. Chapter 2 focuses on the burden of chronic disease and related risk factors in Europe and shows that chronic diseases are no longer confined to the old and rich. Chapter 3 outlines the economic implications of chronic diseases. We distinguish between results generated by microeconomic and macroeconomic analyses.

The second part of the report concentrates on strategies that could combat and prevent chronic diseases, in particular:

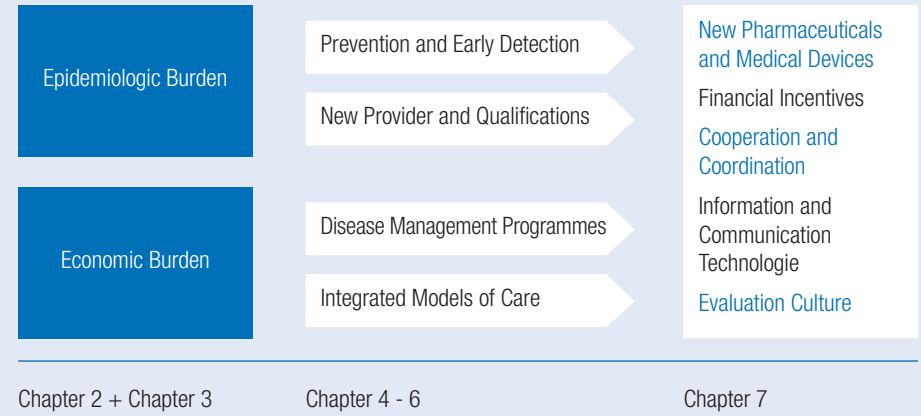
- prevention and early detection,
- qualifications and settings of new providers,
- disease management programmes, and
- integrated models of care.

Chapter 4 describes these strategies. Chapter 5 summarises the evidence on effectiveness and chapter 6 summarises the evidence on cost-effectiveness.

The third part (Chapter 7) draws conclusions from this evidence about the actions policy-makers should take. We make recommendations in five areas:

- innovations, particularly in pharmaceuticals and medical devices,
- financial incentives,
- coordination and cooperation,
- information and communication technologies, and
- evaluation culture.

Figure 1: Structure of the report



Chapter 8 summarises the report and suggests future research needs.

PART I: BURDEN OF CHRONIC DISEASE

This part of the report will outline the burden of chronic disease on patients, groups and societies in Europe. Chapter 2 will focus on the epidemiology and related risk factors in Europe. Chapter 3 will examine the economic implications.

EPIDEMIOLOGY AND ECONOMIC BURDEN OF CHRONIC DISEASE IN EUROPE 2

This chapter will look at how chronic diseases affect European countries in different ways. It will examine the burden of disease across countries and regions, the prevalence of risk factors (such as smoking and being overweight), and the varying burdens of selected chronic conditions. Finally, it will estimate the future mortality and burden of chronic diseases.

2.1 Current status

The burden of chronic diseases

The World Health Organization (WHO) defines chronic diseases as *diseases of long duration and generally slow progression*. Often the terms *non-communicable disease* and *chronic disease* are treated as exchangeable. But given recent advances in treating communicable diseases this use is no longer precise enough. For example, HIV/AIDS treated with modern medicines has become a disease of long duration and generally slow progression. This report acknowledges this issue, but nevertheless refers to sources that use non-communicable disease as a proxy for chronic disease if no alternative high-quality data is available. Following the WHO classification, cancer is treated as a chronic disease in this report, even though it is acknowledged that the strategies used in chronic disease management are not always applicable to those with this disease.

Chronic disease is responsible for most of the disease and deaths in Europe. One measure for the overall burden of disease, developed by the WHO, is the Disability-Adjusted Life Year (DALY). It is designed to quantify the impact on a population of premature death and disability by combining them into a single measure. The DALY relies on the assumption that the most appropriate measure of the effects of chronic illness is time either spent disabled by disease or lost due to premature death. One DALY equals one year of healthy life lost (WHO 2005). Table 1 shows the numbers of DALYs as well as their percentage as a share of non-communicable diseases for 2005 (Singh 2008; WHO 2005).

Table 1: Disease burden and deaths from non-communicable diseases in the WHO European region by cause (2005)

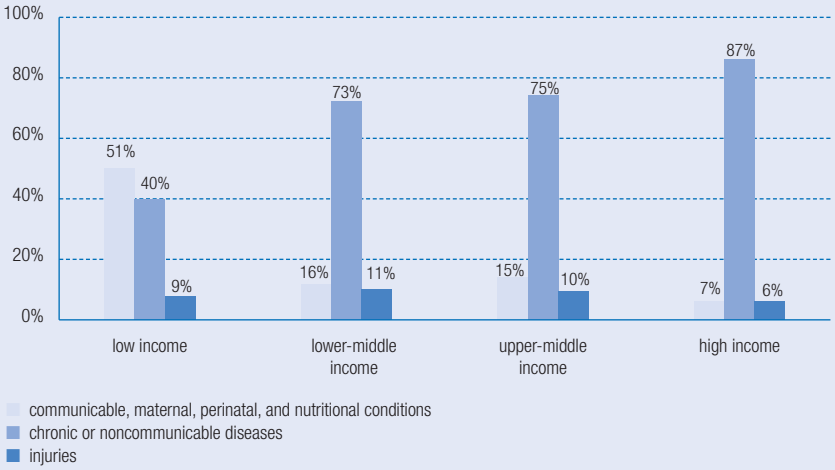
Groups of causes	Disease Burden		Deaths	
	DALYs (thousands)	Proportion from all causes (%)	Number (thousands)	Proportion from all causes (%)
Selected noncommunicable diseases				
Cardiovascular diseases	34.421	23	5.067	52
Neuropsychiatric conditions	29.370	20	264	3
Cancer (malignant neoplasms)	17.025	11	1.855	19
Digestive diseases	7.117	5	391	4
Respiratory diseases	6.835	5	420	4
Sense organ diseases	6.339	4	0	0
Musculoskeletal diseases	5.745	4	26	0
Diabetes mellitus	2.319	2	153	2
Oral conditions	1.018	1	0	2
All noncommunicable diseases	**115.339**	**77**	**8.210**	**86**
All causes	**150.322**	**100**	**9.564**	**100**

Source: Singh (2008)

1 The four groups are according to the income categories used by the World Bank.

The incidence of chronic diseases is high in high-income countries. The WHO's project *The Global Burden of Disease* (GBD) estimates incidence, health state prevalence, severity and duration, and mortality for more than 130 major causes. It includes data since 2000 for WHO member states and for sub-regions of the world (WHO 2008). Figure 2 shows the high share of chronic or non-communicable diseases compared with communicable, maternal, perinatal and nutritional conditions, as well as injuries in low-income, lower-middle income, upper-middle income and high-income countries[1] (Suhrcke et al. 2007).

Figure 2: Worldwide share of deaths by causes and countries within different World Bank income categories (2002)



Source: Suhrcke et al. (2007); Mathers et al. (2003)

The WHO project estimates that in 2002 chronic or non-communicable conditions accounted for 87% of deaths in high income countries (figure 1). Only 7% of deaths were attributed to communicable conditions and nutritional deficiencies and 6% to injuries (WHO). The proportion of deaths worldwide caused by non-communicable disease is projected to rise from 59% in 2002 to 69% in 2030 (Mathers and Loncar 2005).

Most studies focus on chronic conditions and on risk factors between countries, and only a few have looked at the distribution within countries. However, increasing data from high-income countries almost unanimously shows that the poor within these countries carry a higher chronic disease burden than the rich (Suhrcke et al. 2007).

The link between disease and age is also crucial from an economic and public-policy standpoint. The proportion of those in European countries aged 65 and older is projected to grow from 15% in 2000 to 23.5% by 2030. The proportion of those aged 80 years and more is expected to more than double from 3% in 2000 to 6.4% in 2030 (Pomerleau et al. 2008; Kinsella and Phillips 2005). This trend is clearly one of the reasons for the growing burden of chronic conditions and diseases.

But older people are not the only ones affected by chronic diseases. Rising numbers of young and middle-aged people have some form of chronic health problem (Pomerleau et al. 2008). The WHO project estimated that 72% of all deaths before the age of 60 in 2002 were due to chronic or non-communicable conditions in high income countries, whereas communicable diseases accounted for only 8% and injuries for 21%. In the same year, 68% of DALYs lost to chronic diseases in high income countries occurred among those of working age. These findings suggest that chronic disease can no longer be considered just a problem of the elderly (Suhrcke et al. 2007; Mathers et al. 2003).

The burden of chronic disease risk factors

The shape of the future burden of chronic disease can be projected by risk factor data (Suhrcke et al. 2007). The main risk factors for chronic disease are tobacco use, overweight and obesity, hypertension, alcohol abuse, and a sedentary lifestyle. Table 2 presents deaths and DALYs attributable to risk factors.

Table 2: Deaths and burden of disease attributable to common risk factors, in absolute numbers and percentages of all deaths/DALYs, sorted by contribution to world-wide deaths (2001)

Chronic disease risk factors	Low- and middle-income		High-income		World	
	Deaths	DALYs	Deaths	DALYs	Deaths	DALYs
High blood pressure	6,223 (12.9%)	78,063 (5.6%)	1,392 (17.6%)	13,887 (9.3%)	7,615 (13.5%)	91,950 (6.0%)
Smoking	3,340 (6.9%)	54,019 (3.9%)	1,462 (18.5%)	18,900 (12.7%)	4,802 (8.5%)	72,919 (4.7%)
High cholesterol	3,038 (6.3%)	42,815 (3.1%)	842 (10.7%)	9,431 (6.3%)	3,880 (6.9%)	52,246 (3.4%)
Low fruit and vegetable intake	2,308 (4.8%)	32,836 (2.4%)	333 (4.2%)	3,982 (2.7%)	2,641 (4.7%)	36,819 (2.4%)
Overweight and obesity	1,747 (3.6%)	31,515 (2.3%)	614 (7.8%)	10,733 (7.2%)	2,361 (4.2%)	42,248 (2.8%)
Physical inactivity	1,559 (3.2%)	22,679 (1.6%)	376 (4.8%)	4,732 (3.2%)	1,935 (3.4%)	27,411 (1.8%)

Source: Lopez et al. (2006)

According to the 2002 WHO report *Reducing Risks, Promoting Healthy Life*, tobacco use still remains the leading avoidable cause of death in industrialised nations (WHO 2002). In Europe over the past 30 years the proportion of smokers has dropped from 45% to 30%. However in Eastern European countries, and particularly in the Baltic states, smoking has continued to increase, particularly among young people and women (Novotny 2008).

Alcohol abuse causes chronic illnesses, such as alcohol dependence, vascular disease (such as hypertension), hepatic cirrhosis and various cancers. Of the global loss of DALYs, 4.7% can be explained by alcohol-related diseases. At 10.7%, the share for Eastern Europe is significantly higher (Jamison et al. 2006; Novotny 2008).

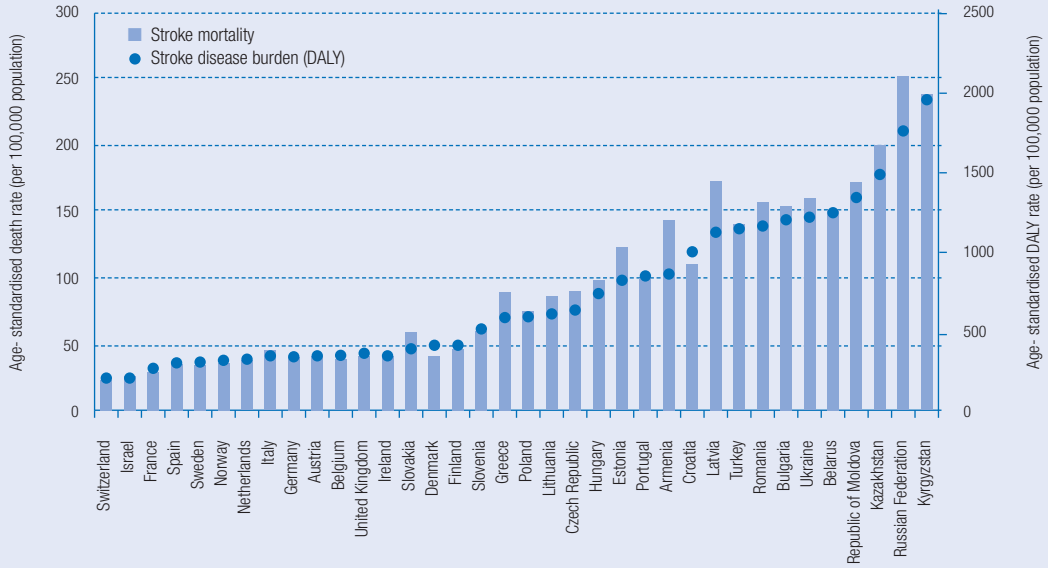
Overweight is defined as a body mass index (BMI or kg/m2) of 25 or more. People with a BMI of 30 or more are classified as obese. According to this definition, almost a third of all people living in Europe are overweight. Older age groups show higher prevalence (up to 57% of men in Western Europe aged 70-79 years) (James et al. 2004; Novotny 2008). However, an increasing number of European children are affected: one study by the London Obesity Task Force found that 18% of children in Europe were overweight (Novotny 2008).

Variation of burden: selected chronic conditions in Europe

The contribution of chronic diseases to the overall mortality and burden of disease varies within the European region, as the leading chronic conditions illustrate. However, with some diseases we do not know how much of this variation is caused by disease, and how much to coding by health professionals in the various countries (Pomerleau et al. 2008).

Cerebrovascular disease or stroke accounted for about 15% of all deaths and about 7% of disease in 2002 in Europe (WHO 2004a). However, the mortality and disease burden attributed to stroke in the European region varies considerably (figure 3). The Russian Federation, Kyrgyzstan and Kazakhstan have up to 10 times higher levels than Switzerland, Israel and France (Pomerleau et al. 2008).

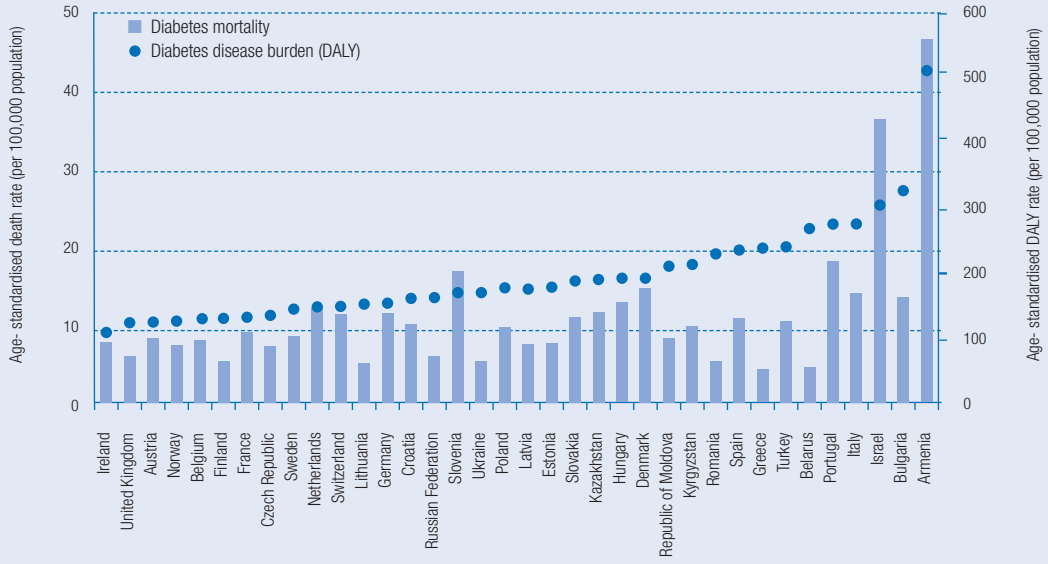
Figure 3: Burden of death and disease attributable to stroke in selected countries in the WHO European region (2002)



Source: Pomerleau et al. (2008); WHO (2004b)

Mortality and disease burden from diabetes mellitus also vary considerably (figure 4). Age-standardised death rates in 2002 ranged from 4.0 per 100,000 in Greece to 17.9 in Portugal, I36.1 in Israel and 46.8 in Armenia. These figures may be an underestimate because diabetes is not always recorded as the underlying cause of death, particularly for older people (Pomerleau et al. 2008).

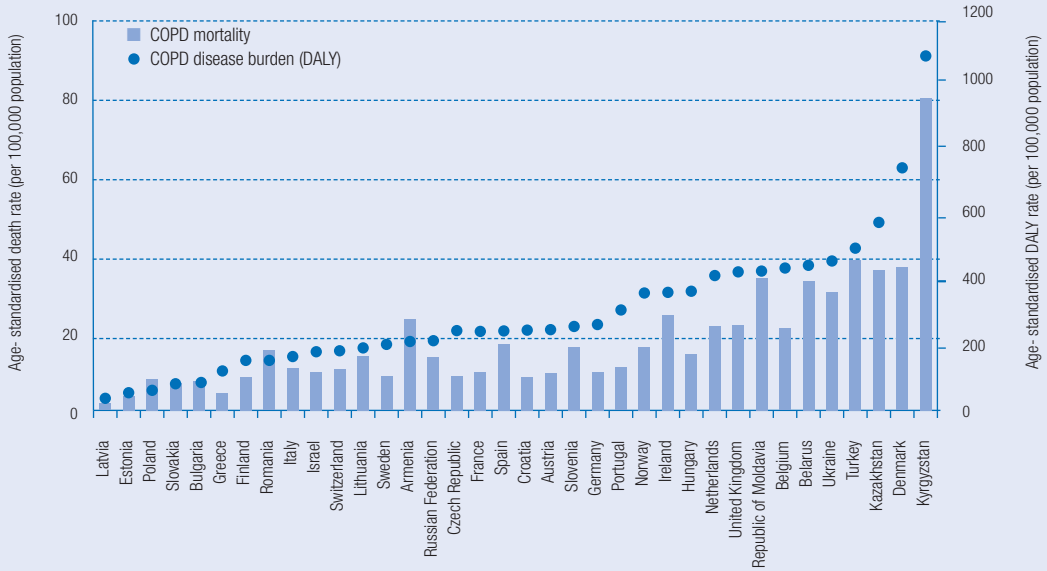
Figure 4: Burden of death and disease attributable to diabetes in selected countries in the WHO European region (2002)



Source: Pomerleau et al. (2008); WHO (2004b)

Chronic obstructive pulmonary disease (COPD) is also one of the leading causes of premature death in Europe and its contribution varies considerably in different countries., COPD is associated with an estimated 5.1 deaths and 70 DALYs per 100,000 population in Latvia, while in Kyrgyzstan it is associated with 80.9 deaths and 1,088 DALYs per 100,000 (figure 4) (Pomerleau et al. 2008).

Figure 5: Burden of death and disease attributable to COPD in selected countries in the WHO European region (2002)

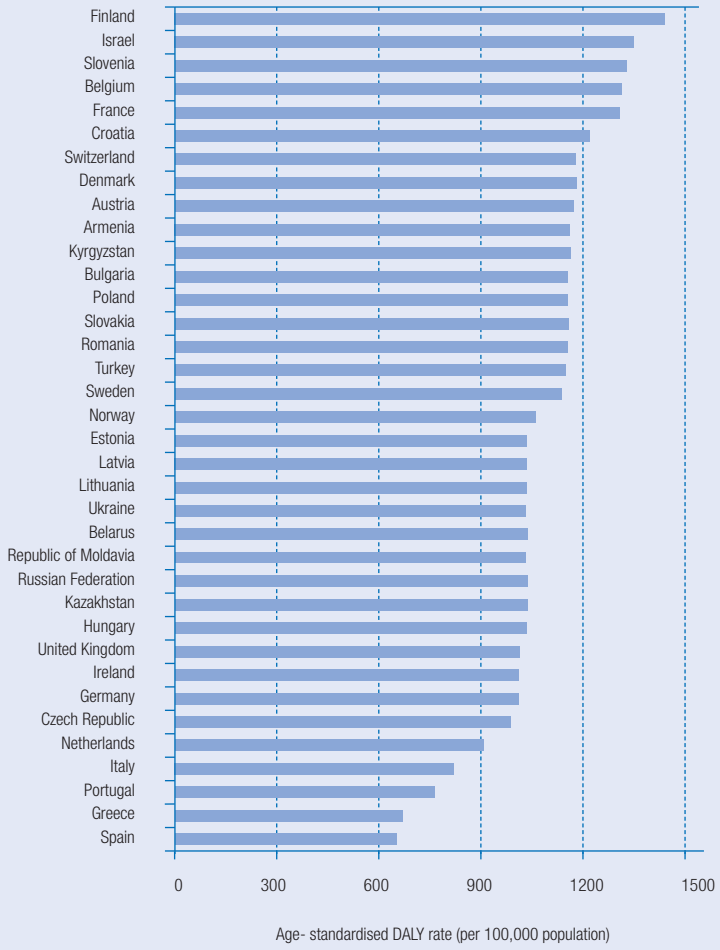


Source: Pomerleau et al. (2008); WHO (2004b)

The prevalence of mental disorders is high in the European region (Kessler, 2007). Dementia among those aged 65 and over in 2000 was estimated to vary between 6% in Eastern Europe and 8% in Northern Europe (Wimo et al., 2003). More recent estimates have placed the prevalence of dementia among those aged 60 and over at 3.8% in Eastern Europe and 5.4% in Western Europe (Ferri et al. 2005).

The WHO has estimated that one person in five will develop depression and that each year 33.4 million Europeans have major depression (WHO Europe 2003). Age-adjusted DALY rates range from 660 to 1,430 DALYs per 100,000 (Figure 5). Rates are lowest in Spain and Greece with DALYs below 700 per 100,000. The highest estimates are for Finland, Israel, Slovenia, Belgium and France, with rates of around 1,250 DALYs (WHO 2004b; Pomerleau et al. 2008). WHO projections suggest that deaths from unipolar depressive disorders in the European region will fall from 0.15 to 0.13 per 100,000 population between 2005 and 2030. However, suicide from depressive disorders is the third leading cause of death among young people in Europe (Pomerleau et al. 2008).

Figure 6: Burden of disease attributable to unipolar depressive disorder in selected countries in the WHO European region (2002)



Source: Pomerleau et al. (2008); WHO (2004b)

2.2 Predictions

Baseline predictions

Projections of future mortality and burden of disease show that chronic diseases will continue to be the biggest contributor to mortality and disability in high-income countries, and chronic disease will increase. The share of DALYs associated with chronic or non-communicable conditions in high income countries is projected to rise from 86% in 2005 to 89% in 2030 (Suhrcke et al. 2007; Mathers and Loncar 2005).

Predictions for selected chronic conditions in Europe

Predictions for specific chronic conditions vary. For example, WHO has projected fewer deaths and DALYs from stroke for both sexes and all ages in the European region by 2030 (WHO 2006). In contrast, Carandang et al. (2006) have estimated more strokes and a greater burden of disease. An ageing population means that more and more people will be prone to strokes, which supports this assumption.

Deaths directly attributable to diabetes are predicted to rise from about 152,000 in 2005 to more than 203,000 in 2030 (WHO 2006). The growth of diabetes type 2 is partly a result of rising obesity levels, especially among children (Pomerleau et al. 2008).

Deaths in Europe from COPD are expected to rise by about 25%, from 270,000 in 2005 to more than 338,000 in 2030. Despite these predictions, the burden of COPD is projected to fall from about 3.44 to 2.95 million DALYs (WHO 2006). However, death rate and DALYs attributable to COPD are expected to decrease in all groups other than women aged 70 and older (Pomerleau et al. 2008).

Unipolar depressive disorders are projected to fall slightly between 2005 and 2030. The WHO has projected a decrease in age-standardised death rates from 0.15 to 0.13 per 100,000. However, the burden of disease from this problem is projected to increase among men from 777 to 785 per 100,000 (1%) and among women by 1.8% (from 1,312 to 1,337 per 100,000) (WHO 2006; Pomerleau et al. 2008).

The condition expected to increase most dramatically is dementia. The number of those in Europe aged 60 and more with dementia is estimated to rise from 7.7 million in 2001 to 10.8 million in 2020. Without effective prevention and treatment, this is expected to double to 15.9 million in 2040. The increase varies between 31% and 51% in different regions (Ferri et al. 2005).

3 ECONOMIC CONSEQUENCES OF CHRONIC DISEASE

There is considerable evidence on the epidemiology of chronic disease, but little on its economic implications (Suhrcke et al. 2007). This chapter will review recent microeconomic and macroeconomic evidence. The economic implications of specific strategies should not be the main or only guide when making health care decisions, but the main purpose of any intervention must be to improve health cost-effectively. Clearly, policy makers often target economic variables such as cost savings, greater labour productivity or economic growth. But these should not be the main criteria for evaluating specific strategies in chronic disease management. In order to understand the implications of chronic conditions and diseases, the economic implications should be examined.

3.1 The microeconomic perspective

Microeconomics examines the consequences of chronic disease on individuals and households. The evidence from European countries is growing but still limited (Suhrcke et al., 2008). So far it has identified the following effects of chronic conditions (Suhrcke et al. 2007):

Consumption and saving decisions: treating chronic diseases may be particularly costly in countries where a high share of total health spending is paid 'out of pocket'. Spending on addictive products such as tobacco and alcohol may cause poor health, and the household's ability to keep consumption levels constant in the face of 'health shocks' can be very costly.

With regard to *labour supply and labour productivity*, lower wages and earnings have been found. Chronic conditions and diseases mean fewer people in the work force, with early retirement, barriers to employment, and stigma.

Suhrcke et al. (2007) summarise the evidence on the impact of chronic diseases and conditions on labour markets (table 3 and table 4).

There is reasonable evidence on the impact of chronic disease and risk factors on the labour market, showing that chronic disease affects wages, earnings, workforce participation, hours worked, retirement, job turnover and disability.

Education and human capital formation is accepted as a powerful determinant of future earnings and future health. A full assessment of the costs of chronic disease should include the impact on education and the current evidence shows it affects educational performance. The death of a parent can reduce school enrolment (Gertler et al. 2004). Several studies have reported an association between maternal smoking and impaired cognitive and behavioural development, which in turn affects the academic performance of children (Ernst et al. 2001). Alcohol abuse is related to poor performance. This applies to young people in developed countries, where excessive drinking among younger age groups is relatively widespread (Suhrcke et al. 2007). Overweight or obese children are more likely to suffer from low self-esteem as a result of stigmatisation and this leads to absence from school (Latner and Stunkard 2003; Hayden-Wade et al. 2005).

The effects of chronic conditions and diseases on labour market outcomes and education are especially pronounced in low- and middle-income countries. In Europe, health insurance mitigates some of these effects. Nevertheless, the consequences on labour supply, productivity, education and the accumulation of human capital accumulation remain negative.

Overall, the evidence shows that chronic conditions and diseases have a negative effect on the labour market and on the formation of human capital. But the causal linkages are far from clear and these gaps need to be filled by further research.

Table 3: The impact of chronic disease and risk factors on labour supply, selected examples

Country and study	Year data collected	Chronic condition and Impact of chronic condition on employment indicators/labour supply
Canada Kraut et al. 2001	**1983–1990**	**Diabetes** People 2.1-fold less likely to work
Europe Jimenez-Martin et al. 1999	**1994–1995**	**Chronic disease** Chronic disease increases the retirement probability Husband's health affects the couple's retirement decisions much more strongly than the wife's health does
Finland Sarlio-Lahteenkorva and Lahelma 1999	**1994**	**Obesity** Women face a 2.5-fold higher likelihood of unemployment Women face a 1.4-fold higher likelihood of unemployment
Ireland Gannon and Nolan 2004	**2000**	**Chronic disease** Men 61% less likely to work; women 52% less likely to work
	2002	**Chronic disease** Men 66% less likely to work; women 42% less likely to work
Russia Suhrcke et al. 2005	**2002**	**Chronic disease** Retirement age decreases by 2.5 years Men have a 13.6% greater chance of retirement Women have a 14.0% greater chance of retirement
Sweden Lindholm et al. 2001	**1979–1997**	**Chronic disease** Unemployment 1.9-fold higher 2.5-fold increase in people on welfare 1.8-fold increase in people with financial difficulties 3.5-fold increase in economic inactivity
United States Serxner et al. 2001	**1990–1998**	**Mental health** Absenteeism is 47% higher
		Tobacco use Absenteeism is 19% higher
		Obesity Absenteeism is 23% higher
United States Simon et al. 2000	**N/A**	**Depression** 15.3% higher employment rate for depression remission vs. control group
United States Dwyer and Mitchell 1999	**1992**	**Cardiovascular disease** Expected retirement age decreases by 0.7 years
		High blood pressure Expected retirement age decreases by 1.0 years
		Diabetes Expected retirement age decreases by 0.12 years
		Cancer Expected retirement age decreases by 0.13 years
United States Pelkowski and Berger 2004	**1992–1993**	**Chronic disease** Men work 6.1% fewer hours Women work 3.9% fewer hours
United States McGarry 2002	**1992–1994**	**Self-reported adult health** Men 3.5% less likely to work at age 62
United States Coile 2003	**1992–2000**	**Chronic disease** Men have a 42% greater probability of retirement and lose 1,030 hours of lifetime work Women have a 31% probability of retirement and lose 654 hours of lifetime work
United States Cawley 2004	**1997–2004**	**Obesity** For white people, a 10% weight increase corresponds to a 12% decrease in probability of full-time employment, 5.4% fewer hours worked, 5% fewer months, 16% increase in months on welfare, and 10% lower earnings For African American a 10% weight gain corresponds to a 10.9% increase in months spent on welfare

Source: Suhrcke et al. (2007)

Table 4: The impact of chronic disease and risk factors on wages, earnings or incomes, selected examples

Country and study	Year data collected	Chronic condition and Impact of chronic condition on employment indicators/labour supply
Australia Lee 1999	**1980–1989**	**Tobacco use** Wages are 6.6% lower for smokers and 5.5% lower for former smokers
Canada Kraut et al. 2001	**1983–1990**	**Diabetes** Wages decrease by 28%
Canada Auld 1998	**1991**	**Tobacco use** Daily smokers earn 30% less than nonsmokers.
Finland Sarlio-Lahteenkorva and Lahelma 1999	**1994**	**Obesity** Likelihood of low household income increases by 1.5 times Likelihood of low individual income increases by 1.6 times
Indonesia Kosen 1998	**1995**	**Tobacco use** Lost annual income is US$115 for individuals who use tobacco Lost annual income is also US$115 for family members of tobacco users
Netherlands van Ours 2004	**2001**	**Tobacco use** Wages 10% lower
Russia Suhrcke et al. 2005	**2002**	**Chronic disease** 5.6% lower median per-person income
United Kingdom Sargent and Blanchflower 1994	**1974–1981**	**Obesity** Wages reduced by 6.4% for 23-year-old women
United States Tucker and Friedman 1998	**N/A**	**Obesity** Likelihood of absenteeism increases 1.7-fold for men Likelihood of absenteeism increases 1.6-fold for women
United States Pronk et al. 2004	**N/A**	**Obesity** Obese employees are less likely to get along with co-workers and more likely to incur work loss days **Physical activity** Physical activity was positively associated with the quality of work performed and the overall job performance **Cardiac fitness** Cardio-respiratory fitness is positively associated with the quantity of work performed, and with extra effort exerted at work
United States Fielding 1996	**N/A**	**Physical inactivity** Productivity declined 50% in the last two hours of work each day
United States Sloan et al. 2004	**N/A**	**Tobacco use** Lifetime wages reduced by US$40,000
United States Gortmaker et al. 1993	**1981–1988**	**Obesity** Income for men is 9% lower (equivalent to a reduction of US$2,876) Income for women is 22% lower (US$6,710)
United States Cawley 2004	**1981–2000**	**Obesity** For white females, a difference in weight of two standard deviations (roughly 65 pounds) is associated with a difference in wages of 9%. (in absolute value, this is equivalent to the wage effect of roughly one and a half years of education or three years of work experience)
United States Levine et al. 1997	**1984–1992**	**Tobacco use** Wages decrease by 4–8%
United States Zagorsky 2004	**1985–2000**	**Obesity** A one-point increase in body-mass index reduces net worth by US$1,000

United States Bhattacharya and Bundorf 2004	**1989–1998**	**Obesity** Wages reduced by US$0.71 per hour
United States Haskins and Ransford 1999	**1988**	**Obesity** Higher weight tends to lower the chances for women to enter higher professional or managerial positions
United States Ng et al. 2001	**1989**	**Diabetes** 33% reduction in wages (US$3,700–$8,700 per year)
United States Averett and Korenman 1999	**1990**	**Obesity** White women's wages are reduced by 17%
United States Pelkowski and Berger 2004	**1992–1993**	**Chronic disease** Men earn 5.6% less; women earn 8.9% less
United States Mitra 2001	**1993**	**Obesity** Women earn US$1.26 less per hour One-pound increase in weight is associated with 2% decrease in wages for women in professional/managerial positions
United States Berndt et al. 2000	**1995**	**Depression** 12–18% lower wages over lifetime
United States Haskins and Ransford 1999	**1998**	**Obesity** Higher weight tends to lower the chances for women to enter higher professional or managerial positions

Source: Suhrcke et al. (2007)

3.2 The macroeconomic perspective

The macroeconomic perspective looks at the overall effect in terms of gross domestic product (GDP) or the GDP growth rate.

Health, as measured by life expectancy or adult mortality, is a robust predictor of economic growth. As shown in Chapter 2, chronic disease makes up a major part of the global health burden. Mortality, DALYs and reduced life expectancy from chronic disease can be expected to depress economic growth. However, research on this has been limited, partly because of data and methodological challenges (Suhrcke et al. 2007).

There is evidence that health is a significant determinant of economic growth for high-income countries. A study by Barro et al. (1996) estimated that a five-year advantage in life expectancy explains a 0.3–0.5% higher annual GDP growth rate in subsequent years. Although this study does not focus on chronic disease, these results suggest a significant relationship between health and growth.

More recently, Suhrcke and Urban (2006) found that cost-of-illness studies showed that the cost of chronic diseases and their risk factors on a country's GDP was sizeable, ranging from 0.02% to 6.77%. They looked at the worldwide impact of cardiovascular mortality on economic growth among the working-age population. In high-income countries, they found that a 1% increase in the mortality rate decreased the growth rate of per-capita income in the following five years by about 0.1%. This may appear small in terms of growth, but it becomes quite substantial when calculated over the long term (Suhrcke et al. 2008).

PART II: CHRONIC DISEASE MANAGEMENT STRATEGIES

Part II looks at the strategies available to combat and prevent chronic diseases. Chapter 4 describes them. Chapter 5 presents the evidence on the effectiveness of each of the four strategies, and Chapter 6 summarises the evidence on cost-effectiveness.

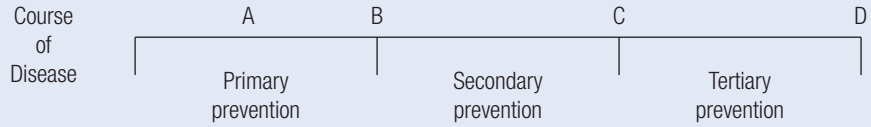
4 STRATEGIES AGAINST CHRONIC DISEASE: WHAT IS BEING DONE?

In this chapter we describe strategies for managing chronic disease, looking at countries that have innovated. These include a range of European countries, as well as Canada, Australia, New Zealand and the USA. They provide important and useful lessons.

4.1 Prevention and early detection

Most countries are experimenting with disease prevention and early detection. Prevention includes primary, secondary, or tertiary approaches that differ in aims and target groups (figure 7).

Figure 7: Prevention and stages of disease



A-B	Period of increased risk
B	First observable pathophysiological changes
C	First changes perceivable by patient
D	Course can no longer be influenced

Primary prevention is directed at the prevention of illnesses by removing the causes. The target group for primary prevention is healthy with respect to the target disease.

Secondary prevention aims at identifying the disease at an early stage so that it can be treated. This makes possible an early cure (or at least the prevention of further deterioration). The target group for secondary prevention consists of people who are already ill without being aware of it, or who have an increased risk, or who have a genetic disposition.

Tertiary prevention is directed toward people who are already known to suffer from an illness. This is therefore a form of care. Tertiary prevention includes activities intended to cure, to ameliorate or to compensate. For example, the avoidance of complications or the prevention of progress of disease would be classed as tertiary prevention.

Source: van der Maas and Mackenbach (1999)

The approaches vary according to the health care system and the dominant political opinions. Different countries may place different emphasis on the responsibility of the community and the individual, depending on cultural views about the role of the state and individual autonomy (Busse and Schlette 2007).

Scandinavian policies, for example, attach considerable importance to environmental factors and social conditions. Other countries, such as France, Germany and the United States, focus more on the individual's attitude to risk factors such as tobacco, alcohol and nutrition (Busse et al. 2006).

Other countries, such as the UK, Canada and New Zealand, emphasise integrated approaches, with clinical care systems part of a broader approach that involves public health and health promotion efforts linked to disease management and support for self-care (Novotny 2008). The following section gives an overview of the different prevention strategies.

Tobacco and alcohol interventions

More and more European countries have been tackling tobacco consumption and its negative health consequences (Busse and Schlette 2007). Common elements are:

- *pricing policies*: taxes, minimum duties, minimum prices,
- *information and communication*: limits on advertising and promotion, product displays and marketing, requirements for compulsory labelling,
- *packaging*: minimum size of packs of cigarettes,
- *distribution:* restriction on sales to minors, introduction of cigarette vending machines with youth protection technology,
- *consumption:* smoking bans in public places, bars and restaurants and at the workplace, and
- *smoking cessation*: behavioural assistance.

Similar policies have been developed for alcohol abuse. Raising prices with higher taxes does reduce consumption. Bans on advertising are thought to reduce social acceptance of excess drinking. Sales of alcohol may be restricted to licensed retail outlets or during limited hours, and minimum age restrictions applied. Strict driving laws discourage excessive drinking and prevent traffic accidents (Novotny 2008).

Obesity interventions

There are various approaches to preventing obesity. These include public information and disclosure, targeting children and adolescents, taxing unhealthy food, planning the urban environment, and food prohibitions (Novotny 2008).

The dominant approach in obesity control is primary prevention. The European Commission has developed an action plan for European dietary guidelines based on existing evidence on health promotion programmes. The plan describes population goals for nutrients and lifestyle for the prevention of chronic diseases in Europe (European Commission 2000). Table 5 sets out the components, goals and level of evidence criteria.

Although there are effective interventions to reduce obesity, in many countries the response to the challenge is inadequate. For example, few European nations have average diets containing less than 30% of dietary energy from fat (Novotny 2008).

Hypertension interventions

It is widely agreed that effective approaches to hypertension should be combined with other strategies aimed at reducing risk factors for ischaemic heart disease (Novotny 2008). Such programmes in Europe and elsewhere include weight loss, healthy diet (high in potassium and low in sodium, low fat, adequate fruit and vegetable consumption), physical activity, and moderate alcohol consumption (Chobanian et al. 2003).

Table 5: Population goals for nutrients and features of lifestyle consistent with the prevention of major public health problems in Europe

Component	Population goals	Levels of evidence
Physical activity levels (PAL)	PAL > 1.75	++
Body mass index	BMI 22-22	++
Dietary fat as % of energy	<30	++
Fatty acids % total energy		
Saturated	<10	++++
Trans	<2	++
Polyunsaturated (PUFA)		
n-6	4-8	+++
n-3	2g linoleic + 200mg very long chain	++
Carbohydrates total % energy	>55	+++
Sugary food consumption occasions per day	≤4	++
Fruit and vegetables (g/d)	>400	++
Folate from food (µg/d)	>400	+++
Dietary fibre	>25 (or 3g/MJ)	++
Sodium (expressed as sodium chloride) (g/d)	<6	+++
Iodine (µg/d)	150 (infants -50) (pregnancy – 200)	+++
Exclusive breast feeding	About 6 months	+++

Levels of evidence: (++++) Multiple double blind placebo controlled trials; (+++) single study of double blind analyses (breast feeding – series of non-double blind analyses); (++) ecological analyses compatible with non-double blind intervention and physiological studies; (+) integration of multiple levels of evidence by expert groups.

Source: European Commission (2000)

Examples of specific intervention programmes

The international trend is towards holistic approaches to prevention. For example, the national diabetes prevention programme in New Zealand (Busse et al. 2006) combines primary, secondary and tertiary approaches and thus reaches the whole target population. The programme has 10 fields of action, with specific goals and measures for each (CHSRP 2006). The fields are:

- supporting community leadership and action;
- promoting behaviour change through social marketing;
- changing urban design to support healthy and active lifestyles;
- supporting a healthy environment through cooperation with the food industry;
- strengthening health promotion;
- improving well-child services;
- working with schools to ensure children are 'fit, healthy and ready to learn';
- supporting primary care prevention and early intervention;
- enabling vulnerable families to make healthy choices; and
- improving service integration and care for advanced disease.

Representatives of various sectors - such as local government, the food industry, cultural groups, schools, sports clubs, and public and private health institutions - are working together,

Similarly, New Zealand's strategy against cancer highlights the fact that every public health strategy should try to integrate all aspects of the population's health, to implement programmes across different sectors, and to bring together all those involved. The cancer control strategy has six goals (CHSRP 2005):

- preventing lifestyle-related, infectious and work-related health risks;
- ensuring effective screening programmes;
- ensuring effective diagnosis and treatment;
- improving quality of life for cancer patients and their families through social support, rehabilitation and palliative care;
- improving the delivery of services for all types of cancer care; and
- improving the effectiveness of cancer control through research and surveillance.

For all sectors, the action plan for 2005–2010 determined secondary goals, defined target outcomes, specified steps for actions and established 'milestones'.

The British government formulated a national cancer plan in 2000, specifying targets and standards for prevention, medical care and palliative medicine. Since 2006, this has included a national screening programme for bowel cancer, which pilot studies suggest has been successful (Oliver 2005).

European measures to prevent specific chronic diseases also include *vaccination*. For example, the approval of the human papilloma virus (HPV) vaccine to prevent cervical cancer in Europe is now part of immunisation programmes in Austria, Germany, France and Italy (limited by age and sex), Belgium, Luxembourg, Norway, Sweden, Switzerland, and the UK (Arun 2007).

4.2 New provider qualifications and settings

Chronic diseases increase the complexity of health problems and the provision of care, requiring changes in professional activities, qualifications and care settings. This section will look at new approaches in provider qualifications and settings.

New provider qualifications

Physicians play a key role in guiding patients through the health system and therefore need to be trained to coordinate activities. In the Spanish region of Castile and Leon, medical and social services for chronic care have been integrated. Ensuring that physicians were appropriately qualified was found to be a major precondition (Casado 2003). Australia, the UK and the Scandinavian countries have used 'collaborative methodology' by training physicians to have a guiding role (Haas 2005). This methodology was developed in the 1990s by the US Institute for Healthcare Improvement and has a learning system aimed at improving care in specific areas, such as asthma, diabetes, heart disease and cancer (Busse et al. 2006).

Providers have also been experimenting with new types of care. Many countries are becoming convinced that the traditional demarcation lines between health professions - for example, between physicians and nurses - are harmful, and they are beginning to redistribute responsibilities. A new profession of *nurse practitioner* has been established in the UK, the Netherlands, the US, Canada, Australia, and New Zealand (Busse and Schlette 2007; CHSRP 2006; van Dijk 2003; McIntosh 2006). These university-trained professionals carry out traditional nursing duties, but also assume responsibility for tasks that would traditionally be viewed as part of a doctor's responsibility, such as limited prescribing of pharmaceuticals and giving less complex treatments.

Germany has recently created *community nurses*, similar to nurse practitioners in other countries. They make house visits and are responsible for basic primary care, supported by e-health equipment. This gives chronically ill people in rural regions better access to basic medical care. It also releases family doctors for other work (Busse and Schlette 2007; Blum 2006).

Another new professional group are *liaison nurses* who have been introduced in several European countries. They do follow-ups after discharge, pulmonary rehabilitation for people with COPD, supervision of medication and compliance, patient education, and service navigation. *Case managers* coordinate services for people with long-term conditions or with complex social and medical needs. Their functions include assessing people's needs, developing care plans, helping people access appropriate care, monitoring the quality of this care, and maintaining contact with the person and his or her family (Dubois et al. 2008). In England, for example, case management is part of the strategy in all primary care trusts. These trusts provide primary medical care and community nursing services, and are taking over responsibility for purchasing secondary care. Other groups, such as pharmacists and social workers, have also been able to perform new roles. For instance, a contract introduced in England in 2004 enabled pharmacists to expand their role by providing repeat prescriptions, reviewing medication and compliance, and providing smoking cessation services (Dubois et al. 2008).

New settings

Single handed practices are no longer seen as the role model for medicine. The trend internationally is towards group practices that are more patient-oriented and more cost effective (Busse and Schlette 2003). In Canada, for example, a major part of health reform involves developing models in which doctors work in a team with nurses, social workers, psychologists, dieticians, midwives and physiotherapists. The aim is to create a primary health care system more closely oriented to the needs of the patients: multidisciplinary, well-coordinated, and accessible 24 hours a day (Torgerson 2005). In Germany, polyclinics with general practitioners, specialists and other health professionals were re-introduced in 2004 (Busse et al. 2006).

In many countries where strong primary care teams already exist, such as the UK, the Netherlands and Scandinavia, the management of many chronic diseases has been moving progressively to nurse-led clinics (Nolte and McKee 2008; Buchan and Calman 2005). These clinics have become more common in managing diabetes and hypertension, allergy/asthma/COPD, psychiatry, and heart failure (Karlberg 2008). The main reasons for this growth are economic, and the chance to create new career opportunities for nurses. Other developments improve access through telephone consultations and offer support for elderly persons with communication difficulties.

4.3 Coordinating care for individual chronic diseases: disease management programmes

This section will look at care models for individual chronic diseases, and the section after will analyse integrated care approaches. Disease management programmes are normally limited to health care workers while concepts of integrated care often include social workers. However, the concepts of *integrated care* and *disease management* are in some respects similar.

There are several definitions of disease management programmes, but most share three main features: a knowledge base, a delivery system with coordinated care, and a continuous improvement process for a specific disease in a specific population (Hunter and Fairfield 1997). Key elements are shown in figure 8.

Figure 8: Disease management: key elements

- comprehensive care: multidisciplinary care for entire disease cycle
- integrated care, care continuum, coordination of the different components
- population orientation (defined by a specific condition)
- active client-patient management tools (health education, empowerment, self-care)
- evidence-based guidelines, protocols, care pathways
- information technology, system solutions
- continuous quality improvement

Source: Velasco et al. (2003)

To summarise, disease management is a means of coordinating care that focuses on the entire clinical course of a disease. Care is organised and delivered according to scientific evidence and patients are actively involved.

Structured disease management programmes for selected conditions were originally developed in the United States, then in a range of European countries. The approach seems promising, particularly when health care is funded through social insurance. Because these systems tend to allow patients to choose family practitioners and some specialists, doctors are more likely to work as single-handed practitioners. This leads to a separation between the ambulatory and hospital sector, and disease management programmes could overcome this (Nolte and McKee 2008).

Germany in 2002 for example introduced programmes that now cover diabetes type 1 and 2, asthma/COPD, coronary heart disease and breast cancer. In December 2006 there were 10,580 programmes with nearly 2.7 million 2,693,000 patients (BVA 2008). By April 2008, this number had risen to 4.7 million (van Lente et al. 2008). Table 6 gives a breakdown of those disease management programmes.

Table 6: DMP participants in Germany according to indication (2008)

DMP	Number of patients enrolled in DMP
Diabetes mellitus type 2	2,708,154
Diabetes mellitus type 1	93,357
Coronary heart disease	1,221,374
Asthma	313,914
COPD	264,299
Breast cancer	100,499
Total	**4,701,597**

Source: van Lente et al. (2008)

Until the end of 2008 risk structure compensation schemes took disease management programmes into account by calculating expenditure for these patients separately. This created strong incentives for sickness funds to enrol patients. They also provided sizeable financial incentives for the doctors taking part (Busse 2004). From 2009, participation in disease management programmes alone will not be taken into account as a separate risk-adjustment factor. Instead, the allocation will give supplements for persons suffering from one of 80 (mainly chronic) diseases. For every insured person classified as suffering from one (or several) of these conditions, the sickness funds will get an extra allocation. Classification will be partly based on medication, and there could be a problem in that insurers may try to benefit from extra funding by motivating providers to prescribe certain medications, irrespective of disease severity.

Sweden now has *chains of care* (Andersson and Karlberg 2000), defined as 'coordinated activities within health care' often involving 'several responsible authorities and medical providers' (Åhgren 2003). County councils are responsible for organising health care and by 2002 most of them had at least one chain of care, mostly designed around patients with diabetes, dementia and rheumatoid disorders (Nolte and McKee 2008).

4.4 Managing care across chronic diseases: integrated care models

Disease management programmes focusing on a single disease have increasingly come under pressure. Doctors and researchers admit they have focused on a straightforward disease-management approach because it was relatively simple. But chronic conditions do not present alone, and so various countries are experimenting with new models of health care delivery - comprehensive *integrated care models* or *provider networks* that can achieve more integrated and more comprehensive services.

Integrated care models developed in the US have been influential in Europe (Nolte and McKee 2008). The redesign of health care services has been guided by approaches taken by US health maintenance organisation Kaiser Permanente (Goodwin et al. 2004), the Evercare model developed by United Health Group (United Health Europe 2005) and the Chronic Care Model (CCM) developed by Edward Wagner (Wagner et al. 1999).

These have been used as the basis for UK National Health Service programmes since 2003 (Nolte and McKee 2008). The Evercare model of managing frail elderly people was piloted in nine primary care trusts (PCTs) in April 2003, and case management then became part of the government's policy for supporting people with chronic conditions. The 2004 NHS Improvement Plan stipulated the introduction of case management in all primary care trusts (PCTs) through appointing senior nurses (known as *community matrons*) by 2007 (Department of Health, 2004).

In 2005, the UK launched a model designed to help health and social care organisations improve care for people with chronic conditions (Singh and Fahey 2008). It built on US approaches such as the Chronic Care Model, the Kaiser Triangle and the Evercare model (Department of Health 2004). It outlined how people with chronic conditions will be identified and receive care according to their needs. The goals of the NHS and social care model are to improve the quality and accessibility of care for people with chronic conditions, and to contain or reduce the associated costs (Singh and Fahey 2008).

Various autonomous communes in Spain have been operating pilot projects on the long-term integration of care for many years. These aim to achieve complete health care by providing complete care from one source only and by having regional strategies. For example, the Spanish region of Valencia has been testing local, population-based integration models in three areas since 1997 (Campoy 2005).

In Germany, various models have been introduced to promote more integrated care, such as disease management programmes (see section 4.3), care models based on the family physician as gatekeeper, integrated care contracts, and medical polyclinics. The integrated care contracts include at least two entities from different health-care sectors or interdisciplinary collaborations. Between 2004 and 2008, 1% of the total payments for physicians and hospitals has been earmarked for investment into integrated care projects. This involves reallocating about 680 million euros a year. There is a remarkable variety of contracts. For example, most of them are related to a specific indication such as stroke, or a specific medical procedure such as hip replacement. Population-based approaches are rarely taken (Busse et al. 2006). Recently analysts recommended the Chronic Care Model as a means of advancing the country-wide approach started in 2002 (Genichen et al. 2006).

Various provider networks have been developed in Europe and elsewhere. In France the 1996 Juppé reforms introduced mechanisms aimed at stimulating local provider networks for ambulatory patients and at the interface between ambulatory and hospital care (Bras et al. 2006; Sandier et al. 2004). Initiatives were formalised in 2002 under the heading of *health networks* (réseaux de santé) (Frossard et al. 2002). These arrangements now include mobile dialysis units, specialised mental health facilities, new cancer centres (combining research, treatment, and prevention) and new centres for managing HIV/AIDS (McKee and Healy 2002).

The Netherlands has also been trying to improve the continuity and quality of care for people with long-term conditions and to close the gap between primary and hospital services. This led to the concept of *transmural care* in the early 1990s (van der Linden et al. 2001), which has since been developed extensively, with an estimated total of over 500 initiatives by 1999 (van der Linden et al. 2001). Most forms of transmural care tend to focus on those who are not able to return to a fully independent life by managing the interface between acute hospital care and alternative settings (Nolte and McKee 2008).

The Canadian province of Ontario has chosen to promote networks of family doctors (family health groups and family health networks) and local health integration networks. The mission of their local care networks is to improve the planning, coordination and integration of health care. Being local organisations, they are expected to be more responsive to local needs (Torgerson 2005).

EFFECTIVENESS OF STRATEGIES AGAINST CHRONIC DISEASE

Evaluating a health programme requires looking at health improvement as measured, for example, by patients' quantity and/or quality of life. This chapter examines the available evidence on various strategies.

5.1 Prevention and early detection

Studies have looked at a range of interventions. Measures to reduce tobacco consumption have been analysed in considerable depth (see section 4.1). Effective interventions include higher prices for cigarettes, public smoking bans, public information, bans on advertising and promotion, smoking cessation programmes, and smuggling controls. Combining various measures is more effective than single measures. Anti-tobacco regulations therefore should be as comprehensive as possible and combine a number of different instruments (Busse and Schlette 2007).

Table 7: Effects of anti-smoking measures on smoker prevalence

Measure	Effect on smoker prevalence
Price increase by 10 percent	Decline by 4 percentage points in countries with high per capita income
Ban on smoking at work	Decline by 5-10 percentage points
Bans on smoking in pubs, restaurants and other public places	Decline by 2-4 percentage points
Advertising ban	Decline by 6 percentage points if ban is absolute
Health warning on cigarette packs	In the Netherlands, 28 percent of all 13- to 18-year-olds said they smoked less as a result of the health warnings; In Belgium, 8 percent of those asked said they smoked less because of warnings.
Media campaigns	Percentage of smokers declines by 5-10 percentage points, depending on how the campaigns are targeted at specific groups
Withdrawal measures; subsidies for treatment	Decline by 1-2 percentage points after 2 years, depending on the people registered

Source: European Network for Smoking Prevention (2004)

Opposition to measures such as smoking bans has come from vested interests and public opinion. More and more countries - such as Ireland, Italy, Malta, New Zealand, Norway, Singapore and Sweden - have introduced a complete ban on smoking in public and at work. Similar regulations have been introduced in other countries, including Australia, Czech Republic, England, Finland, Germany, Hungary, Portugal, Scotland and Spain. However, public support varies considerably. The first countries introduced rigid bans some years ago – and after initial scepticism, people have increasingly come to accept them (Busse and Schlette 2007).

The disease burden from alcohol abuse has been reduced by various policy approaches as well as by integrating advice, screening, and referral within clinical settings (Novotny 2008). For example, non-directive interviewing and counselling was effective in identifying and addressing problem drinking before the onset of chronic problems (Burge and Schneider 1999).

Diet can be affected substantially by changing production processes to reduce unhealthy components of food, such as trans-fat or salt. These changes can be implemented quickly if the private sector and/or governments are supportive. For example, government induced changes in manufacturing processes in Mauritius and Poland appear to have reduced risk factors for chronic diseases (Zatonski et al. 1998).

There is clear evidence that anti-hypertensive and anti-cholesterol medications, as well as aspirin, reduce the risk of ischaemic heart disease and stroke (Rodgers et al. 2006). A combination of education, careful monitoring according to clinical guidelines, and fixed dose therapies improves patient adherence, which is notoriously hard to do (Novotny 2008).

Overall prevention still plays a secondary role in most health systems and few countries have set up programmes to prevent chronic diseases.

5.2 New provider qualifications and settings

Primary care nurses with enhanced roles can provide high quality care in many areas traditionally looked after by family doctors (Dubois et al. 2008). But most studies have included only small numbers of clinicians and have not examined long-term outcomes (Brown and Grimes 1995; Horrocks et al. 2002). It has long been established that the availability of specialist nurses for long-term conditions may improve health outcomes and reduce use of health resources (Boaden et al. 2006; Griffiths et al. 2004; Singh 2005a; Smith et al. 2004). Some researchers have questioned this, suggesting that nurse practitioners and case management of frail elderly people may reduce hospital admissions, but at the same time they introduce more services into primary care (Gravelle et al. 2007; Sargent et al. 2007).

Clinics run by specialist nurses have been associated with better clinical outcomes (Connor et al. 2002; Singh 2005b; Vrijhoef et al. 2000; Vrijhoef et al. 2001; Vrijhoef et al. 2003). Patient satisfaction with nurse-led care is generally high (Horrocks et al. 2002; Kinnersley et al. 2000; Shum et al. 2000). Research in Sweden, for example, showed that nurse-led heart failure clinics - giving education, better treatment and social support - improved survival and self-care behaviour, and reduced the need for hospital care (Cline 2002; Stromberg et al. 2003). However, the precise effect was hard to identify because their implementation was part of an overall reorganisation of care (Dubois et al. 2008).

5.3 Coordinating care for individual chronic diseases: disease management programmes

Evidence on the effectiveness of disease management programmes comes from several systematic reviews and meta-reviews.

In 2002 a meta-review of 118 disease management programmes (DMPs) looked at the effectiveness of different strategies in chronic disease management (Weingarten et al. 2002). Those using provider education, feedback, and/or reminders produced better adherence by providers to care guidelines. However, the meta-review did not show which approaches produced the greatest relative improvement as the studies did not directly compare different approaches. The authors concluded that it was not possible to draw up policy recommendations on developing disease management programmes.

Another study concluded that appropriately evaluated disease management programmes improved the quality of care as measured by the provider's increased adherence to evidence-based standards and by disease control (Velasco et al. 2003). However, evidence for effectiveness of the programmes was found only for diabetes, depression, coronary heart disease and heart failure (McAlister et al. 2001a + b; Weingarten et al. 2002; Norris et al. 2002). For other chronic conditions the results were inconclusive. Effectiveness referred only to process and structure, and no study found any statistically significant impact on (long-) term health outcomes.

The findings on patients' quality of life and on patients' and providers' satisfaction were also inconclusive.

A related study (Ofman et al. 2004) found that improvements in quality of care, as measured by patient satisfaction, were greatest with treatment, patient adherence to treatment recommendations, and measures of disease control. Nolte and McKee suggest that disease management may be an effective way of changing the behaviour of patients and providers (Nolte and McKee 2008).

A recent meta-review (Mattke and colleagues 2007) concluded that disease management programmes improve processes of care and disease control. However, the authors found no evidence of any effect on health outcomes. Disease management did not seem to affect use except for reducing hospitalisation rates among patients with congestive heart failure, and increasing outpatient care and prescription drug use among patients with depression (Mattke et al. 2007).

These are preliminary findings, because most of the empirical work looked at small-scale programmes run for high risk individuals as a demonstration project on a single site. These pilot projects mostly combined individual patient education, care planning, and follow-up delivered by a nurse or case manager. Such levels of support would be difficult in large scale disease management programmes.

Most evidence exists for congestive heart failure (CHF) and diabetes mellitus, with CHF standing out. Sufficient research was also identified for coronary artery diseases (CAD), asthma, COPD, and depression, but not for other chronic conditions such as cancer, dementia, Alzheimer's disease, and musculoskeletal disorders (Table 8).

Table 8: Summary of evidence for various disease management programme outcomes by disease

Disease	**Clinical processes** Adherence to evidence-based guidelines	**Health-related** Changes in behaviors	**Disease control** Changes in intermediate measures	Clinical outcomes	**Healthcare utilsation** Changes in utilization of services	Financial outcomes	**Patient experience** Satisfaction, quality of life, etc.
CHF	**Improved**	Inconclusive evidence	**Improved**	Inconclusive evidence	Reduced hospital admission rates	Inconclusive evidence	**Improved**
CAD	**Improved**	Evidence for no effect	**Improved**	Evidence for no effect	Inconclusive evidence	Inconclusive evidence	Insufficient evidence
Diabetes	**Improved**	Evidence for no effect	**Improved**	Insufficient evidence	Inconclusive evidence	Inconclusive evidence	Insufficient evidence
Asthma	Inconclusive evidence	Inconclusive evidence	Inconclusive evidence	Evidence for no effect	Inconclusive evidence	Evidence for no effect	Insufficient evidence
COPD	Insufficient evidence	Insufficient evidence	Inconclusive evidence	Insufficient evidence	Insufficient evidence	Insufficient evidence	Insufficient evidence
Depression	**Improved**	N/A	**Improved**	Inconclusive evidence	Increased utilization	Increased costs	**Improved**

Source: Mattke et al. (2007)

Generally, the evidence suggests that disease management programmes can improve the care process. Improvements in clinical care affect intermediate outcomes and disease control for CHF, CAD, diabetes mellitus and depression. The impact of these programmes on long-term outcomes is not yet established, so it is impossible to draw any general conclusions.

The evidence on the impact of disease management programmes on utilisation of health services is generally inconclusive. A few studies compare patients taking part in programmes with those following 'normal' care paths. They were found to reduce hospitalisation rates for those with CHF, but increase use of outpatient care and prescription drugs.

Overall, the evidence on disease management programmes is far from satisfactory, given its prominent role. Few studies have looked at the effects of large population-based interventions (Table 9).

What studies there are conclude that population-based interventions improve patient care. The results have to be interpreted carefully, however, because none of the studies was randomised, and only one used a rigorous comparison. The evidence on cost is also inconclusive. Sidorov (2002) and Villagra (2004) found net cost savings for DMPs, but Fireman (2004) examined four chronic conditions and did not find net cost savings.

One large-scale study using a three-armed prospective cluster-randomised design was the German ELSID-Diabetes study, set up in 2005 to assess the effectiveness of a diabetes disease management programme in primary care in two German federal states (Joos et al. 2005). Early results show that the death rate among patients in the programme dropped significantly over two and a half years (10.9%) compared with those receiving 'standard' care (18.8%). Age-adjusted evaluations among severely ill women showed a significant variation: 9.5% of those on the programme compared with 12.3% of others (Szecsenyi et al. 2008). The data for men are not yet available. The study also found that patients taking part in a programme perceived their care as more structured and coordinated than did those receiving standard care (Szecsenyi 2008).

To summarise, there is a lack of systematic evaluations of population-based chronic disease management programmes in Europe. This is partly because disease management programmes have been introduced relatively recently (Nolte and McKee, 2008). Their impact depends heavily on their context, so research from high-income countries outside Europe are of limited value.

Table 9: Findings from studies of large-scale, population-based disease management programmes

Author	Setting	Managed condition(s)	Comparison strategy	Results
Sidorov (2002)	Programme developed and operated by integrated delivery system	Diabetes	Programme participants versus non-participants, controlled for age, sex, insurance type, duration of plan enrollment, presence of pharmacy benefit	Improved quality of care and disease control, lower costs and utilisation, net costs saving
Fireman (2004)	Programme developed and operated by integrated delivery system	CAD, CHF, diabetes, asthma	Patients with the condition against non-diseased group matched by age and sex	Improved quality of care and disease control, costs increased less in intervention group than in reference group, no net cost saving
Villagra (2004)	Programme developed and operated by disease management vendor for health plan client	Diabetes	Natural experiment created by phased roll-out, plus prepost comparison, adjustment for risk, and demographic differences	Improved quality of care, lower cost and utilisation in both comparisons, net cost savings

CAD indicates coronary artery disease; CHF, congestive heart failure

Source: Mattke et al. 2007

5.4 Managing care across chronic diseases: integrated care models

The evidence on different models of integrated care is inconclusive (Nolte and McKee, 2008). Studies have found that one or more components of the chronic care model (CCM) benefits some processes and outcomes, but the evidence does not show whether the whole model is needed to achieve the same benefits (Singh and Ham 2006).

One analysis looked at the effectiveness of the six components of the chronic care model, focusing particularly on primary care (Zwar et al. 2006). From a systematic review and review of reviews they identified a series of effective key elements and approaches.

Components influencing adherence to guidelines were found to be self-management support and delivery system design, particularly when combined with decision support and clinical information systems.

However, Zwar's conclusions must be treated with caution. The findings are based on the management of adults with type 2 diabetes and may not be transferable to other chronic conditions or other age-groups. It is also unclear whether broader components of the chronic care model - such as health care organisation and/or community resources - have caused the changes. It is difficult to look at the effect of this model in experimental studies, which may explain why such studies are rare (Zwar et al. 2006).

Piatt et al. (2006) found preliminary evidence on the chronic care model as a whole. In an experimental study, they examined the effect on clinical and behavioural outcomes of patients with diabetes. They targeted small practices in an under-served area of Pittsburgh, USA. Substantial improvements were found after 12 months for two clinical outcomes and for self-monitoring of blood-glucose in the chronic care model group compared with control groups (provider intervention; usual care). Otherwise no statistically significant outcomes were found.

Another US study examined the impact of the CCM approach on the quality of care for patients with diabetes, coronary heart disease and depression (Solberg et al. 2006). After two years, the organisation had adopted most elements of the chronic care model, and the quality of care for patients with diabetes and coronary heart disease had improved. Nevertheless, no significant correlation could be established between these changes.

Table 10: Summary of evidence on effectiveness of CCM components

CCM component	Interventions shown to be effective	Outcome measures affected
Patient self-management support	• Patient educational sessions • Patient motivational counselling • Distribution of educational materials	• Physiological measures of disease • Patient - quality of life - health status - functional status - satisfaction with service - risk behaviour - knowledge - service use - adherence to treatment
Delivery system design	• Multidisciplinary teams	• Physiological measures of disease • Professionals adherence to guidelines • Patient service use
Decision support	• Implementation of evidence-based guidelines • Educational meetings with professionals • Distribution of educational materials among professionals	• Professionals adherence to guidelines • Physiological measures of disease
Clinical information systems	• Audit and feedback	• Professionals adherence to guidelines
Delivery system	Little published experimental evidence	
Community resources	Little published experimental evidence	

Source: Zwar et al. (2006); Nolte and McKee (2008)

Self-management support and delivery systems - identified in other studies as the most important CCM elements (Singh 2005a; Zwar et al. 2006) - did not bring significant improvements. Evidence of the effectiveness of CCM is not overwhelming, but this may be because the model is not being implemented properly. One qualitative study examined potential barriers during the implementation process (Hroscikoski et al. 2006). They found too many competing priorities plus lack of specificity of changes, agreement about the care process, and engagement by health professionals (especially doctors). The authors concluded that the chronic care model is useful as a conceptual framework, but should be supplemented by guidelines on implementation.

There is also limited evidence on the impact of provider networks. Studies in France suggested rather positive effects, with fewer drug prescriptions, fewer hospitalisations and lower mortality rates (Singh 2008).

A study in Canada recently examined provider networks - an ambulatory care centre with a group practice and multidisciplinary teams using electronic medical records. The study looked at nine process outcomes and three clinical outcomes: blood pressure, HbA1c levels, and lipids. The results suggest positive outcomes, especially for blood pressure targets and HbA1c outcomes (Suhrcke et al. 2008).

6 COST EFFECTIVENESS OF STRATEGIES AGAINST CHRONIC DISEASE

Although different instruments and approaches have been developed to combat chronic diseases, resources are limited. Policy makers have to prioritise between different strategies. Cost-effectiveness analysis determines how much health improvement is gained for each monetary unit spent and is a systematic and sophisticated tool for deciding on priorities. But cost effectiveness analysis demands considerable data, so many management strategies lack sophisticated evaluations, particularly in Europe. There are also many methodological problems, and it can be difficult to establish whether a specific programme or component is effective from a health perspective. Furthermore, it is not always easy to measure the costs of conducting a specific programme. The following chapter sums up the available evidence on cost-effectiveness.

6.1 Prevention and early detection

Studies on cost-effectiveness have found that individual and group approaches to chronic disease prevention may be highly cost-effective. However, the success of interventions is largely determined by regional differences in cost-structures and in the burden of chronic diseases.

For tobacco control, the World Bank (Jha and Chaloupka 2000) and the Disease Control Priorities Project (2007) have found evidence for cost-effectiveness; this is not surprising considering the health benefits. The main intervention targeted at individuals is over-the-counter nicotine-replacement therapy. These strategies have been applied successfully and are cost-effective (Jha et al. 2006).

The evidence for interventions to prevent or reduce obesity (and consequently diabetes) is inconclusive. Cawley (2007) identified costs for primary, secondary, and tertiary preventions ranging from US$4,305 for school-based interventions to US$35,600 for bariatric surgery, using quality-adjusted life years saved as an endpoint (Table 11).

Table 11: Cost per Quality-Adjusted Life Year (QALY) saved by interventions to reduce or prevent obesity

Intervention	Target population	Estimated cost per QALY, US$	Source
Planet health (a school-based intervention to improve nutrition and increase physical activity)	Middle-school children	In girls, 4,305	(Wang et al., 2003)
Orlistat	Overweight and obese patients with type 2 diabetes mellitus	8,327	(Maetzel et al., 2003)
Bariatric surgery	Middle-aged men and women who are morbidly obese	Women: 5,400-16,100 Men: 10,000-35,600	(Craig & Tseng, 2002)
Diet, exercise, and behaviour modification	Adult women	12,640	(Roux et al., 2006)

Source: Cawley (2007)

Another study found that 'self-management diabetes education', physical activity and diet were cost-effective for preventing diabetes (Narayan et al 2006). Given the dependence of such strategies upon context, cost-effectiveness is likely to vary according to regional settings. Parallel interventions at social, health system, and individual levels would seem to be needed to prevent the rise of obesity and diabetes throughout Europe.

Screening for greater risk of cardiovascular disease is cost-effective, according to the evidence. However, the number of proven screening procedures for chronic diseases is limited (Novotny 2008).

Results differ for primary prevention of cardiovascular disease. Controlling blood pressure with drugs or serum cholesterol is highly cost-effective for those with risk factors, and sometimes cost-effective for the general population. But there are marked differences.

For adults over 45 years with high blood pressure (over 105 mmHg diastolic pressure), drug treatment costs a few hundred dollars per life-year gained. Drug treatment costs US$4,600 to US$100,000 per life year gained. Differences in underlying risks, age and cost of medication explain the enormous difference in cost-effectiveness (Rodgers et al. 2006).

Cost-effectiveness ratios for cholesterol-lowering interventions, are improving, but they vary significantly by age and risk level. Some evidence has suggested that dietary interventions for reducing cholesterol can also be cost-effective, costing about US$2,000 per quality-adjusted life year (QALY) (Posser et al. 2000).

6.2 New provider qualifications and settings

So far there is no conclusive evidence on the cost-effectiveness of new qualifications, such as those for nurse practitioners or case managers.

Studies increasingly confirm that nurse-led clinics give better health outcomes (Nolte and McKee 2008) and often lead also to better use (Vrijhoef et al. 2001; Singh 2005b). There is some evidence, but the findings cannot be generalised (Smith et al. 2001).

6.3 Coordinating care for individual chronic diseases: disease management programmes

The original goal of disease management programmes when first introduced in the USA was to reduce costs (Pilnick et al. 2001). It was expected that using the programmes to change usage would lower hospitalisation and complication rates and be more efficient.

However, few studies included measures of utilisation, such as emergency department visits or hospitalisations. Economic evaluations of disease management programmes tend to focus only on costs, while benefits and cost benefits are rarely considered Velasco et al. (2003) and Ofman et al. (2004). Ofman et al. and Velasco et al. conclude that there is no evidence that DMPs are more cost-effective than standard care.

Mattke et al. (2007) draw similar conclusions. Their comprehensive review found that many studies have methodological flaws, such as incompletely accounting for costs or lacking a suitable control group. Even looking at the reported costs and the savings generated rarely brings any conclusive evidence that disease management brings net savings on direct medical costs.

Furthermore, the long-term and medium-term impact of disease management programmes has not yet been studied satisfactorily. As a consequence, no conclusions can be drawn about the financial returns on investment (Nolte and McKee 2008).

6.4 Managing care across chronic diseases: integrated care models

The economic impact of integrated care models in Europe has not yet been well studied. There is some evidence on the Evercare approach to case management. US-based studies have found it is cheaper to care for older people in nursing homes (Nolte and McKee 2008). The main reason is more appropriate use of resources, especially hospitals and emergency services (Kane et al. 2004; United Health Europe 2005). However, evaluations of the Evercare pilot in England did not find improvements such as lower emergency admissions and fewer bed days (Gravelle et al. 2007).

Bodenheimer et al. (2002b) did a review-of-reviews on the CCM and its impact on use of resources and costs for congestive heart failure, asthma and diabetes. They reviewed 27 studies and found that support for self-management support was the most common component, followed by delivery system redesign (such as the introduction of follow-up by home visits, multi-speciality teams, nurse-led clinics, and case management - mostly for congestive heart failure and diabetes). The findings were mixed. Some approaches showed positive results (for example fewer hospital admissions or visits to emergency departments, and/or cost reductions), but others did not. This means that we can not draw any general conclusions, especially since there was a lack of population-based interventions, context-specific variables were not controlled, and sophisticated comparison with other strategies in chronic disease management was largely absent (Nolte and McKee 2008).

PART III: DIMENSIONS OF CHRONIC DISEASE MANAGEMENT

This part of the report draws conclusions from the evidence presented in chapters 4-6 about what policy makers need to do in order to improve future chronic disease management. Our conclusions cover five areas:

- pharmaceuticals and medical devices,
- financial incentives,
- coordination and cooperation,
- information and communication, and
- evaluation culture.

7 SHAPING THE FUTURE OF MANAGING CHRONIC DISEASES IN EUROPE

Shaping the future of chronic disease management in Europe will be a challenge. The epidemiologic and economic analyses suggest that policy makers should make disease management a top priority. But choosing the right strategies will be difficult, particularly given the limited evidence on effectiveness and cost-effectiveness. Policy makers need more than academic evidence on individual interventions; they also need to know which institutional and organisational conditions favour successful chronic disease management and where the gaps in knowledge need to be closed. This chapter gives policy makers the relevant insights for effective chronic disease management and suggests areas of research that will help them to draw further conclusions.

7.1 New pharmaceuticals and medical devices

Pharmaceuticals and medical devices are essential for diagnosis and treatment. Many licensed drugs - such as anti-hypertensives, insulin, anti-depressants, anti-inflammatories and inhaled steroids - target chronic diseases. These treatments have become increasingly sophisticated, sometimes targeting elements of the disease process that were unknown 20 years ago.

Despite the important role of pharmaceuticals, the debate on chronic disease management tends to concentrate on structures and programmes. The following section will look at new pharmaceutical approaches. Reviewing drug development for individual diseases is beyond the scope of this report: rather, it will examine broad trends and highlight some advances.

Improvement in compliance

Successfully managing chronic disease requires not just effective drugs but also effective and sustained self-management such as medication compliance (Bangalore et al. 2007). Compliance, or adherence, can be defined as the extent to which patients follow medical instructions (WHO 2003). In 2003 the WHO report *Adherence to Long-Term Therapies* found that compliance by patients with long-term diseases - such as cardiovascular diseases or depression - was poor. Only about 50% of patients in developed countries adhered to their treatment: in the United States, for example, the proportion of patients adhering to their high blood pressure regimen was 51%. Similar patterns were reported for other conditions such as depression (40%) and asthma (43% for acute treatments and 28% for maintenance) (WHO 2003).

Many factors affect adherence. Most notable are those related to the complexity of the medical regimen, length of treatment, previous treatment failures, frequent changes in treatment, the immediacy of beneficial effects, and side-effects and the availability of medical support to deal with them (WHO 2003; Bloom 2006). A systematic review (van Dulmen et al. 2007) outlined various ways of improving adherence:

- *Technical interventions*: simpler medication regimens, e.g. dosage, packaging or combining drugs
- *Behavioural interventions:* memory aids and reminders, e.g. by mail, telephone, computer or home visits
- *Educational interventions:* teaching and providing knowledge through individual and group education, face-to-face contact, audio-visual techniques
- *Social support interventions*: practical and emotional support by family, friends, health professionals
- *Structural interventions*: disease management programmes (DMPs), community care
- *Complex or multi-faceted interventions*: combining and adopting different approaches and interventions.

Research into pharmaceuticals and medical devices now recognises the importance of technical interventions that could increase adherence. For example, one meta-review (Bangalore et al. 2008) concluded that fixed-dose combinations can improve compliance by reducing the pill burden (polypharmacy). Fixed-dose combinations also reduced the risk of non-compliance by 24%. Wald and Law (2003) proposed the use of a polypill that would include a statin with 3 antihypertensive medications - a thiazide, a beta-blocker and an angiotensin-converting enzyme inhibitor - in addition to folic acid and aspirin. They estimated that if everyone over 55 with preexisting coronary artery disease took this one pill, the risk of ischaemic heart disease could be reduced by 88% and the risk of stroke by 80%. Whether this 'magic bullet' is practical is open to debate. But these two studies show that compliance and health outcomes can be improved by fixed-drug combinations.

Simplifying the medication regimen also seems to increase compliance. A meta-analysis (Claxton et al. 2001) concluded that 79% (±14%) of patients took 'once daily' doses, 65% (±15%) 'three times daily' and only 51% (+/-20%) 'four times daily'.

Quality of life in pharmaceutical care

Improvement of adherence is closely linked to the concept of quality of life. In 1948, the WHO defined health as a 'state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO 1991). This broadened the concept of health beyond the biomedical model. Today pharmaceuticals are intended to improve the patient's quality of life as well as achieve better clinical outcomes; this is important with chronic conditions for which there is often no cure. Pharmaceuticals for most chronic diseases aim to prevent and control symptoms, reduce the frequency and severity of exacerbations, and improve general health. A better quality of life is their more realistic objective (Kheir et al. 2004).

The chronically ill are often restricted in their daily lives, with phases of poor functional, mental and social skills. The burden of diagnosis and treatment can be high (for instance, chemotherapy and radiotherapy in cancer treatment) and be accompanied by psychosocial implications, such as social involvement, partnership, workforce, stigma and pain (Petermann 1996). 'Supportive' drugs that improve the quality of life become more important. They are less toxic, often administered orally, and enable patients to spend fewer days in hospital (Wilking and Jönsson 2005).

Taking this into consideration, the assessment of pharmaceuticals in chronic care has to go beyond considering whether the patient has been cured, or not. It seems more appropriate to be using quality of life as a key criterion for chronic disease management. But to use this concept for decisions on approval, therapy and reimbursement requires valid and objective methods of evaluation.

Personalised medicine

Developments in drug therapy aim for a good response with easy application, fixed doses and mild side-effects. The different ways in which patients respond is determined by personal factors (such as genetics, age, gender, other disease and/or drug therapy and environmental agents) and by drug factors (such as pharmacokinetics, pharmacodynamics, adverse effects and drug interactions). Personalised medicine aims to optimise drug therapy in the face of these factors (Lewis 2005). Advances in human genome research have replaced the linear process of drug discovery and development by an integrated and heuristic approach (Ginsburg and McCarthy 2001). Table 12 gives some examples.

Table 12: Personalised medicine

Drug	Disease(s) or condition(s) treated
Abatacept	Rheumatoid arthritis
Adalimumab	Crohn´s disease, psoriatic arthritis, rheumatoid arthritis
Anakinra	Rheumatoid arthritis
Efalizumab	Psoriasis
Epoprostenol sodium	Primary pulmonary hypertension
Etanercept	Ankylosing spondylitis, juvenile rheumatoid arthritis, psoriatic arthritis, rheumatoid arthritis
Glatiramer	Multiple sclerosis
Imiglucerase	Gaucher´s disease
Infliximab	Ankylosing spondylitis, Crohn´s disease, psoriasis, psoriatic arthritis, rheumatoid arthritis, ulcerative colitis
Interferon beta-1a	Multiple sclerosis
Interferon beta-1b	Multiple sclerosis
Laronidase	Hurley's disease
Natalizumab	Multiple sclerosis
Omalizumab	Asthma
Palivizumab	Respiratory syncytial virus
Peginterferon alfa-2b	Hepatitis C
Peginterferon alfa-2a	Hepatitis C
Treporstinil sodium	Primary pulmonary hypertension

Source: Shane (2007)

Cancer research, for example, is now using pharmacogenomics to personalise drug therapy. Advances in genetics are used to explain individual differences in drug responses (Shurin and Nabel 2008). The advances in molecular medicine mean that traditional anti-tumour agents have been replaced by new agents with milder side effects that target disease-specific mechanisms. Gene/protein expression analyses make treatment more accurate as well as improve imaging techniques. Cancer researchers are working on deciphering the human proteome which has considerable potential. The main areas where new agents have been developed and now are used in clinical practice are as follows (Wilking and Jönsson 2005):

- targeting the cell cycle apoptosis,
- replicating/transcripting and repairing DNA,
- inhibiting hormones, growth factors and cell signalling pathways,
- inhibiting new blood vessels (angiogenesis).

Cancer research illustrates that personalised medicine is an important factor in developing innovative pharmaceuticals for the chronically ill. Apart from increasing cures, it may lead to drugs that improve the patient's quality of life.

Policy recommendations

- Personalised drugs are one of the main trends in the development of pharmaceuticals. However, using specialised medication to manage chronic disease brings a new set of problems. In particular, policy makers need to consider how to organise effectively licensing and reimbursements for personalised medicine (Shane 2007). Therapeutic innovations will have to be introduced without sacrificing patient safety; and so far few adequate policy solutions have been proposed.
- Drug development and approval aiming to improve quality of life need different approaches when it comes to assessing cost-effectiveness and cost-benefit. Previous parameters, such as narrow clinical outcomes, are insufficient. Evaluating efficacy, effectiveness or cost effectiveness must be supplemented – within rigorously conducted trials - by patient-related parameters, such as satisfaction and quality of life. Policy makers must adapt their licensing and reimbursement schemes accordingly.
- The required evaluation should not block authorisation and implementation of new pharmaceuticals and medical devices, but be conducted as quickly as possible.

7.2 Financial incentives

When discussing quality of care, health professionals tend to stress the importance of professional ethos, motivation, adequate staffing levels, and education and training. Research indicates that these dimensions are limited in their capacity to change behaviour (Busse and May 2008). Instruments allowing more rapid change are needed, and one of the tools available is financial incentives.

Using financial incentives effectively often means eliminating incentives that make chronic care or disease management less effective. But, however motivated stakeholders may be to improve chronic care, few will operate against their economic interest (Leatherman et al. 2003).

Financial flows influence most of the relationships in a health system, i.e. act as incentives – with intended or unintended effects. This section will try to define the financial flows/incentives between patients, providers, financial poolers and payers/purchasers. It will also look at the intentions and (theoretical) justifications behind these flows, and the results so far.

Financial incentives can be used to target certain processes or outcome-related goals, but this can be challenging. The treatment needs of patients are complex, and effective management involves a range of people in different sectors. The aim of this section is to give policy makers the insights they need to think critically about designing financial incentives. First, it identifies different financial mechanisms in the health system. Second, it presents different types of financial incentives and reviews the evidence on their impact. Third, it gives some policy recommendations.

Financial incentives in health systems

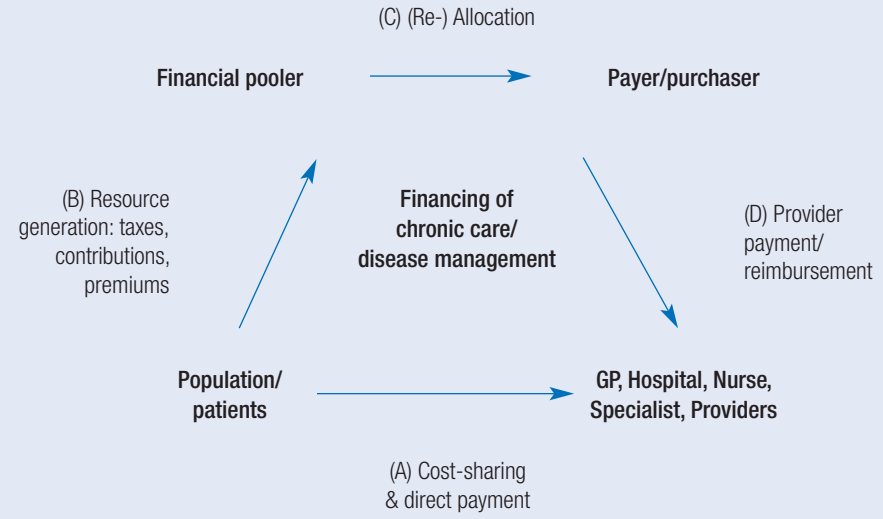
Given the complexity of most health systems, we need a model that will analyse the financial mechanisms as well as show policy makers how to design that will improve care for those with chronic diseases. Busse and May (2008) recently developed the *extended triangular model*. It distinguishes between population/payers, providers, and financial intermediaries. The latter are subdivided into *financial poolers* and *payer/purchasers* (Figure 9).

This analytical framework allows us to group financial mechanisms and incentives in the following way:

- *Relationship A:* patient ➔ provider: cost -sharing, co-payments
- *Relationship B:* population ➔ financial pooler: resource generation, taxes, contributions, premiums
- *Relationship C:* financial pooler ➔ payer/purchaser: (re-)allocations to payer/purchasers
- *Relationship D:* payer/purchaser ➔ provider: provider remuneration

Currently the main debate is how to remunerate providers (Relationship D). This is central to the discussion in this section. But the other three relationships will also be discussed.

Figure 9: Financial relations between stakeholders in health care



Source: Busse and May (2008)

Provider remuneration in chronic care

There are currently three different approaches to paying health professionals from pooled resources.

(1) *Capitation* gives the health professional a fixed sum to care for patients over a period of time, irrespective of the services provided. Financial poolers and payers/providers find it easy to budget under this type of payment, but the financial incentives for the health professional can give cause for concern. The danger is that they will offer as little a service as possible to each patient because they are bearing the cost. Services may become under-used. Capitation may have worse outcomes for chronic care. Unless there are risk adjustments, providers will not be interested in treating these patients because the cost to them will be more than a capitation sum based on average patients (Busse and Mays 2008).

(2) *Fee-for-service* (FFS) involves paying for each unit of service provided. It is generally assumed that more services will be provided where margins are high in order to maximise income. This may lead to some services being overused. The effect on chronic care is two-fold. On the one hand, overprovision may be counterproductive. On the other hand, given sensible payments, there are no incentives for underuse. The fee-for-service approach can also be applied to pay institutions rather than individuals and in this case the incentive structure works in the same way.

(3) *The salary approach* splits the cost of health care into one part human resource and one part covering other costs. The health professional is compensated by a fixed amount irrespective of productivity. There is no specific incentive for underuse or overuse of services. At the same time there is no specific incentive to provide good care for chronic patients with chronic illnesses (Busse and Mays 2008).

On the institutional level, approaches include *per diem* payments and *case fees*. Per Diem payments (a standard amount per patient per day) have a bad effect on chronic disease. Institutions tend to avoid chronic patients because of their high cost, or keep them in hospital longer than necessary in order to make up the costs through higher overall reimbursement.

Case fees were used originally to pay fixed amounts for each patient with a certain diagnosis. Early systems in the US assumed that all patients in each DRG generated similar costs, thus sharing financial risk with providers. This led to seriously ill patients with chronic or multiple diseases being avoided, and also resulted in premature discharge. Approaches in France, Germany and the Netherlands (Busse et al. 2006) defined outliers with higher payments and based their classifications on hospital procedures. This turned European DRGs into a hybrid with fee for service. This reduces the adverse selection, but risks overprovision. Institutional budgets have similar incentives for professional salaries. The effect on chronic care will depend on specific arrangements in each context.

Getting financial incentives for providers in line: new initiatives

Beyond these 'traditional' approaches, a new set of tools for paying providers has been developed in Europe. Table 13 summarises the main ways in which payers can encourage appropriate chronic disease care. Financial incentives can apply to structure, processes and outcomes.

Table 13: Incentives used to improve chronic care in European countries

Financial incentives targeting the individual	Financial incentives targeting structures of care	Financial incentives targeting processes of care	Financial incentives targeting outcomes of care
• Piloting of 'year of care' payment for the complete package of chronic disease management required by individuals with chronic conditions (e.g. based on validated 'care pathways' for diabetes) (DK; UK)	• Per patient bonus for physicians for acting as gatekeepers for chronic patients and for setting care protocols (FR) • Bonus for DMP recruitment and documentation (GER) • 1% of overall health budget available for integrated care (GER) • Points for reaching structural targets (UK: GP contract)	• Points for reaching process targets (UK: GP contract)	• Points for reaching outcome targets (UK: GP contract)
	• Additional services (e.g. patient self-management education) only reimbursable if physicians and patients participate in DMP (GER)		

Note: DMP = disease management program; DK = Denmark; FR = France; GER = Germany; UK = United Kingdom
Source: own table based on Busse and Mays (2008)

Financial incentives aimed at improving chronic care tend to focus on the structure, processes and outcomes of care (Busse and May 2008). But there are regional differences. Most financial incentives in European countries relate to the structure or process of care. Only the UK NHS contract for general practitioners specifically includes incentive payments focused on the delivery of particular outcomes (Smith and York 2004; Roland 2004). Generally focus has been shifting from approaches which simply take into account the presence (or potential presence) of patients with chronic disease towards funding incentives designed to encourage providers to make specific structural and process responses (Glasgow et al. 2008; Bodenheimer et al. 2002a + b).

Empirical evidence: There are only a few good studies of the impact of different payments on quality and/or efficiency of care for chronic disease. Many generate their conclusions from single cases rather than from comparative studies. It is difficult to draw firm conclusions on effectiveness or cost-effectiveness.

Studies of financial incentives for providers in Europe have tended to suggest that clear conclusions are impossible because of a lack of evidence. One recent US study (Peterson et al. 2006) recently generated some preliminary conclusions and these might be used to inform the European debate. Their conclusions were:

- Designs setting out a few narrow goals may lead to excessive focus on the incentivised tasks or areas of quality, generating 'gaming' or better reporting without any true improvements in care quality. These problems are well-documented in other sectors (Baron and Kreps 1999).
- The impact of financial incentives is not the same for different groups of providers. Those with high, average or poor performance will each react differently.
- Mixed approaches combining different payment schemes (such as fee-for-service and case fees) may reduce the negative effects of either approach applied alone.
- The size of the incentive clearly matters. Studies in other sectors suggest that a significant percentage of income has to be variable before providers can be expected to change their behaviour. Overly large incentives, on the other hand, may lead to providers focusing too much on incentivised goals.
- Motivational theory suggests that financial incentives will be less effective for groups of providers than they will be for individuals (Baron and Kreps 1999). This is because the individual's effort is only partly reflected in group benefits, with colleagues earning the same for less work. As a result, individuals are less motivated to improve quality. On the other hand, on the provider-group level risk-adjustment can be practised, which can not be done for individuals.
- Small to medium-sized multidisciplinary teams tend to provide positive outcomes (Bodenheimer et al. 2002a+b), suggesting that this could be an appropriate way of providing financial incentives to providers, especially when combined with rigorous performance monitoring and benchmarking (Kerr and Fleming 2007).

Clearly, one cannot deduce that these conclusions apply in the European context, but they offer a good starting point for future investigation.

Some evidence has been generated about the Quality and Outcomes Framework (QOF) in the UK, which set up pay-for-performance for general practitioners, using outcomes and quality variables and making about 25% of practice income dependent on quality rewards. The programme is still controversial but in general it has had a positive effect on quality of care, and particularly chronic care (Campbell et al. 2007). Most researchers conclude that improvements are likely to be the result of better organisation of general practices. In particular, it seems that patients are benefiting from more systematic care (Wang et al. 2006)

Financial incentives for payers/purchasers

Few policy approaches use financial incentives to target payers and/or purchasers. One exception is the 2002 health reform in Germany which changed the way of allocating individual sickness funds. Before the reform, it was unattractive to insure patients with chronic diseases or to set up disease management programmes for people with chronic illnesses. After the reform, sickness funds received extra funding when enrolling patients in disease management programmes. This led to a rapid growth of such programmes. No systematic reviews on the impact of these programmes on health outcomes or the use of resources have yet been published. Some critics have already attacked the formula on the grounds that putting people into disease management programmes this does not necessarily mean they get better care.

Another health reform in Germany, being implemented from January 2009, provides extra financial incentives for payers and insurers by taking individual morbidity criteria into account (individually risk-rated capitations). This has already been implemented in the Netherlands (van Ginneken et al. 2008).

Financial incentives for patients

There are relatively few financial incentives for patients to take part in chronic disease management programmes. France and Germany are exceptions because they apply (modest) cost-sharing. This may be reduced or waived in Germany when patients enrol in a programme. This incentive was mainly used to attract people to take part in disease management programmes. Patients taking part also have access to extra services. Patients in France become exempt from co-payments for chronic disease care if they present their previously agreed care protocol at every physician visit. Neither scheme has yet been systematically analysed.

Financial incentives for promoting better chronic disease management are rarely used to affect the relationship between financial poolers and the population (relationship B in figure 8). One such incentive would be to lower premiums or contribution rates for those with chronic diseases who take part in a disease management programme. There are no such schemes in Europe.

Policy recommendations

This section has shown that early findings suggest that financial incentives can be used to promote better quality care when properly applied and when certain prerequisites are fulfilled. This section makes recommendations for policy makers considering new financial incentives. It builds on the findings in this section and incorporates relevant findings from other sections. It separates structural and operational recommendations.

Structural policy recommendations

- Most European countries have set up programmes to promote chronic disease management, but these programmes rarely give financial compensation to integrated approaches targeting several chronic diseases. Research shows that chronic illnesses and chronic conditions are increasingly inter-related (Busse and May 2008). Policy makers should therefore consider integrating or linking chronic care programmes.
- Continuity of care is a key prerequisite for payer or provider investment in chronic disease management programmes. Any net returns from investments in infrastructure tend to come five years later (Fahey et al. 2008); and benefits from avoiding severe complications come after 5-10 years (Eastman et al. 1997). Health systems that have traditionally focused on 'patient choice', little enrolment with particular providers and/or fee-for-service payments – all of which led to relatively poor continuity of care - face the greatest difficulties in aligning financial incentives to promoting better management. Given this, policy makers should consider strengthening or introducing financial incentives that will encourage 'continuity of care'.
- In most European countries, different professional groups are paid according to separate schemes. However, effective care often depends on the co-operation of multidisciplinary teams. Different incentives for different members of the same team may frustrate common efforts, where economic interests motivate different treatments. Policy makers should align compensation schemes for health professionals working together in chronic care.

Operational policy recommendations

- Financial incentives encouraging a few narrow goals can lead to excessive focus on these goals, together with 'gaming' or better reporting without any improvements in quality. Policy makers should set out quality indicators that reflect different aspects of quality (structure, process and, where possible, outcome).
- Since the impact of financial incentives is likely to differ across different groups of providers, policy makers should decide which they want to incentivise and then design the incentive accordingly.
- Policy makers should consider mixed payment approaches, since this can mitigate negative effects of single approaches.
- Theory and empirical evidence suggest that a substantial amount of income has to be variable before providers can be expected to change their behaviour. Incentives should not therefore be too large, given the sensitivity of quality in health care and lack of clarity about the impact of different payment schemes. Where possible, pilot studies should be conducted before programmes are rolled out.
- Financial incentives for individuals may undermine cooperation, while financial incentives to organisations may have little impact on the motivation of individuals. Using small to medium multidisciplinary teams seems to yield positive outcomes (Bodenheimer et al. 2002a+b), so policy makers should consider targeting these when introducing financial incentives.

7.3 Improving coordination

Research suggests that one of the major obstacles to better care for those with chronic disease is the lack of coordination in health care systems. Structured approaches such as disease management programmes and integrated multi-disease care models tend to fall between different layers of increasingly differentiated health systems (Busse 2004; Epping-Jordan et al. 2004; Velasco et al. 2003; Pelikan et al. 1998). This section will look at different ways of co-ordinating services, and at the structural, organisational and operational barriers. Finally, it will make recommendations so that policy makers can define strategies for better co-ordination.

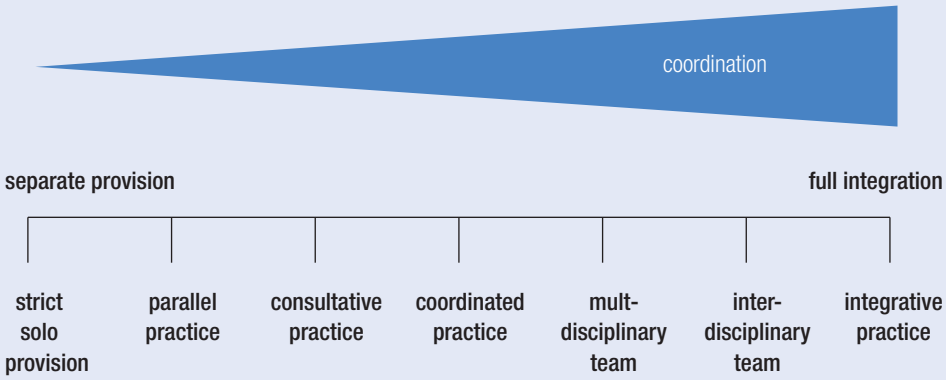
Dimensions of coordination in chronic care

Clearly, involving more providers requires better coordination. Chronic care often involves multi-provider settings, and since patients with chronic conditions often have several diseases, coordination is particularly appropriate. Research confirms that patients' perception of the quality of care is largely determined by how successful this coordination is. The following dimensions are important:

- *getting in* - getting access to appropriate care
- *fitting in* - adapting the care to their requirements
- *knowing what's going on* - receiving information
- *continuity* - of staff and also coordination and communication among professionals and
- difficulties in making progress through the system, mainly due to failures in the other four areas (Preston et al. 1999).

Boon et al. (2004) identified seven types of provision with varying degrees of coordination (Figure 9). At one end of the continuum is *strict solo provision*. At the other is *full integration of disciplines* for curative, rehabilitative and preventive services. Second on the non-coordination side of the continuum is *parallel practice*, where practitioners work independently and carry out services independently. *Consultative practice* is where information on patients is shared informally case by case. In *coordinated practice* the exchange of data on patients is related to particular diseases, and therapies are administered through a formal structure. Often a case coordinator will supervise the exchange of patient records. An advanced model of the former is the *multidisciplinary team*, which is more formalised, has more team members, and often clear team structures with sub-teams and team leaders. An *interdisciplinary team* is where group decisions are made, shared policies developed, and regular face-to-face meetings held. Finally, *integrative practice* is based on a shared vision and provides a 'seamless continuum of decision-making and patient-centred care and support'.

Figure 10: Types of care provision with varying degrees of coordination



Source: own figure based on Boon et al. (2004)

Barriers to coordination

The problems of coordinating health care systems have been the subject of wide-ranging discussions for decades (Grundmeyer 1996). This report concentrates on structural, organisational and operational problems.

Structural problems of coordination

Structural problems are often rooted in different ways of working across different sectors (primary or secondary; public or private). Providers have incentives to compete rather than to cooperate. Individuals or professional groups are compensated for separate activities rather than for cooperation. There is rivalry over resources and power struggles between professional groups, as well as overlapping responsibilities and unclear accountability between divisions and providers. Figure 11 summarises common structural barriers in Europe.

Figure 11: Structural barriers to coordination

- Competing operation cultures and management approaches in different sectors (social care vs. health care; primary sector vs. secondary sector, home practice vs. general practice)
- Different ownership structures (lack of universal standard for the interfaces between the public and the private sector)
- Separate and competing providers with no incentives to cooperate
- Rivalries between professional groups
- Lack of clarity about competencies and accountability (national vs. regional actors for policy initiatives; general practice vs. specialists for the process of care)

Source: own compilation based on Nolte and McKee (2008)

These problems exist in varying degrees in most European health systems, but different problems arise in countries where general practice has a central gatekeeping position. Gatekeeping is designed to promote integration and coordination of care provision (Catlan et al. 2006). The various coordination problems can be summarised as follows.

Structural problems of coordination in gatekeeping countries

In gatekeeping countries, general practice guides patients through the health care system. Those entitled to regular care are registered with a general practice and the general practitioner has access to their records. General practice is usually the first point of access, irrespective of medical problem or need. Other providers, such as specialists, are only accessible after consultation with or referral by the GP. Drugs tend to be provided by prescription only. In this context general practice has two main roles: (1) controlling the use of specialist services, which is meant to reduce or contain health care costs; and (2) acting as a coordinator, providing navigation, continuity of care and encouraging the system to be more responsive (Catlan et al. 2006). This latter function should benefit patients with chronic disease, because different professionals are involved at different stages and continuity of care is essential.

Nevertheless, the record of gatekeeping approaches in providing better coordination is mixed. Some evaluations have found that gatekeeping approaches are successful (Starfield 2001; Gervas et al. 1994; Gross et al. 2000), while others have pointed out that there is no conclusive evidence that gatekeeping contains health care costs or enhances the quality of care (Halm et al. 1997). There are several reasons for the contradictions: implementation and operational problems (which will be discussed in more detail below), and also context-specific structural problems. For example, in many countries the role of GPs is unclear once the patient has passed through the gate into the rest of the system (Catlan et al. 2006). Also, conflicts rooted in the traditional hierarchy of the medical professions may undermine the success of gatekeeping models. General practice is often at the lower end of the doctors' hierarchy, even though the gatekeeping model places them in a central position. The new 'governance' model challenges the well-established hierarchy, and may lead to conflicts about legitimacy, power and resources. Depending on the intensity, these conflicts may lead to less rather than more coordination among different professionals.

Structural problems of coordination in non-gatekeeping countries

Coordination problems are different in countries with no gatekeepers. Patients can visit a GP or specialist without a referral. If they prescribe care or tests, patients usually have the right to choose who should do this. It is not necessary to be registered with one general practice. Patients have a greater choice of providers, but no single health professional is responsible for the full process. Navigation through the system and through different stages of care is not a part of the system, so patients have to organise their own way. This can produce serious problems, particularly regarding continuity of care. France, for example, did not introduce gatekeeping to promote navigation through the health system until 2005. Evaluations indicated that this was not good for chronic care. Treatment for diabetes for example, was fragmented (Bras et al. 2006) and as a result national guidelines only rarely respected (Catlan et al. 2006).

Organisational and operational problems of coordination

In addition to structural problems, the following organisational and operational aspects impede effective coordination.

Funding and finance: Some European countries have invested considerably to improve chronic care, but those measures intended to increase cooperation are often cut after early success. Governments seem to expect that measures to improve coordination will 'self-fund' from savings (Leutz 1999). However, evaluations show that these expectations are unrealistic, and threaten the success of efforts to improve coordination. In many cases, 'self-funding' expectations are seen as a threat by those in the organisation, particularly if ambitious savings are expected. They may fear that they will have to make the 'efficiency gains' by cutting resources. Given strong incentives to protect these resources, willingness to cooperate has been found to be low (Leutz 1999).

Research also indicates that coordination initiatives seldom generate short-term savings. Also, improving co-ordination does not compensate for a lack of resources (Freeman et al. 2007), and so is not an easy way to solve funding problems.

Human resources and pay: Integrated approaches (such as disease management programmes or gatekeeping models) that bridge traditional professional boundaries need well defined roles and competencies (Nolte and McKee 2008). In many countries, legal barriers have to be redrawn before competencies can shift between professional groups (Durand-Zaleski 2008; Orbrecht 2008). Reimbursement schemes have to be adapted in order to compensate participation in new schemes, such as multidisciplinary teams to treat chronic diseases (Glasgow et al. 2008). The evidence clearly shows that professional groups will be less involved in integrated care models unless they have pay incentives (Steuten et al. 2002; Schiotz et al. 2008).

In addition, performance-related pay schemes may set incentives which undermine cooperation (Hofmarcher et al. 2007). Specialist doctors are particularly worried about shifting competencies to other professional groups, such as nurses or GPs, and this can undermine coordination of chronic care (Rosemann et al. 2006). The lack of training for staff undertaking new roles is a serious problem. Doctors in most countries are rarely trained to 'navigate' patients through the health system. Nurses having to perform new and demanding tasks are often inadequately prepared and supported.

Strategies for better coordination

Policy makers increasingly recognise the importance of coordination for the quality of care (Boerma 2006), patients' care experience (Alazri et al. 2006; Schoen et al. 2007; Turner et al. 2006) and cost containment. Accordingly, governments in most European countries have developed appropriate strategies.

Many of these strategies have been applied to the structural, organisational and operational problems of coordination. Some countries, such as Denmark and England, have developed national strategies for chronic care, integrating health promotion, prevention and management under a common framework. Other countries, where professionals are more fragmented, have developed strategies focusing on specific aspects of chronic care and chronic disease (France, Germany, the Netherlands, Sweden) (Nolte and McKee 2008).

Table 14 summarises recent policy initiatives in selected European countries. It distinguishes between those with a common framework and thus a national strategy, and those using *parallel strategies*.

Table 14: Recent policy initiatives to improve coordination and quality of chronic care

Country	Policy initiatives	Goals/mechanisms
Denmark	**National strategy**	
	• Development of a national Vision of chronic disease control: Healthy throughout Life (2002)	• Facilitate easier access to chronic care via Municipal Centres
	• National targets to increases life expectancy	• Increase transparency and accountability via defined targets
	• Reallocation of responsibilities between regions and municipalities	
	• Municipal health centres for elderly and patients with chronic disease (limited to the provision of non-physician services)	
United Kingdom	**National strategy**	
	• Development of a national Vision for chronic care: Choosing Health (2004)	• Improve navigation through the system via case management
	• Implementation of casemanagement	• Define adequate policies for patients via stratification and clustering
	• Risk stratification	• Develop integrated chronic care via multidisciplinary teams
	• Multidisciplinary care teams	• Establish the provision of high quality care for selected chronic conditions in primary practice via a new compensation scheme
	• New payment system for primary care	• Increase access to chronic care for specific patient groups via multiple points of entry
	• Establishment of "NHS Walking-in centres" and "NHS-Direct"	
France	**Parellel strategies**	
	• Introduction of "health networks"	• Improve exchange of experience between providers via networks
	• Target-setting for health and risk indicators	• Increase transparency and accountability via defined targets
	• Universal and mandatory registration with general practice (GP)	• Increase the use of evidence-based guidelines in chronic care via financial incentives
	• Financial incentives (reduction of co-payments) for the use of evidence-based guidelines in provision of long term conditions	• Improve navigation through the system via universal gatekeeping by general practice
Germany	**Parellel strategies**	
	• Attractive compensation for disease management programmes (2002 and 2004)	• Establish integrated and structured care models via attractive financial compensation for the establishment of DMPs
The Netherlands	**Parellel strategies**	
	• Establishment of transmural care (focusing on the interface between acute hospital care and alternative setting)	• Improving the interface between acute hospital care and ambulatory care via new initiatives/cooperation between existing actors in transmural care
	• Development of disease management programmes	• Development of integrated care models via financial for the establishment of disease management programmes

Country	Policy initiatives	Goals/mechanisms
Sweden*	**Parellel strategies**	
	• Strong emphasis on primary care centres for chronic care guided by regional and local guidelines	• Improve navigation, accessibility and continuity of care via chronic care in primary care centres and nurse lead chronic care
	• Nurse lead chronic care	• Improve quality of chronic care via the development of common guidelines for chronic care across professional and provider boundaries ("chains of care")
	• Development of chains of care	• Increase continuity of care and accessibility for elderly and patients with chronic diseases via locally coordinated health care strategies
	• Development of "local healthcare" initiatives	

*Sweden devolves significant responsibilities for health care to provinces and other lower levels of government. Therefore policy approaches differ across the country. These are only selected policy initiatives.

Source: own compilation based on Nolte and McKee (2008) and Catlan et al. (2006)

Despite these initiatives, problems with coordination and continuity of care persist irrespective of health care system and the policy approach (Catlan et al. 2006). Given the lack of research, short duration of the initiatives and relationship to country-specific variables, only tentative conclusions can be drawn. One is that, while gatekeeping countries such as the Netherlands and the UK still have problems of coordination and continuity of care, these problems tend to be worse in health systems with no systematic gatekeeping and where patients are left to navigate through the system on their own.

Also many governments try to improve coordination of services in primary, specialist and social care, of community services through joint committees, and of shared care. Evaluations suggest that the success of these approaches is limited, and depends on the cooperation of different professionals (Evans 1996).

Finally, increasing points of entry with *walk-in centres* or *call-in centres* comes at a cost. It tends to split primary care and undermine continuity of care (Anderson et al. 2002; Salisbury 2004). For some patients, especially those with chronic and multiple conditions, these may make it harder to improve quality of care (Calnan et al. 1994).

Policy recommendations

There is no agreed best practice for better coordination. Problems persist in all European health systems and the impacts of various policies differ. Formulating policy is difficult, but studies have informed the following recommendations.

Strategic policy recommendations

- Policy makers must recognise that they need to act. The complexity and variety of people involved in chronic care means that better coordination will not emerge spontaneously (Nolte and McKee 2008). Decision makers must make better cooperation a priority in order to overcome deeply-rooted vested interests and professional scepticism. Better coordination will only become a realistic goal if it is adequately managed and politically supported.
- Policy makers must decide early whether change can be implemented in the existing system, or whether fundamental reform is needed. This applies particularly where there are central structural barriers to cooperation (Glasgow et al. 2008; Nolte and McKee 2008; Plochg and Klayinga 2002).
- All European health systems face increasing demands on health outcomes, medical progress and finances. Policy makers should take into account the consequences of restructuring when designing policies specifically targeting coordination (Nolte and McKee 2008).

Structural policy recommendations

- Policy makers should decide what mix of *centrally-controlled parameters* and *local autonomy,* or *top-down* and *bottom-up* management they want for improving coordination (Ahgren and Axelsson 2007). Policy makers must take into account the likelihood of bringing about change. They should also consider whether their approach will fit in with established mechanisms of accountability and responsiveness. In Germany, strict national guidelines for disease management programmes have been praised for ensuring common standards, but they have also been criticised for making it difficult to respond to local requirements and conditions (Siering 2008). In England, a perceived lack of regulation has been blamed as the main cause of a highly differentiated and fragmented set of programmes.
- Similarly, policy makers should choose between *parallel policy initiatives* or one *integrated national strategy*.
- Policy makers should decide which patient group they are targeting. The debate about whether to increase access through multiple entry points or strengthen continuity of care and improve navigation with gatekeeping shows that policies to improve chronic care often involve trade-offs for different groups of patients. Policy makers should define the target (patient) population of their strategies in order to minimise unintended consequences and side-effects.
- Separate and shared responsibilities within and between providers should be clearly defined in order to prevent duplication or omissions (Catlan et al. 2006).

Organisational and operational policy recommendations

- Policy makers should provide enough funding for start-up costs and sustained operations. Expectations of self-funding tend to be unrealistic and often produce rivalry over resources (Leutz 1999).
- Policy makers should set up remuneration schemes that will allow cooperation across primary and secondary sectors, professional groups and competing providers.
- Policy makers should enable health professionals to fulfil their new responsibilities. This means setting up the appropriate legal framework, providing training, and helping to build trust between professional groups that are not used to working together.

7.4 Information and communication technologies (ICT)

There is growing international agreement that introducing modern information communication technologies (ICT) may lead to a more effective use of resources, an improvement of the quality of care, and to greater attention paid to the needs and wishes of patients (Busse et al 2006). In particular, disease management programmes and integrated care models need strong and effective systems for exchanging information and collecting data if they want constant quality control (Hofmarcher et al. 2007; Leutz 1999).

The European Union has therefore proposed various information technology initiatives – for example, within the framework of the eEurope action plan – and many governments have been motivated to strengthen their efforts (eEurope 2005). For the health sector, the EU presented the action plan e-health which encourages member states to develop their e-health strategies. It also seeks to set up agreed international standards for exchanging health data (European Commission 2004). This section will give policy makers an overview of the effectiveness of different decision-support systems. It will also highlight how various countries are reforming their e-health platforms and electronic health records.

Clinical decision support systems

Clinical decision-making is supported by a wide range of interventions. These rely increasingly on electronic systems for their delivery. The main goals are to increase the quality of care through standardising the delivery of care in accordance with evidence-based practice, while at the same time containing costs (Glasgow et al. 2008). Clinical care processes are more likely to become standardised when evidence-based practice guidelines or protocols and clinical pathways are being used. They are intended to reduce variation in health care and thereby increase quality of outcomes and reduce medical error. Coiera (2003) points out that these electronic systems range from presenting information (treatment requirements for specific conditions or diagnosis) to undertaking complex functions as in *expert systems* and *machine learning systems*. Evidence suggests that formal decision-support systems are beneficial, and they have been studied for conditions such as hypertension, diabetes, depression, heart failure, asthma, COPD, osteoarthritis, and end stage renal failure.

Table 15 summarises the evidence of effectiveness of decision support in clinical practice.

Table 15: Evidence of effectiveness: Computerised clinical decision support (CDSS)

(Abbreviated) title	Year	Study design	Condition/ treatment	Target	Type of Intervention	Patient objective outcomes	Patient subjective outcomes	Quality of care	Reduced healthcare costs/ use of services
Effects of computerised clinical decision support systems (Garg et al,. 2005)	2005	Systematic review	n/a	Practitioner	CDSS			+	
Decision aids for people facing health treatment or screening decisions* (O'Connor et al., 2003)	2003	Systematic review	n/a	Patients	Computer and web-based decision aids		+		-
Effect of computerised evidence based guidelines on management of asthma and angina in adults (Eccles et al., 2002)	2002	RCT	Asthma angina	GP	Computerised guidelines	-	-	-	-
Effect of computer-aided management on the quality of treatment in anticoagulated patients (Manotti et al., 2001)	2001	RCT	Oral Anti-coagulant treatment	Anti-coagulant clinic physicians	Computer aided dosing	+		+	+
A randomized trial using computerized decision support to improve treatment of major depression in primary care (Rollman et al., 2002)	2002	RCT	Major depression	GP	CDSS with diagnostic and feedback on treatment	-		-	
Lessons from a randomized controlled trial designed to evaluate computer decision support software to improve the management of asthma (McCowan et al., 2001)	2001	RCT	Asthma	GP	CDSS	~~			~~
Failure of computerized treatment suggestions to improve health outcomes of outpatients with uncomplicated hypertension (Murray et al., 2004)	2004	RCT	Hyper-tension	Physicians, pharmacists	Evidence based treatment suggestions using eHR	-	-	-	
Can computer –generated evidence care suggestions enhance evidence based management of asthma and chronic obstructive pulmonary disease? (Tierney et al., 2005)	2005	RCT	Asthma, COPD	GP	Computer-based evidence care suggestions	-	-	-	-
Randomised controlled trial of an informatics-based intervention to increase statin prescription for secondary prevention of coronary disease (Lester et al., 2006)	2006	RCT	Ischaemic heart disease	GP	CDSS	+		+	
Cost effectiveness of an intervention based on the Global Initiative for Asthma (GINA) recommendations using a computerized clinical decision support system (Plaza et al., 2005)	2006	RCT	Asthma	Specialist and GP	CDSS		+		+

Note: "+" - intervention improves the outcome; "~~"intervention does not show any effect on the outcome; "-": intervention has a negative effect on the outcome. * This majority of studies included in this review concerned cancer screening and treatment; also, 25% of the decision-aids reviewed at were not computer/web-based. However, the review provides important evidence on the use of decision aids for patients and was therefore included here.

Source: Glasgow et al. (2008)

The evidence so far indicates that progress has been made in some disease areas. Nevertheless, many challenges exist if we are to make full use of the potential of decision supports (Glasgow et al. 2008).

E-health platforms and electronic health records

Many governments support holistic information and communications systems such as e-health platforms and electronic health records or cards. The aim is to improve data exchange between key people such as doctors, patients, hospital workers, pharmacists, care workers, health insurers and public administrators. E-health platforms are meant to improve access, increase patient participation, improve efficiency of delivery and improve coordination. Often the platforms have guidelines for professionals, information and education programmes for patients, and eligibility criteria for benefits.

Examples of such platforms include the Canadian Health Infoway, MedCom in Denmark, Connecting for Health NHS in Britain, Health Connect Australia and in France an internet portal for chronic conditions (Glasgow et al. 2008). Cross-sectoral electronic health records are used for the long-term collection and documentation of relevant patients. They contain personal data and a wealth of medical information, such as the medical history of the carrier, important laboratory results, physicians' letters, records of operations, and digital data from investigations (Busse et al. 2006). Only a small amount of evidence is available, but some studies have found positive effects on the care process, while others have found no effect on subjective or objective outcomes (O'Connor et al. 2005; Tierney et al. 2005).

Policy recommendations

- Agreeing on technical standards is essential because one of the key challenges is to achieve functional interoperability within health systems. Policy makers should get those involved together and ensure that they agree on goals and standards for information technology.
- More important is how the vast amounts of data generated by medical treatments can be merged into meaningful information. Modern information technology can store vast amounts of data, but health professionals usually need carefully selected pieces of information combined in a specific way. Since time is critical, both in terms of costs and medical treatment, intelligent ways of compressing, aggregating and interpreting information must be found. ICT providers often ignore this, but policy makers should insist that systems are developed in order to meet the needs of health professionals.
- The use of information technology has to be more broadly evaluated. Pilot projects in Austria, Canada, France, Germany, Italy, Japan, Switzerland and the United States have found relatively high costs, budget overruns and many unforeseen difficulties (Hendy et al. 2005; Tuffs 2004; Tuffs 2006; Burton et al. 2004; Scott et al. 2005). There is a clear need to assess the benefits of information technology and long term cost-benefit analyses should be undertaken.
- Policy makers should ensure that patients accept the new electronic systems. Data protection is a key part of new designs, but patients often demand full access to their own data. Where necessary, laws must be passed to ensure strict standards on data protection, and to affirm patients' rights to access their records.

7.5 Evaluation culture

This report has shown that many aspects of chronic disease management have not yet been properly evaluated and neither the effectiveness nor the cost-effectiveness of various interventions have been established. Those making policy for chronic care lack good-quality information, based on scientifically valid methods, to support their decisions. This section outlines how technologies (medical devices and pharmaceuticals) and strategies are evaluated in different countries, describes what methodology should be used, and outlines which steps could be taken to improve evaluations.

Evaluation is described here as the comparative appraisal of technologies and strategies used to manage chronic disease - pharmaceuticals, programmes, projects, services or organisations - using methodically aggregated and analysed data (Ovretveit 2002). The evaluation can relate to the structure, process and results of an intervention. Evidence-based assessment and quality development must be transparent and must provide the conditions necessary for rational health planning and control (Busse et al. 2006). Unlike basic research, evaluation addresses the specific questions of decision makers on efficacy, cost-effectiveness and equity.

Evaluation of medical procedures and devices

Evaluating chronic disease management needs careful preparation, and should be built into a programme from the start. However, few countries have adopted the idea that evaluation should be an integral part of public health programmes. Exceptions include the Netherlands, Canada, Australia and the UK (Suhrcke et al. 2008). Since the 1990s the global trend has been towards more evidence-based policy. Many countries are trying to evaluate medical technologies and procedures, for instance, including those for chronic diseases. This is usually carried out by health technology assessment (HTA) institutions (cf. accompanying report on HTA). Most European HTA agencies are independent of government but publicly-funded, with the mandate of supporting policy-making and decision-making (Velasco-Garrido and Busse 2005). An increasing number of European countries can draw on their experiences evaluating health technologies and supporting policy decisions (Busse et al. 2006).

Evaluation of pharmaceuticals

Those with multiple diseases have become much more complex to manage as new, more powerful, but also potentially more dangerous drugs become available (Nolte and McKee 2008). Until recently, there was only limited evidence for the pharmacological management of chronic disease. That was particularly the case for new drugs that had proven their safety and efficacy in randomised controlled trials (RCTs - often against a placebo as a control), and were licensed to be marketed. But it was unclear whether they offered any additional benefits – especially in real-life conditions – over existing pharmaceuticals. Were they really innovative or simply patented 'me too' products with no (or very limited) added value?

Many countries have therefore introduced a post-licensing evaluation before making decisions on price, eligibility for reimbursement, and recommendations (in clinical guidelines) for use (Zentner et al. 2005). The number of groups assessing evidence for the added value of a drug has grown continuously over the past decade. Examples of such bodies are the Swiss Federal Office of Public Health and Confederate Pharmaceutical Commission, the Swedish Pharmaceutical Benefits Board Committee and the National Institute for Health and Clinical Excellence in the United Kingdom (Zentner et al. 2005).

Negative reviews from these bodies cause the pharmaceutical industry to criticise the lengthy evaluation procedures and the quality of the evidence-based evaluations. Reimbursement decisions have been contested successfully in litigation, for example in France (Naudin and Sermet 2003; Couffinhal 2003). The example of Australia (van Gool 2005) shows how drug evaluation and regulation increasingly come into conflict with a global market. The free trade agreement with the United States obliges Australia to allow an independent assessor to review negative decisions by its Pharmaceutical Benefits Advisory Committee. One of the challenges facing policy-makers is to develop internationally accepted standards and methods of evidence-based evaluation, and to increase the transparency of the procedures and of policy decisions (Busse et al. 2006).

Methods of evaluation

Chronic disease management tries to strike the right balance between scarce resources on the one hand and high-quality health care on the other. If models are to be acceptable their impact needs to be proven. Disease management programmes, for example, should comply with the standards of evidence-based medicine. These standards should also apply to evaluation. Prospective, randomised, controlled evaluation is seen as the best way of generating empirical evidence on structured health care, From a statistical point of view, observational studies are weaker when evaluating the effectiveness of chronic care models, even though the observation of a cohort can be larger than an RCT sample size. However, RCTs allow different programmes to be compared in addition to evaluating one intervention (Sawicki et al. 2006; Beyer et al. 2006).

Developing a study design for a randomised controlled trial in disease management would face methodological problems. These would include defining primary target criteria, guaranteeing a 'naturalistic' intensity of intervention, and creating a control group that is not significantly affected by spill-over effects (such as the physicians using knowledge they have gained from the programme or because implementation becomes mandatory during the evaluation period). Evaluations considering relevant health outcomes also need a long observation time.

These problems can be addressed scientifically (through cluster randomisation with physicians having either only or no disease management programme patients). However, scientists face challenges when conducting adequate evaluations, because decision makers need rapid answers and might encourage measuring process rather than outcomes.

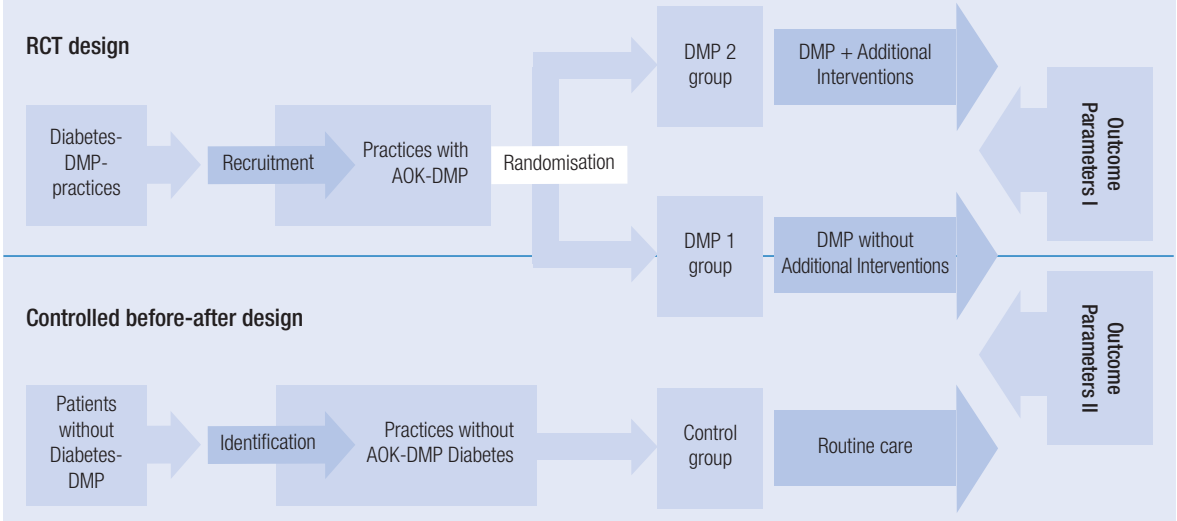
Evaluation of strategies in chronic disease management

Evaluating strategies in chronic disease management is a part of health services research (HSR). It examines how social factors, financial systems, organisational structures and processes, health technologies and personal behaviours affect access to health care, the quality and cost of health care - and, ultimately, the health and wellbeing of citizens (Lohr and Steinwachs 2002; AcademyHealth 2007). It does this at a *macro-level*, which is the health care system at large (regionally, nationally or internationally) and at the *micro-level*, which is the interaction between patients and providers. Health Technology Assessment concentrates on the *micro-level* when evaluating new pharmaceuticals or medical devices (cf. accompanying report on HTA). The *meso-level* focuses on health care organisations and the services they provide, as in disease management programmes.

Several small-scale research projects are studying single elements of disease management programmes, such as patient enrolment or documentation. Until now there have been few large-scale, population-based evaluations of chronic care.

One example is the German study *Evaluation of a Large Scale Implementation of Disease Management Program* (ELSID). In 2003, the first disease management programmes for patient with diabetes mellitus type 2 were introduced in Germany. The Social Code Book V made evaluation obligatory by and a prerequisite for further accreditation. The regional health funds commissioned independent scientists to evaluate the disease management programme for type II diabetes in primary care in two German states. They designed a three-armed prospective cluster-randomised comparison of a DMP, a DMP providing extra services such as quality circles or outreach visits, and routine care without a DMP as a control group. Figure 12 shows the study design (Joos et al. 2005).

Figure 12: ELSID - Study Design



Source: Joos et al. (2005)

This is an example of best practice. It allows valid data to be collected and conclusions drawn about the effectiveness of a disease management programme. This randomised controlled trial seems promising.

Policy recommendations

- Policy makers should understand the relevance and basic methodological requirements of evaluation. They should use this knowledge to ensure that evaluation is an integral part of programmes to improve chronic disease management. Adequate incentives or regulations should be applied to encourage programme designers to take account of the need for evaluation. For example, constant quality control through defined evaluation should be compulsory for large scale publicly-funded programmes.
- Given increasing globalisation, policy-makers need to develop internationally agreed standards and methods of evidence-based evaluation. They also need to make their procedures and policy decisions more transparent (Busse et al. 2006; cf. accompanying report on HTA).
- The need for evaluation should not unnecessarily hinder innovation nor should it be used as an excuse for uncontrolled implementation. Policy makers must use a step-by-step approach, such as getting a small number of providers to use the technology, strategy or organisational component on a small number of patients. Once positive results are available, the numbers of providers and/or patients may be increased.
- Data routinely available in different sectors of the health system (for example, for reimbursement) should be made available so that independent researchers can carry out in-depth analyses of effectiveness and cost-effectiveness.

CONCLUSIONS 8

Chronic conditions and diseases are already the leading cause of mortality and morbidity in Europe. Research suggests that conditions such as diabetes and depression will impose an ever larger burden in future.

The economic implications of chronic diseases and conditions are serious. They depress wages, earnings, workforce participation, labour productivity and hours worked – and may also lead to early retirement, high job turnover and disability. Disease-related impairment of household consumption and educational performance affect GDP and economic growth. Spending on chronic care is rising across Europe, and takes up an increasing part of public and private budgets.

European policy makers must start to improve chronic disease management. In order to inform decision-making, part I of this report described the available strategies and the evidence on their effectiveness and cost-effectiveness.

On *prevention and early detection*, this report has shown that most countries are trying to combat chronic conditions by experimenting with prevention and early detection. These approaches aim to reduce the burden of chronic disease by activities that avoid impairment to health, or make it more unlikely. Prevention includes primary, secondary or tertiary approaches which differ in aims and target groups. Research indicates that approaches combining several interventions at once are most effective. Cost-effectiveness analyses indicate that there are efficient strategies to combat chronic disease, but they are rarely more cost-effective than therapeutic interventions. Cost-effectiveness varies considerably according to region and population group. Regional factors for each intervention must be carefully examined, and relevant target groups defined carefully so that policy makers can do more than just choose between: broad implementation or no implementation at all. Prevention interventions are far from developed in most countries. Because of the severe medical, social and economic consequences of chronic diseases, more effort and resources have to be invested in prevention and early detection.

Health care has recently seen the emergence of *new providers, new settings and new qualifications*. New professions such as nurse practitioners, liaison nurses and community nurses have been set up, and the tasks and responsibilities of existing professional groups have been moved and expanded. New settings have been established, such as nurse-led clinics, group practices and medical polyclinics. A key challenge is to enable those working in chronic care to meet their new duties and responsibilities (Busse et al. 2006; Casado 2003). Some countries have recognised this challenge, but gaps remain. In particular, there is often a shortage of well-targeted training for those in lower status professions. Empirical evidence on new qualifications and settings is limited, but pilot studies suggest that new qualifications, structures and settings can help to effectively manage chronic diseases. Nurses with wider roles and clinics run by specialist nurses seem to improve chronic care. The cost-effectiveness of such measures has rarely been studied systematically, but some research points out that use of resources improves. Future research should build on these early results to decide whether investment is justified and where the priorities should lie.

Disease management programmes have been introduced into many European countries. The aim is to improve the coordination of care by focusing on the whole clinical process, building on scientific evidence and involving patients. There is a lack of large-scale and rigorous population-based evaluations, but small-scale studies suggest that disease management programmes may benefit the process of care. Both the evidence on medical outcomes and on cost-effectiveness is inconclusive (Mattke et al. 2007). Providers and insurers must make the data they collect available to researchers, and evaluation must become an integral part of chronic disease management.

Integrated care models respond to the fact that chronic diseases can only rarely be treated in isolation. Often patients suffer from several chronic diseases or conditions. These models organise treatment (and prevention) to achieve more integrated services across the whole range of care. The effectiveness of integrated care models is controversial, because the lack of large-scale population-based studies does not allow far-reaching conclusions. Early results suggest that some improvements may be generated but, given the complexity of integrated care, implementation is a key challenge. Future studies must examine implementation problems. Also it is not clear which components of integrated care bring about individual improvements. Evidence on cost-effectiveness is also limited: preliminary results are inconclusive (Nolte and McKee 2008).

The third part of the report used this evidence to draw conclusions about what policy makers should do. It also made specific recommendations on how to shape the future. *Pharmaceutical and medical innovations* will continue to play a major part. New pharmaceuticals may lead to better adherence and better quality of life. At the same time, innovative pharmaceuticals will provide a challenge to challenge marketing authorisation and reimbursement schemes as well as the evaluation of outcomes.

This report has argued that properly applied *financial incentives* can be a powerful way of triggering effective and rapid change in chronic disease management. But policy makers need to pay attention to the size of variable compensation or funding and issues in goal-setting. Benefits in chronic illness often occur only in the mid- or long-term, so policy makers must be aware that often the quality of care can only be improved when providers are sure their investment is worth-while. Policy makers must consider carefully which strategy they follow when aiming to improve continuity of care.

Better *coordination* is critical, because chronic care involves many providers. Research confirms that patients' perception of the quality of care is largely determined by successful coordination (Preston et al. 1999). But structural, organisational and operational barriers persist. Preliminary conclusions, based on past experience and recent research, suggest that strategic, organisational and operational variables must be taken into account if coordination is to be improved. In particular, policy makers must recognise that well-organised interests tend to benefit from fragmented care, so reforms aimed at improving coordination should be well-prepared, and supported by strong political will. Policy makers also need to monitor other reforms on coordination. They must decide early whether to depart radically from the current structure, or build on established norms, institutions and practice. Structurally, policy makers need to define clearly responsibilities for those involved. The balance between local autonomy and central authority also needs to be defined. Operationally, enough funding is needed to pay for reforms, while at the same time compensation schemes need to be set up that encourage cooperation rather than stress professional separation. Finally, the workforce must be prepared to fulfil its new roles, which means adequate training, learning and communication.

Another important building block is *information and communication technology (ICT)*. Theoretical models and some small-scale pilot studies suggest that computerised decision support and data collection can generate many benefits. Using electronic protocols and clinical pathways to support evidence-based medicine is particularly attractive, because it could improve outcomes and reduce medical error. However, the evidence is weak with only a few rigorous studies on effectiveness and cost-effectiveness. Experience in many countries has been disappointing: most ICT initiatives run into unexpected difficulties with budget-overruns and high costs. If ICT is to meet its potential in chronic disease management, problems of functional interoperability need to be solved through agreement on technical standards. Policy makers must bring about consensus. Even more important, they must find solutions for translating vast amounts of data into meaningful information for health professionals. They also need to ensure that public concerns about data protection are taken into account, and appropriate legislation introduced.

This report also shows that many aspects of chronic disease management are not properly *evaluated*. The effectiveness and cost-effectiveness of various prevention and treatment interventions are not well established. Policy makers are therefore not best equipped to make informed decisions. An important cornerstone for improving knowledge is the development of health technology assessment institutions in several European countries (Busse et al. 2006). Policy makers need better grounded empirical evidence on effectiveness and cost-effectiveness, generated through methodological approaches such as prospective, randomised, controlled evaluation. Policy makers must ensure that evaluation is an integral part of public programmes. They should also act immediately to make existing data available for research and review, so that an independent and in-depth analysis can take place of effectiveness and cost-effectiveness across different technologies, settings and providers. In the face of increasing globalisation of pharmaceutical and health care markets, policy-makers need to ensure that standards and methods of evidence-based evaluation become internationally accepted. They also need to increase the transparency of procedures and policy decisions (Busse et al. 2006).

Finally, this report indicates that policy makers do not yet have the information and evidence they need to understand and shape chronic disease management. Future research should concentrate on the following issues:

- Evidence based on rigorous research designs needs to be generated with regard for the strategies available to prevent or combat chronic diseases, such as prevention and early detection, new providers and qualifications, disease management programmes and integrated care. The research should make use of routine population-based data to evaluate key outcomes such as appropriateness, effectiveness and cost-effectiveness, as well as to identify what makes an approach succeed or fail.
- Equally important is that future research examines how specific financial incentives interact with 'continuity of care' in different health systems. This question is of fundamental importance for chronic diseases because investment tends to generate health and economic benefits only after 5-10 years. Incentives that make providers or insurers make frequent changes may undermine quality of care and cost containment.
- This report suggests that future research should investigate how to translate the vast amounts of data that information and communication technology can store into meaningful information for health professionals.
- Finally, there is a need for international agreement on the acceptability (or even uniformity) of evaluation standards, methods and conduct as well as for the transparency in applying them. There are still no agreed standards and methods, especially regarding the core conflict of fast access to effective technologies and the need for proper, time-consuming comparative evaluation.

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THE FUTURE OF HEALTH TECHNOLOGY ASSESSMENT IN EUROPE

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LIST OF ABBREVIATIONS

AFSSAPS	Agence Francaise de Securité Sanitaire des Produits de Santé (France)
AIFA	Italian Medicines Agency
ASMR	Amélioration du Service Médical Rendu (France)
CaHTA	Catalan Agency fpr Health Technology Assessment
CEPS	Comité Économique des Produits de Santé (France)
DACEHTA	Danish Centre for Evaluation and Health Technology Assessment
DAHTA	Deutsche Agentur fuer Health Technology Assessment (Germany)
DCHPDP	National Centre for Health Promotion and Disease Prevention (Denmark)
DIMDI	German Institute of Medical Documentation and Information
EBM	Evidence-Based Medicine
EC	European Commission
EUNetHTA	European Network for Health Technology Assessment
FinOHTA	Finnish Office of Health Technology Assessment
HAS	Haute Autorité de Santé (France)
HTA	Health Technology Assesment
IQWiG	Institute for Quality and Efficiency in Health Care (Germany)
LDL	Low Density Lipoprotein
LEEM	Pharmaceutical Manufacturers Association
MPA	Medical Products Agency
NCCHTA	Natioanl Coordinating Centre for Health Technology Assessment
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
PCT	Primary Care Trust (UK)
PSS	Personal Social Services
QALY	Quality Adjusted Life Year
RCT	Randomized Control Trial
SBU	Swedish Council on Technology Assessment in Health Care
SMC	Scottish Medicines Consortium
SMR	Service Médical Rendu (France)
TAC	Technology Appraisal Committee
TLV	Dental and Pharmaceutical Benefits Board (Sweden)
VBP	Value-Based Pricing
WHO	World Health Organization

EXECUTIVE SUMMARY

Health Technology Assessment (HTA) is a rapidly evolving process that informs decisions about the benefits, risks, and costs of mainly new technologies, interventions and practices. Over the past 20 years, many European countries have started to use it, though usually to serve fairly narrow objectives. But HTA is developing rapidly, and considerable experience on good and less good practice is now available.

This report discusses these experiences and considers the future of HTA in Europe. It also looks at ways of improving international collaboration. The emphasis is on those HTA activities related to decisions on allocating resources, and on the relationship between the HTA and subsequent decision-making. The report considers four broad themes:

- The structure of HTA activities;
- Methods of HTA;
- Processes for the conduct of HTA; and
- Use of HTA in decision-making.

The growing use of HTA provides a greater opportunity to compare and contrast the various approaches and define best practice. Agreement on best practice is important because HTA is increasingly a fundamental part of the way organisations decide on which health technologies they will reimburse. The report proposes 15 principles and identifies seven important issues.

The goal and scope of the HTA should be explicit and relevant. A detailed scoping document should be developed with broad stakeholder involvement. It should define the question(s) to be addressed and outline how the assessment will be used by decision makers.

HTA should be unbiased, rigorous and transparent. The process is best conducted independently of the body that will be responsible for adopting, paying and implementing the decisions.

HTA should include all relevant technologies; otherwise, decisions on resources are likely to be distorted. Public health interventions and e-health should also be assessed. There should be a clear system for setting priorities and selecting topics, because unless every technology can be assessed the decision-making process again risks distortion.

Rigorous analytical methods for assessing costs and benefits should be used in order to encourage the trust of stakeholders and the public. This requires clear process and methods, and also access to appropriate experts. HTAs should examine a wide range of evidence and outcomes, and need data from the widest possible range of appropriate sources.

HTAs should adopt a broad perspective to optimise efficiency and benefits to society. They also need to avoid allowing vested interests to distort clinical decisions and health policies.

Uncertainty over estimates should be specified. All data are imperfect point estimates of underlying distributions that incorporate a variety of errors. All analytical methods are subject to biases and limitations. Thus, sensitivity analyses are required to determine the robustness of HTA findings and conclusions. The limitations of the analysis should always be acknowledged. HTAs should consider and address issues of whether their findings can be generalised and transferred.

Those carrying out HTAs should engage all key stakeholder groups at all stages of the process. This is likely to produce assessments that are of higher quality, more widely accepted and have a greater chance of being implemented. An open process will enhance transparency and trust. Contact with HTA agencies should be encouraged at early stages before assessment or review.

Those doing HTAs should actively seek all available data, whether confidential or not. If confidential data are used, it should be made publicly available as soon as possible in the interests of transparency and trust. Implementation of findings should be monitored to ensure that the original investment is worthwhile and to ensure that findings are being implemented fairly.

HTAs should be carried out when they can inform key decisions in the spread and use of health technologies, and the assessments should be kept up to date. Manufacturers and other advocates need to carry out studies in good time and, in some cases, limited reimbursement can be conditional upon enrolment in a further study. In addition, HTAs should be separate from of the process of marketing authorisation. HTA findings need to be communicated to different decision makers, which means developing appropriate communication strategies.

A clear distinction must be made between the HTA and any subsequent decision over funding, but the relationship between them needs to be transparent and clearly defined. Several important issues have emerged.

- *Technology foresight*. HTA agencies should have 'early warning' and 'horizon scanning' systems to identify new and emerging technologies that might require urgent evaluation.
- *Affordability*. The HTA process should not consider whether a technology is affordable. This is a question for politicians.
- *Value-based pricing*. HTA can help define the 'value' of new medical interventions but its use is constrained by the quality and availability of data.
- *Disinvestment*. The need for disinvestment must be explicitly recognised and integrated into the scoping, researching and deliberation phases of guidance development.
- *Resourcing and expertise*. HTA agencies should be appropriately resourced
- *Partnerships*. Manufacturers and HTA agencies should work together, particularly over the treatment of uncertainty and the assessment of new data.
- *Mini-HTA*. This is a management and decision-support tool based on the reasoning involved in HTAs and can be used regionally or locally. It is a flexible and dynamic tool.

Economic evaluation is an important part of HTA, and it is essential to develop international standards if there are to be any meaningful comparisons. But there is still considerable debate about which methods should be used. One of the major issues is whether the analyses are intended to inform decisions across all disease areas – or within a particular disease area only.

Those conducting economic evaluations recognise the importance of good quality clinical data. Most economists subscribe to the accepted hierarchy in the quality of clinical studies and agree that the best evidence on relative treatment effect comes from systematic overviews of the randomised clinical trials. However, it is hard to imagine an approach based only on such data, and most national guidelines for economic evaluation allow some economic modelling, although few foresee a broad role. This is because many decision-makers still have concerns about modelling, because of the assumptions involved. Initiatives to improve the quality of models are therefore essential.

One obvious recommendation for international standards in economic evaluation is that alternative therapies should also be subject to a cost-consequences analysis. This would ensure that all the relevant dimensions of clinical outcome are included, and would also add transparency to the calculation of QALYs.

Once the costs and benefits have been estimated, the decision-maker needs to estimate value for money. The notion of a threshold value of the incremental cost-effectiveness ratio has been extensively debated. This is often described as a decision-making process, where the decision-maker is 'searching for the threshold'. Certainly, it is envisaged that many factors, such as equity of access to health care and the severity of a disease, are important components of any decision.

An international reference case for economic evaluation has been proposed, but more debate is required before it can to be adopted. One area worth exploring is what can and can not be standardised. For example, the principle that future costs should be discounted to present values should probably be an international standard, but the actual discount rate could vary from country to country.

Attempts to standardise the methods of economic evaluation are one aspect of international collaboration. A key attempt at increasing international collaboration is the EUnetHTA project. In the short term, progress will depend on how the various outputs of this project are received; the first is a proposal for a 'core' HTA.

The development of international standards in methods would make it easier to compare assessments and make it easier for those making submissions in several countries. It would therefore be a fruitful form of international collaboration. The main argument for common assessments is that they would avoid duplication of effort. Of course, progress will depend on the extent to which there is agreement on common methods and requirements.

Perhaps clinical systematic reviews have greater potential for common assessments than economic evaluations. Even if there were agreement on common methods for economic evaluation, various data inputs could vary from jurisdiction to jurisdiction. Better understanding of how these variations affect cost-effectiveness is needed, as well as methods to increase the international transferability of economic evaluations.

The final step in international collaboration would be common decision-making, as currently happens for drug licensing within the EU. Quite apart from the principle of subsidiarity in EU health care decision-making, it is unlikely that there will be much early progress in this area. First, different countries have different levels of resource to devote to health care. Different decision-makers, faced with the same assessment, may still come to different decisions about the same technology.

1 INTRODUCTION

Over the last few decades, innovative health technology has become an indispensable part of most European national health care systems. Innovations such as new medicines, devices, diagnostic tools, and surgical procedures have brought remarkable benefits to patients, and allowed providers and governments to improve the effectiveness, safety, efficiency, and quality of health care. However, with growing demands for new medical products and services, policy-makers face unprecedented challenges in providing high-quality and innovative care while also managing budgets and safeguarding the basic principles of equity, access, and choice. To help meet these objectives, many European countries now have health technology assessment (HTA) systems to identify which innovations provide best (or at least acceptable) value for money and to validate their place in health care. The evidence from HTA on costs and benefits is used to support various forms of health care decision-making and priority-setting, including decisions on coverage and pricing.

The extent to which HTA is linked to a particular decision about reimbursement, coverage, or use of a health technology influences the extent to which firm recommendations are made based on the assessment (in some settings this process is called 'appraisal'). The body conducting the HTA is not normally responsible for implementing recommendations unless it is a decision maker (for example a branch of the health ministry or a health insurer). In most countries, the organisations that do HTAs are public sector agencies, reflecting the public financing and/or provision of health care.

Therefore, HTA is a dynamic process, embracing different types of assessments that inform decisions about the value (benefits, risks, and costs) of new technologies, interventions and practices. HTA is changing rapidly, particularly in the United States, Eastern Europe, and parts of Asia and Latin America. Drawing upon the substantial body of existing experience, several groups have identified examples of good and bad practice and proposed recommendations to guide the conduct of HTAs.

This report will look at how HTA is done in a number of European countries and investigate its role in decision-making. It draws upon examples from nine EU countries to show how HTA fits into health care decision-making. The report then looks at the future of HTA in Europe, with a view to improving clinical and policy decisions, enhancing access to clinically- and cost-effective care, improving efficiency of care and advancing the health of the public. It is also intended to enhance the quality and credibility of HTA for resource allocation decisions and to build greater trust in, and support, for HTA programmes.

The report focuses on nine EU countries: UK, Germany, France, Italy, Spain, the Netherlands, Sweden, Denmark, and Finland. All of them have developed HTA national or regional networks or systems to informing decisions on different health technologies.[1]

Both primary and secondary sources were used to address these questions. Primary sources included contacting national experts and acquiring material from them as well as completing a template with a series of questions on HTA applicability. Secondary sources included a literature search (both peer reviewed and other published literature), as well as 'grey literature' on the use of HTA in decision-making.

Chapter 2 will define the role and objectives of HTA as currently applied in different settings. Chapter 3 will summarise the evidence on uptake of HTA, while Chapter 4 will focus on the structure of HTA programmes. Chapter 5 will look at desired methods for conduct. Chapter 6 will analyse desirable processes and Chapter 7 elaborate on the application of HTA in decision-making. Finally, Chapter 8 will draw together the main conclusions.

1 With the exception of Italy, where HTA is not used in the decision-making process, all countries use it in some way to inform such decisions. With the exception of France, where the concept of HTA includes a clinical component only, all countries use HTA in the context of clinical-cost-effectiveness. Often, as the case of Denmark demonstrates, HTA is a voluntary requirement. Finally, most countries that use HTA as a tool to inform decision-making make more extensive use of it in pharmaceuticals rather than other health care technologies.

DEFINITION AND ROLE OF HEALTH TECHNOLOGY ASSESSMENT (HTA) 2

2.1 Definition

Health Technology Assessment (HTA) evaluates health interventions through producing, synthesising, and/or systematically reviewing a range of scientific and non-scientific evidence.[2] The type of evidence typically considered includes the safety, efficacy, cost, and cost-effectiveness of an intervention. HTA is also concerned with the societal, organisational, legal, and ethical implications of health technologies or interventions. For example, it often considers the broader macroeconomic impact on national health care budgets, resource allocation among different health programmes, regulation, and other policy changes. There is considerable overlap between HTA and evidence-based medicine (EBM), but HTA is understood to represent a 'policy embodiment of EBM'.

The aim of HTA is to inform and guide health care decision-making and practice. This report focuses on HTA agencies that have a formal or informal influence on decision making on pricing and reimbursement as well as guidance on health care technologies. The terms *technology* or *intervention* may include pharmaceuticals, vaccines, medical devices and diagnostics, medical and surgical procedures, and processes used to prevent disease and maintain and restore health. In this report we also include public health programmes.

Methods of HTA vary from country to country and from setting to setting. They can impact pricing and reimbursement decisions and/or prescribing guidelines.

Finally, there is a link between HTA and innovation. The varying nature and complexity of health technologies, combined with limited national budgets, have resulted in tensions between delivering cost-effective health care and improving (or sustaining) a country's manufacturing and research base. It has become increasingly important to find a balance between affordable and equitable health care on the one hand and the use of innovative health technologies on the other. To do this it is necessary to consider the value of a product (in both medical and economic terms), and also who benefits from innovations, the optimal usage[3], and the appropriate place in the spectrum of care. HTA can help meet these challenges by determining which technologies are inefficient and which give value for money, and by defining when it is appropriate to use the technology (Drummond, 2003). Moreover, HTA can validate a new technology and define its role in a health care system. It thus provides important benefits by empowering governments to make decisions based on value, support innovation and give patients and physicians the information needed to choose the best treatment.

The effectiveness of HTA in achieving these benefits – particularly encouraging innovation – depends on properly performed assessments and the appropriate implementation and use of subsequent recommendations. HTA can encourage innovation if the assessments are done properly; this means considering a wide range of life-cycle costs and benefits rather than simply focusing on acquisition costs. In particular, the costs of adopting new technologies should be seen in terms of the broader benefits that would ensue if they were integrated into the health system. This is because budgetary constraints do not necessarily result in the most effective or cost-effective products being selected. Governments may have to allow more funding and greater flexibility between budgets, so that expenditure can be driven by value and not by arbitrary spending caps (Drummond, 2003).

2.2 Role and objective

Health Technology Assessment (HTA) is the formal, explicit assessment of the (clinical) effectiveness and cost-effectiveness of health technologies. It also considers their organisational, social, legal and ethical aspects as well as their impact on the national economy. It is multidisciplinary, drawing on expertise from medicine, epidemiology, demography, statistics and economics. The term *technology* is used in the broad sense and includes drugs, devices, surgical procedures, medical diagnosis and advice, and health promotion. Effectiveness and cost-effectiveness are quite different, as we discuss later. HTA was initially focused on effectiveness but is increasingly focused on cost-effectiveness.

2 HTA typically entails 1) identifying the policy question, 2) systematic retrieval of scientific and non-scientific evidence, and analysis, and 3) appraisal of evidence, including judgments regarding the meaning of the evidence. The evidence and its applications then inform the decision-making process.

3 Variation in uptake and diffusion can signify the suboptimal use of technology. Excess use is signified when the costs outweigh the benefits for any additional level of technology diffusion or use. Under-use can occur when the foregone benefits outweigh the costs of additional diffusion or use. Both scenarios are suboptimal, potentially resulting in economic costs and/or reduced health outcomes.

4 Although this may well be changing in the near future.

The main objective of HTA is to identify treatments and interventions that bring the greatest net benefit to patients (or to citizens generally). It can identify therapeutic areas where additional investment is justified and also identify those where disinvestment is indicated. High-quality assessments with timely and relevant guidance can help support decision makers by:

- ensuring the efficient and equitable use of health care resources;
- ensuring universal access to treatments which bring the greatest benefit to patients; and
- allowing choice among treatments of value.

The application of HTA should be consistent with the underlying values on which a particular health care system is based, such as equal access for all citizens. HTA should be accountable, but free from undue political interference.

Finally, health care processes should be improved so that *efficacy* (the potential proven in RCTs for new products) can be realised in practice (*effectiveness*). Decision-makers should accept that effectiveness is not the same as efficacy and should aim to improve practice so that there is consistency between the two.

HTA is based on objective analysis, but also embedded in the political environment. Social and cultural factors, as well as public opinion, can influence the HTA process. It may be used to:

- inform and guide decision-making. In this context, the data used in HTAs should follow principles of transparency, consistency and reliability, and seek the most appropriate evidence in order to help rational decision making;
- speed up access to innovative technologies and procedures for patients. Sometimes HTA is a formal requirement for reimbursement, but it should not be used covertly as a justification for rationing, restricted coverage or cost containment;
- identify obsolete strategies and health care technologies and help make decisions on reducing investment;
- provide information for decision making from a macroeconomic perspective; and
- enable people to choose between health care options.

Within this context, HTA recommendations should be appropriately resourced and implemented to ensure the best possible outcomes.

The SBU in Sweden

Sweden was one of the first countries to assess health technologies. The Swedish Council on Technology Assessment in Health Care (SBU) was set up in 1987. The main aim was not to contain costs but to improve the efficiency and equity in access to, and use of, technologies proven safe and effective. Its remit was to provide central government and health care providers with information on the overall value of medical technologies (especially new therapies) from the medical, economic, ethical and social perspectives. Specifically, the SBU reviews the benefits, risks, and costs of health technologies. It also helps to identify areas in which further research is needed.

The HAS in France

France has a specific health technology assessment system that does not involve any pharmacoeconomic evaluation.[4] The *Haute Autorité de Santé* (HAS) carries out the assessments within the Transparency Commission. HAS's four founding principles are: collegiality, independence, transparency and expertise. The Transparency Commission evaluations are based on clinical evidence and are structured around the efficacy-safety ratio, the position of the new drug in the therapeutic strategy, and the public health interest. An evaluation of the drug itself by the *Service Médical Rendu* (SMR – Provided Medical Service) determines access to it and the level of reimbursement, while a comparative assessment with the existing therapy (*Amélioration du Service Médical Rendu* – ASMR level) helps determine the price. The negotiations are carried out by the Economic Committee (CEPS), an executive arm of the government where health care insurance is highly represented. This system supports drug access independent of pharmacoeconomic considerations, but does not prevent drug evaluation being influenced by economic considerations.

HTA PRACTICES IN EU COUNTRIES 3

3.1 National agencies

HTA dates back to the early 1970s, when the rising costs of technology and health care began to attract the attention of decision-makers. The introduction and growth in Europe coincided with greater emphases on measurement, accountability, value for money and evidence-based policies and practices. Increased need came from the advent of randomised control trials (RCTs) and subsequent data, increase in medical research and information technology, and decentralisation of decision-making.

In Europe, the first bodies established to evaluate health care technologies were set up in the 1980s, initially at the regional and local level in France and Spain and, later, at the regional level in Sweden. In the 1990s, HTA programmes were set up in most countries, either through new agencies or institutes, or in established academic units or other entities (table 1). These bodies were generally either independent ('arm's-length')[5] review bodies that produced and disseminated reports on a range of topics or bodies under governmental mandate with responsibilities for decision-making and priority-setting. The second group can be advisory or regulatory.

Many EU countries are investing in HTA and associated activities. For example, Sweden dedicates €5 million each year on the Swedish Council on Technology Assessment in Health Care (SBU). In the Netherlands, the Dutch Fund for Investigative Medicine spends €8.6 million each year on evaluations.

With extra spending comes a growing recognition that the HTA process must be scientifically sound, consistent, transparent, and practical. More countries are doing more to ensure that key decision-making processes now take the results of HTA into account.

5 Operating independently of the decision-making bodies.

Table 1: Agencies responsible for HTA activities in selected EU countries, 2008

1. Denmark	Reimbursement Committee/Danish Centre for Evaluation and Health Technology Assessment/Center for Evaluering og Medicinsk Teknologivurdering (DACEHTA/CEMTV)
2. Finland	• Pharmaceuticals Pricing Board – PPB (Laakkeiden hintalautakunta) • Finnish Office of Health technology Assessment (FinOHTA)
3. France	• Economic Committee for the Health Products (CEPS) • Transparency Commission
4. Germany	• Federal Joint Committee • Institute for Quality and Efficiency in Health Care (IQWiG) • Deutsche Agentur fuer Health Technology Assessment (DAHTA)
5. Italy	• Committee on Pharmaceuticals (CIP Farmaci) • Italian Medicines Agency (AIFA)
6. Netherlands	National Health Insurance Board/Committee for Pharmaceutical Aid
7. Spain[1]	• Spanish Agency for Health Technology Assessment • Catalan Agency for Health Technology Assessment (CaHTA)
8. Sweden	• Dental and Pharmaceutical Benefits Board (TLV) • Swedish Council on Technology Assessment in Health Care (SBU)
9. UK [1]	• National Institute for Health and Clinical Excellence (NICE) • National Coordinating Centre for Health Technology Assessment (NCCHTA) • Scottish Medicines Consortium (SMC)

Note:1 This is not an exhaustive list of the agencies available in the country.
Source: The authors; adapted and enhanced from Velasco-Garrido and Busse, 2005; Zetner et al., 2005.

While the HTA agencies shared many original objectives, the structures and processes have developed differently in different countries. Variations include responsibility and membership, assessment procedures and methods, application of evidence to decision-making, and dissemination and implementation. Transparency and accountability are encapsulated in each of the above elements.

The range of HTA activities in the EU reflects the different health care and political systems, with varying mandates, funding mechanisms, and roles in the formulation of policy. The use of HTA in decisions about the diffusion and uptake of technologies can be influenced by many factors, such as income levels, reimbursement mechanisms, regulatory environments and behavioural determinants. It reflects the specific needs of decision-makers, which vary considerable from country to country.

In May 2002, the seventh recommendation of the G10 Medicines report (EC 2002) called on member states to improve HTAs, share national experiences and focus equally on assessing clinical effectiveness and cost effectiveness.

The European Commission responded to this document in July 2003 with a seven-point plan for the following five years (EC, 2003). It advocated greater cooperation and sharing of information as well as advancing work on HTAs under the new Public Health Programme (2003-2008) in order to extend their use at a national level. The EC has an interest in the better coordination and communication of national HTAs and, to support these objectives, has funded projects such as EUR-ASSESS, HTA in Europe, and ECHTA. A new body, the European network for HTA (EUnetHTA), was developed to connect national and regional HTA agencies, research institutions and health ministries so that member states can exchange information and support. EUnetHTA has 59 partners, including FinOHTA, IQWiG, DAHTA, NCCHTA, and the SBU. These proposals have significant implications for the health care industry and the health professionals and patients it serves across Europe.

3.2 Uptake since the 1990s

The uptake of HTA accelerated further towards the end of the 1990s. For the last decade more and more European countries have been applying HTA to decision making and have made the outcome of HTAs binding; other have given it an advisory role (for examples, see table 2). Countries where HTA decisions are binding include England, Scotland, Sweden, The Netherlands, Finland, Denmark, and France. Countries where HTA operates mostly in an advisory capacity include Spain and Italy.

Table 2: Uptake and use of HTA in nine European countries, 2008

Country	Type of approach used	Use in pricing	Use in reimbursement	Level applied
Denmark	Integrated, voluntary	N	Y	National/regional/local
Finland	Integrated, formal	N	Y	National/regional/local
France	Stepwise/integrated, informal	Y	N	National
Germany	Arm's length, formal	N	Y	National
Italy	Integrated, informal	N	Y?	National
Netherlands	Integrated, formal	N	Y	National
Spain	Arm's length/ integrated, informal	N*	N*	Regional
Sweden	Arm's length, formal	N	Y?(local)	National/regional/local
UK	Arm's length, formal	N	Y?(local)	National*

Source: The authors.

European institutions have helped to coordinate different HTA agencies by setting up EUNetHTA (Box 1). The WHO has set up the Health Evidence Network in order to understand and fund research on public health issues, including HTAs (WHO, 2008). As such, the uptake and implementation of HTA in different settings serves the over-arching goal of creating appropriate evidence for rational decisions. The approaches are seldom coordinated and vary considerably in the approaches, methods and tools used. This often leads to a divergence of opinion over individual technologies in different countries.

Box 1: European Network for Health Technology Assessment – EUNetHTA

In 2004 the European Commission and the Council of Ministers targeted Health Technology Assessment (HTA) as a political priority, recognising an urgent need for setting up a sustainable European network. A group of 35 organisations, led by the Danish Centre for Evaluation and HTA (DACEHTA) in Copenhagen, joined up. The European Network for Health Technology Assessment, EUnetHTA, now coordinates efforts in 27 European countries (including 24 member states) to evaluate health technology. The goal is to connect national HTA agencies, research institutions and health ministries, enabling information to be exchanged effectively and policy decisions by the member states supported. During its first three years (2006-2008) EUnetHTA aimed to develop an organisation that would sustain a European HTA network and provide practical tools for ensuring timely and effective production, dissemination and transfer of results into useful policy advice. Initially, the project is being co-financed by the European Commission (DG Sanco) and contributions from network members.

Further information: www.eunethta.net.

3.3 Towards the future

HTA is evolving rapidly, embracing different types of assessments to inform decisions on the value of technologies, interventions and practices. Growth has been significant in many countries over the past 20 years, although mostly it has been used for fairly narrow policy objectives. HTA is now changing rapidly in many parts of Europe and a body of experience is available on good – and bad – practice. Based on this experience, the following sections will consider the future of HTA and look at several principles that can be used to assess existing HTA activities or establish new ones. Examples and case studies from Europe are given. The emphasis will be on HTA activities relating to resource allocation decisions, and will consider the links between the assessment and the subsequent decision.

The principles considered will be organised into four themes (The International Group for HTA Advancement, 2008):

- the structure of HTA activities;
- methods of HTA;
- processes for the conducting HTA; and
- the use of HTA in decision-making.

4.1 Objectives and scope

6 In the sense that decision making bodies are using HTA as a basis for their decisions.

The responsibilities of the HTA bodies vary by mission and policy objectives. As one component in the broader decision-making process, HTA programmes typically reflect current policy, such as the need to contain costs, improve quality, or improve access to a given intervention or service. HTAs often coincide with policies on pricing, reimbursement and use of health technologies. However, they often deliver information to providers through HTA-informed practice guidelines and they support decisions on investing in and acquiring health technology. Recently mini-HTAs have emerged (see below) to make local decision-making more rational.

Some HTA bodies are only involved in assessing evidence, but increasingly they are making, or contributing, to decisions[6] about whether technologies should be used or reimbursed. In these cases, HTA is 'formal' and 'explicit', suggesting a process-driven exercise (as distinct from the implicit assessments made by health care professionals and managers each time they commit resources to the providing a service). Such decisions relate to:

- *pricing and/or reimbursing new technologies*. The HTA body makes a binding decision on behalf of the government or another payer;
- *listing for a formulary*. These decisions are typically binding because doctors will not prescribe and pharmacies will not stock products unless they are listed in the formulary;
- *assessing value for money*. These decisions may or may not be binding depending on whether the government or third-party payer requires the recommendation to be adopted and what sanctions, if any, are applied. Such decisions can apply at all levels;
- *including a technology in a clinical practice guideline*. In this context, typically, the guideline is a recommendation to health care professionals rather than a binding requirement.

Given the above, it is important that a detailed document should be developed before starting the HTA process, with involvement from all stakeholders. It should focus on defining the questions to be addressed, plus the link between assessment and subsequent use. This is central to the process. The scoping document should clearly identify the decisions on which the assessment will be focused. The questions to be addressed should be stated as precisely as possible, with clear aims and testable hypotheses. The questions should take into account the context of the decisions to be made and how the technology will be used. The draft document should be circulated to all stakeholders, allowing them to critique and influence the process. Major questions raised in this scoping process should be dealt with so that the resulting assessment is solidly based on a common understanding of the intent of the review and the evidence required.

The investment in the HTA process suggests that recommendations should be followed even when there is no legal requirement to do so. However, binding yes/no decisions assume a degree of confidence in the level of evidence that may not be held. HTA guidance must allow doctors enough freedom to address individual clinical situations. Where there is uncertainty there should be a favourable decision with a recommendation for more data. Decisions must always be reviewed in the light of new evidence. Evidence on the value of new products is often provisional because they have not yet been used in routine clinical practice.

'Arm's length' HTA agencies

Organisations such as NICE in England and Wales, SMC in Scotland, TLV in Sweden and IQWiG in Germany are examples of good practice mainly because they operate at 'arm's length' of payers and make explicit recommendations to decision-makers rather than make decisions on funding themselves. Their arm's length status guarantees that the evidence or guidance is independent of the body that has to decide how to use it. Implementation and monitoring rests with the decision-makers rather than the HTA agency (see table 3 below).

In 2003, as part of Germany's health system modernisation, legislation set up a new national institute. The Institute for Quality and Efficiency in Health Care (IQWiG – *Institut fuer Qualitaet und Wirtschaftlichkeit im Gesundheitswesen*) is independent of the state. It was formed by a private foundation set up by the federal joint committee that administers health services in Germany. The institute was established in Cologne in 2004 and is responsible for evaluating the use, quality and efficiency of health care services and pharmaceuticals. It also evaluates clinical practice guidelines, makes recommendations on disease management programmes, and publishes health information.

As an independent scientific establishment, IQWiG looks at the quality and efficiency of services provided by statutory health insurance, taking into account people's age, gender and living conditions. The assessment process starts with a clear-cut question, followed by a definition of patient-relevant outcome measures (usually undertaken after consulting patients' self-help organisations, including qualitative research). A plan is formulated and published. An extensive literature search (including hand search and interpretation of study results) is generally done and external experts consulted. A preliminary report is published and comments are gathered, including patients' views and statements by pharmaceutical companies. Scientific comments must be directed only to the completeness of the data base and the correctness of its interpretation. In most cases, a meta-analysis is carried out, similar to those done by the Cochrane Collaboration. The Institute's final report summarises and weighs the evidence of good and harmful effects of the product. It draws clear conclusions about the interpretation of the evidence but does not include recommendations on reimbursement; this is the responsibility of the federal joint committee.

Despite some good but limited attempts for clarity of process, the institute was originally criticised of being monolithic in its admission of evidence and applying conservative criteria for what kind of data can be submitted. Criticisms have also been voiced about the resulting evaluations, which often differ substantially from published evidence.

IQWiG can be singled out as a case of good practice in terms of its arm's length status, but other elements of its practice cannot receive the same acclaim. IQWiG was initially seen as a highly politicised, and therefore biased, initiative, although this changed in April 2007 when the organisation took over an explicit role in decision-making.

Table 3: Good practice among HTA agencies in the UK, Sweden and Germany

Criteria	NICE (England and Wales)	TLV (Sweden)	IQWiG (Germany)
Explicit decisions based on clear and transparent evaluation criteria	Yes	Yes	Yes
Binding recommendations for payers	Yes	Yes	No[1]
Monitoring implementation	na[2]	na[2]	na[2]

Notes: 1 In light of the most recent health care reforms in Germany, this is likely to change.
2 None of the three bodies has a competence to monitor implementation. This rests with the payer.

The emergence of mini-HTA

Mini-HTA is a decision support tool based on HTAs and may be used, for instance, where a hospital is thinking of introducing new health technology. It usually takes the form of a checklist eliciting the prerequisites for, and consequences of, using the proposed health technology. The questions are grouped according to the four HTA perspectives: technology, patient, organisation and economy. The answers to the questions provide a brief (2-5 pages) written basis for decisions and takes 5-15 hours, excluding time spent on information retrieval and assessment, and economic calculations. The purpose is to formulate a proposal to introduce a specific new health technology or change the indication for use of existing technology. The preparation and use of the information may take place at local or regional level and be adapted to local or regional requirements.

A mini-HTA can be done quickly. It is easily adapted to local budget and planning processes. In many hospitals, the consultant who knows about the new treatment will start filling in the relevant form, involving others such as the staff nurse, anaesthetists and laboratory staff. Resource people such as librarians or economists may also be involved.

Mini-HTAs are a flexible and dynamic tool. They are prepared locally or regionally, so can adapt to local or regional objectives and to the requirements of the decision-makers. They also provide an opportunity for close dialogue between health professionals and decision-makers.

There is a growing interest in developing and using methods for decision support that may lead to better prioritisation. In practice, hospitals and other decentralised systems (as in Italy, Spain and the Nordic countries) can not undertake a comprehensive HTA every time a decision is to be made on a new drug, a treatment or medical device. Local and regional decision-makers therefore have demanded decision-support tools that can be adapted to local conditions.

It is important to define when a mini-HTA should be undertaken. Should it be used for new treatments, and if so what is the definition of a new treatment? Should it be used for a new application of existing technology or for a new medical device? Should it be used for draft budgets or activities that are becoming increasingly expensive?

It is important to consider when a proposal for new health technology requires a full-scale HTA. For instance, if a proposal is expected to involve important issues or likely to be implemented widely, a mini-HTA would not be enough. Choosing between the two will often require balancing the need for quality and thoroughness against speed and timing. The undertaking of a mini-HTA may sometimes accentuate the need for a more in-depth assessment and may be a forerunner for a full-size HTA.

Evidence of mini-HTAs

In 2000 the Danish Agency for Health Technology Assessment (DACEHTA) prepared a form and a guide for hospitals on acquiring medical devices. The purpose was to encourage a systematic and thorough assessment before making new investments. Since then, the use of HTA procedures has spread from medical devices to a more general use.

The concept of mini-HTA was framed in the Copenhagen Hospital Corporation/Copenhagen University Hospital, which was one of the first to use forms as a tool for decision support (see box 2). Gradually, Danish hospitals have become inspired by the idea of assessment based on the HTA reasoning and there are now many local bids for applications of mini-HTA.

Mini-HTAs are also done in Sweden, for instance by a county council wishing to decide on coverage decisions (see box 3). Some of the Spanish autonomous regions are conducting HTAs with a view to informing decision-makers about the cost of illness and the extent to which technologies are effective and cost effective. Outside Europe, Australia is also using this tool in local decision-making.

Box 2: Example of a mini-HTA in Denmark

Copenhagen Hospital Corporation

In 2000 Copenhagen Hospital Corporation developed its own mini-HTA. The condition for introducing a new treatment was that the proposal had to be described in a mini-HTA and approved at all levels of management. The mini-HTA is mainly used in connection with:

- new treatments and diagnostic initiatives for which it is possible to document a significant clinical effect, and
- approval of special national and regional enabling the department's expenses for particularly expensive drugs or implants for a small well-defined group of patients to be reimbursed.

As many proposals may result in considerably more expenditure, the mini-HTA is closely connected with the annual budgeting procedure.

Unless there are strong arguments for introducing a new treatment quickly, all treatments must be approved politically during budget negotiations. Therefore a new treatment cannot be introduced until the beginning of the new budget year. The mini-HTAs are undertaken by a physician and/or the department manager using a template with questions on patients, technology, organisation and economy.

Box 3: Example of a mini-HTA in Sweden

The County Council in Östergötland, Sweden

Östergötland is a Swedish county with three large hospitals, including a university hospital. In early 2004, the county council that manages Östergötland established a 'methods board' to advise on the introduction of new health technology and methods. The aim is for the methods board to be a 'sparring partner' for hospital managers and a resource on political questions and priorities. The task was to:

- identify and evaluate diagnostic, treatment and rehabilitation technologies expected to be important for the hospital service;
- provide a basis for decision-making on new procedures and technologies that are important and involve a political decision; and
- assess technologies already being used but with a questionable effect. The county council's medicines committee assesses new drugs, but the methods board deals with all other new technologies.

The methods board should assess technologies at the request of the hospital management and the county council, but it may also take the initiative for an HTA. This will comprise: technology, the expected target group, actual knowledge of the clinical effect and consequences for the patients, ethical aspects, cost effectiveness and the economic consequences for the health and hospital services, and consequences for the hospital structure and organisation.

Mini-HTAs in decision-making

There are three different types of HTA:

- a broad, comprehensive HTA aimed at an entire illness area, with a timeframe of 1.5-3 years;
- a quick HTA, typically concerned with a specific problem and a specific technology, with a timeframe of 3-9 months; and
- a mini-HTA.

Mini-HTAs have the potential to promote HTA principles. Their strengths are:

- they may be undertaken locally with local resources;
- the decision-making basis may be available at the right time and with local relevance, which may lead to better prioritising;
- they aim to be evidence-based, and so should improve the quality of decision-making;
- the amount of work to be carried out in a mini-HTA is clear, which increases the likelihood that it will be undertaken and used; and
- they keep focusing on professional standards and benefit to patients while still taking into account organisational and economic considerations.

On the other hand, mini-HTAs have limitations:

- those doing mini-HTAs need to be aware when they should undertake a full HTA;
- a mini-HTA must often be done quickly, so some questions may remain unanswered;
- an effort must be made to ensure quality and credibility;
- they risk being done by a group of people from a single profession, which means that it will not have the necessary interdisciplinary approach; and
- mini-HTAs may be influenced by self-interest.

The need for evidence in health care decision-making means that the evidence must be suited to regional and local circumstances. Decentralisation, the devolution of budgetary responsibility and the requirement for providers to be efficient have driven the quest for 'value' at regional level and have created the need for mini-HTAs. It is important that they are done with methodological rigour, impartiality, and without duplication.

4.2 Openness, rigour and transparency

Given the complicated and controversial nature of HTA-based decisions and their importance to many decision makers and stakeholders, the process is best carried out independently of the body that ultimately will adopt, fund and implement the decisions.

Many groups – including payers, manufacturers, patients, health care professionals, health care institutions, and the general public – have an interest in HTA. If it is to be widely accepted, it must be unbiased and transparent, in perception as well as in reality. Many organisations undertaking reviews are seen as being too closely allied with specific interests, particularly if they are part of the government structure (DAHTA@DIMDI in Germany), linked to a payer (NICE as part of the NHS in England and Wales) or part of a professional society.

Some countries have mechanisms to reduce perceptions of bias. The most common approach is to have recommendations made by an external expert committee, comprised of academics, health care professionals, patient representatives, and (sometimes) industry representatives. In England and Wales (NICE), the HTA agency has been set up at 'arm's length' (see previous section), with government funding but an independent oversight board. In Sweden, where TLV is an independent public authority set up to evaluate applications for reimbursement, the decisions are taken by a committee of external members, appointed by the government. SBU is also an independent authority, but final decisions about the report are taken by its governing board, which has members from different stakeholders. The country councils, the 'payers,' have an opportunity to be informed about and influence the process, but cannot dictate the decisions.

Some groups do their own HTAs using their own staff, supplemented by external consultants (SBU and TLV in Sweden). Others commission external academic centres or consulting companies to conduct their HTAs. These can be full, independent assessments (such as NICE multiple technology appraisals and reports commissioned or produced by IQWiG), or independent critiques of company submissions, as in Scotland.

HTAs, including detailed discussion of the basis for conclusions, should be freely and publicly accessible. In some countries, the assessments and the reasons for the subsequent decisions are made public (for instance SBU and TLV in Sweden, NICE in the United Kingdom); in others, the process is open to the public.

However, not all countries have their HTA meetings in public. Often the discussions are held in private, with incomplete information released. The All Wales Medicines Strategy has an open and transparent approach for its deliberations, and NICE may hold future discussions in public.

HTA organisations also differ widely in the extent to which stakeholders can take part in the process. Nearly all HTA organisations encourage manufacturers and other interested parties to provide relevant information and data, but few have a formal mechanism that would allow external parties to review and critique draft analyses and recommendations. This would further increase transparency and perception of independence and objectivity, thereby building acceptance of the process among stakeholders and improving HTA content and accuracy. For example, the NICE process involves extensive interaction between the sponsor (who often has all the data, but also a vested interest) and agency staff (who are trying to understand the technology being evaluated). Supplementary analyses address questions arising or re-specified as the process progresses. In Germany, IQWiG asks manufacturers for their opinions, orally or in writing.

All stakeholders should have reasonable access to the HTA process at all stages. This requires:

- timely notification of plans to review a specific medical intervention;
- identification of study questions;
- criteria for review of evidence and explicit value judgements;
- clearly defined process;
- interaction with stakeholders during the process;
- availability of draft findings;
- exclusion of 'commercial in confidence' data from disclosure;
- opportunity for public comment on draft reports;
- dissemination of final report of findings; and
- justification of rationale for the decision.

Objective scientific review of the evidence is the foundation for a rigorous assessment performed without regard to the evaluator's economic interests. Clinical assessment requires full transparency. Economic assessment also demands significant transparency, but private markets raise several issues (for example, protecting proprietary or sensitive information) that may make it impossible to apply this principle. One way of handling this is to have complete transparency on the economic models used, but a more general level of disclosure regarding selected proprietary data. NICE takes this approach.

Transparent information is needed for prudent purchasing in a competitive market and for informed decisions by physicians and patients. Technology developers will also benefit from greater transparency because it will help them to address any concerns raised by payers during the appraisal process. Different payers may interpret and implement decisions differently based on contractual and/or market factors, but they all should be held to high standards of independence and transparency. While it may be appropriate to have a different level of transparency for certain specific aspects, the general principles should nevertheless apply.

4.3 All-inclusiveness

Most HTA programmes have two dangers: the first is directing too much activity towards pharmaceuticals; the second is concentrating on new technologies at the expense of existing ones.

Health technologies include drugs, devices, procedures, diagnostics and treatment strategies. The range of relevant technologies relates to the breadth of the budget that the decision maker is seeking to optimise. If HTA is being done nationally, it should include all health technologies (including current standard or commonly used interventions) using clearly defined, explicit criteria. If this does not happen, policies and clinical practices will be distorted, with investment and practice gravitating toward those interventions for which regulatory barriers are lower and that are not evaluated.

In many of the countries where HTA has been linked to decisions on reimbursement or coverage, it has focused on pharmaceuticals alone. There are several reasons for this. There often exists an established procedure for approving drugs for reimbursement. Because drugs are subject to highly structured and rigorous licensing procedures, there is a substantial body of clinical literature providing a strong basis for conducting HTAs. Pharmaceuticals are discrete goods with a purchasing chain that is more easily identified than many other medical goods and services (and probably with a degree of resentment or scepticism towards the powerful commercial entities producing them). In the light of these factors, some HTA programmes have a remit only to consider drugs (for example the TLV in Sweden, the SMC in Scotland). In other programmes where all new technologies can be assessed (NICE in the United Kingdom, IQWiG and DAHTA in Germany), a disproportionate amount of HTA activity is still directed toward drugs.

The other danger is concentrating on *new* technologies. This probably occurs because new technologies are easily identifiable, tend to be more expensive than existing technologies, and their emergence requires a policy determination. However, many *existing* technologies are thought to be inefficient or used inappropriately. This leads to two problems. First, resources devoted to less effective, less safe, or less efficient medical practices are wasted resources. Second, when new technologies are being assessed they may be compared with a baseline of 'current care', which may itself be inefficient. An assessment that a new technology is cost-effective compared to an existing treatment that is inefficient can be misleading. Increasingly, some countries are beginning to tackle this issue. For example, in Sweden the Dental and Pharmaceutical Benefits Board (TLV) is reviewing existing drugs as well as new ones.

Despite the bias towards pharmaceuticals, other health care technologies such as devices and procedures have also been appraised from time to time. But the costs and benefits of two types of health care interventions have not had their costs and benefits appraised. These are public health interventions and e-health, and this report will now examine them.

HTA and public health

We define public health as 'the science and art of preventing disease, prolonging life and promoting health through the organised efforts of society. It has a population rather than individual focus and involves mobilising local, regional, national and international resources to ensure the conditions in which people can be healthy'. (Allin et al., 2004). This definition recognises that a range of stakeholders, and not just governments, contribute to public health and that it is necessarily multi-disciplinary: 'public health can be seen as an ideology, a profession, a movement, or a set of actions, but not as a single scientific discipline'. (Savitz et al., 1999).

The involvement of local communities in public health interventions is also used by Kohatsu et al. in their definition of the concept of evidence-based public health: a 'process of integrating science-based interventions with community preferences to improve the health of populations'. (Kohatsu et al., 2004)

The following discussion will look at four types of public health and health promoting interventions:

- those that alter individual behaviours and lifestyles;
- those that control and prevent infectious diseases;
- those that tackle the broader determinants of health; and
- those that provide secondary prevention, in particular screening for disease.

The first two areas are concerned with primary prevention, while the third addresses risk factors and socio-economic determinants. These can lead to a range of interventions such as tobacco and alcohol control policies, water and air quality monitoring, the introduction of seat belts into motor vehicles and vaccination campaigns. Broader measures, such as redistributing income, might help to tackle disease and ill health and also promote positive physical and mental wellbeing.

The final area of investigation secondary prevention which identifies those at an early stage of a disease or illness when it is still possible to eliminate or prevent some harmful effects. Approaches include dietary and lifestyle advice given to those who have recently had heart attacks. It can be argued that many drug and surgical therapies are a form of secondary prevention.

The rationale for HTA in public health

A key question for European policy makers is the extent to which health systems should encourage investment in health promotion and prevention. There is good evidence that a substantial reduction in avoidable deaths might be achieved through preventive measures, such as vaccinations to prevent the spread of some communicable diseases or statins to tackle cardiovascular health problems. But it has long been recognised that any strategy to promote the health of a population needs to take a broad perspective. As well as biological and genetic factors, the socio-economic environment in which people live can have a substantial impact on the risk of early death and avoidable illness.

A broad approach to promoting health could involve a combination of *upstream* and *downstream* interventions. The former includes measures such as income support, better housing, or more education. Many of these will be delivered and funded outside the health system, but even here the health system should liaise with these sectors to help emphasise the health impact of their policies. Downstream interventions are specifically concerned with health promotion and prevention, either targeted at the population generally or at specific groups. This could include diet and lifestyle advice, tobacco and alcohol control, water and air quality monitoring, and, laws and other safety measures to reduce the case of accidents and injury.

Another aspect of any population health strategy is health protection. In addition to routine vaccination campaigns, the health system must be able to react to emerging risks such as the spread of new viral diseases. It should also provide support in the aftermath of natural or man-made disasters.

The main economic argument for prevention is three-fold:

- evidence on the effectiveness of such interventions;
- information on the costs and benefits of the intervention; and
- whether the existence of a 'market failure' would help justify public sector action.

Better evidence is needed for the second and third components of the economic argument. It may be that preventing a significant part of the existing burden of mortality and disease could generate substantial economic benefits. This expectation comes from the recent evidence of wide-ranging economic benefits from better health in Europe, and more specifically from the economic benefits brought about by eliminating some of the mortality attributed to modifiable risk factor behaviours (table 4).

The importance of evidence on 'market failures' is often underestimated by public health experts. Under this scenario the unfettered free market activities of individuals could damage society as a whole, while in theory at least the damage could be reduced by public sector intervention. An obvious example is the cost of passive smoking on non-smokers: the price of cigarettes is unlikely to take account of this effect without government intervention to raise the tax on cigarettes. The benefit to the general population of a high uptake of vaccines is another area where financial incentives or regulations might be used to influence behaviour.

The cases for intervening on vaccination, smoking or alcohol abuse are well established. Recently attention has also been given to other lifestyle-related choices. Such choices have often been considered a matter of personal taste, but they may have been caused by poor information or by people taking a short-sighted view on the risks to long-term health Others such as children may not be able to weigh up fully the risks associated with different choices. In such circumstances, it would be appropriate to use financial incentives or legislation to encourage consumers to make healthy choices.

Even if there are market failures, there is still a need to show that society will be better off with the intervention costing less than the benefits. Such information will help policy-makers, who have limited resources, get most value for money. The need to strengthen the evidence on costs and benefits of public health interventions was highlighted in a review commissioned by the UK Ministry of Finance. One of its key conclusions was that robust evidence on cost-effectiveness was only available in a small number of areas.

Table 4: Potential economic benefits of actions against risk factors in Germany

Risk factor	Attributable deaths (2002)	Per capita benefit of 25% reduction
Tobacco	61,548	€950
High blood pressure	39,780	€594
High cholesterol	29,124	€428
High BMI	25,556	€374
Alcohol	16,845	€243
Physical inactivity	13,749	€198
Low fruit and vegetable intake	10,603	€152

Source: Suhrcke, M. et al., 2007.

The economic benefits from health promotion and prevention may be high, but it does not always follow that prevention is cheaper than treating conditions when they arise. The human and infrastructure costs associated with delivering care must be taken into account. Health promotion or prevention will appear to be more favourable the greater the health problem it might help to avoid. Economic analysis tends to discount future costs and benefits so, other things being equal, a health promotion intervention that could lead to large health gains in 20 years may not be attractive. Future health gains are heavily discounted compared to interventions with more modest but shorter term health benefits (Kenkel, 2000; Ganiats 1997; Sheldon, 1992). There could be some immediate non-health benefits such as health promotion schemes improving community cohesiveness (Hills et al., 2007).

So far the use of HTA in public health has been limited. This focus on treatments is to some extent unsurprising. Evaluating the complex interventions of public health practitioners can present methodological challenges. It is far harder to measure effectiveness than it is for pharmaceutical interventions; often conducting a randomised controlled trial will not be feasible.

Many public health and health promotion interventions will only be effective if they change individual behaviours, so it is difficult to generalise from the results of any one evaluation. Other challenges include the length of time between the intervention and subsequent benefits. This makes it difficult to attribute change in health to any one public health intervention. The time lag may also force studies to report process outputs, such as participation rates in exercise classes, rather than long-term impacts on health status. These proxy measures can be challenged as good indicators of long-term impact and so their value to policy makers may be limited.

The nature of public health interventions also places greater emphasis on qualitative studies to help identify factors that make the interventions work. Where the interventions do not work the question needs to be asked: is this because the intervention is ineffective, or has it been badly implemented, or has it been implemented in a setting and context which has induced failure? (Rychetnik et al., 2002). Yet collaborations between health economists and qualitative researchers within the framework of HTA have so far been modest.

Another barrier may be the fact that many public health interventions are not seen as being within the province of health care systems. Many interventions require funding from budget holders in transport, education or environment. Analysts have said that there are comparatively few evaluations of population-level interventions, particularly those that may address the socioeconomic determinants of health. They may link this to evidence of low budgets for public health as a proportion of total health expenditure. Thus, the need to evaluate cost effectiveness has tended to have been a low priority (Holland, 2004; Kelly et al., 2005) Political imperatives are demanding greater emphasis on interventions that have a more immediate impact on both health care and public opinion.

Finally, the public health community may not have done enough to make the economic case for investment, believing it to be inadequate for their needs. Some public health professionals, for instance, have criticised traditional economic evaluation for taking a 'reductionist' perspective that does not capture all the benefits of maintaining good health and averting illness. They point to benefits from regeneration schemes that not only have a positive impact on health but may also strengthen community cohesion and thus build social capital. These are not, they argue, picked up by measures such as the Quality-Adjusted Life Year (QALY)[7]; when it comes to public health they say that economic evaluation is not feasible (Burrow et al. 1995). Others argue that the real challenge is the limited level of resources spent on studies of public health and health promoting interventions. Unlike pharmaceuticals, there are no regulatory requirements for these interventions. Public funding for evaluating them remains modest and there is only limited non-governmental funding available.

This apparent lack of HTA and economic evaluation might simply be caused by the difficulties of identifying such studies in the literature. The nature of public health interventions means that economic evaluations could appear in many journals aimed at a wide range of disciplines (Jackson and Waters, 2004). Studies may be difficult to identify, particularly by those more used to trawling through medical journals (Petticrew and Roberts, 2005).

Evidence of using HTA in public health/health promotion

The use of HTA in public health or health promotion interventions is fairly new at policy-making level. Three organisations in the countries studied (NICE from England, SBU from Sweden, and DACEHTA/NCHPDP from Denmark) have recently started public health/health promotion activities. SBU and DACEHTA/NCHPDP advise the health care service whereas the NICE guidance is, strictly speaking, binding on the NHS.

England: NICE and its role in public health

Significantly, it was the Treasury in England that commissioned a review of the potential benefits of improving public health; this was done to complement an earlier review on long-term health care investment. One conclusion of this second review was that the economics evidence base for public health interventions was limited (Allin et al., 2004). Robust evidence was found only in a small number of areas (Wanless, 2004).

7 The quality-adjusted life year (QALY) is a measure of disease burden, including both the quality and the quantity of life lived. It is used as a means of assessing the value for money of a medical intervention. The QALY model requires utility independent, risk neutral, and constant proportional tradeoff behaviour. The QALY is based on the number of years of life that would be added by the intervention. Each year in perfect health is assigned the value of 1.0 down to a value of 0.0 for death. If the extra years would not be lived in full health, for example if the patient would lose a limb, or be blind or be confined to a wheelchair, then the extra life-years are given a value between 0 and 1 to account for this.

This debate has now moved forward with the establishment of the public health panel within the National Institute for Health and Clinical Excellence (NICE). NICE produces guidance on health promotion and disease prevention for the NHS, local authorities and the wider public and voluntary sector. The guidance covers specific interventions and broader programmes, and may be reviewed and updated (usually after three years). The views and experiences of stakeholders are actively sought to ensure that recommendations are realistic and appropriate.

Within the wider context of public health, NICE can cover both 'downstream' issues such as lifestyle as well as 'upstream' issues such as housing and environment. Reviews of evidence on effectiveness and cost effectiveness are commissioned and assessed according to well-defined criteria. They are then graded. Qualitative and quantitative evidence is considered. For interventions, an expert advisory committee then considers the evidence, drafts recommendations, are oversees field tests and develops guidance which is published on the NICE website. For programme developments, a committee meets 5-6 times over nine months to review effectiveness and economic evidence. This committee sends out draft recommendations for consultation, oversees field tests using identified facilitators, amends the identified recommendations and finally publishes the guidance on the NICE website.

Box 4: HTA in Public health and health promotion

Cost effectiveness of a community-based exercise programme for the over 65s

The objective was to assess the cost-effectiveness of a community based exercise programme as a public health intervention. Twelve general practices in Sheffield, England, were randomised to either act as one of four intervention practices or as one of eight control practices. Over two years the intervention practices offered all their sedentary male and female patients aged 65 or older, the chance to attend free exercise classes for 75 minutes twice per week. The classes focused on joint mobility, muscle strength and endurance, balance coordination, and cardio-respiratory fitness. Exercises were combined with 'fun' activities like tea dances, bowling or swimming.

The benefit to the intervention group was 0.011 QALYs because their health declined more slowly over the two years. Benefits were both in terms of mental wellbeing and physical health. Costs to the National Health Service were estimated to be €128,302 or a cost per participant of €9.06 (2004 prices). The incremental cost per QALY gained over usual care was €17,174. The researchers concluded that this compared well to investment in other interventions.

Denmark: The Danish Centre for Health Technology Assessment (DACEHTA) and the National Centre for Health Promotion and Disease Prevention (NCHPDP)

Under the National Board of Health, the National Centre for Health Promotion and Disease Prevention (NCHPDP) is responsible for most of the central initiatives in the prevention and health promotion. The centre's main tasks are monitoring, documenting, developing strategies and methodologies, disseminating, collaborating and planning. The centre advises the Ministry of the Interior and Health and other national bodies on health promotion and prevention. Importantly, the Centre for Health Promotion and Prevention operates independently of the Danish Centre for Health Technology Assessment (DACEHTA) whose aims include health technology assessments to improve quality, standards and value for money. But both are under the umbrella of the National Board of Health. The intention is to integrate HTA-principles into the running and planning of the public health service at all levels.

Box 5: DACEHTA: Using HTA in health promotion/disease management

Managing chronic pain: follow-up visits from nurses after discharge from multi-disciplinary pain centre

This study showed that follow-up nurse visits can be provided within the existing health care system and is a relevant and useful treatment option. The nurses found that all patients benefited from the visits, though some patients clearly had a greater need for the visits. The few GPs who evaluated the intervention were positive attitude about the initiative. Also, suggestions that the intervention reduced patients' need for contacts with the health care system were confirmed, although weakly. Patients in the intervention group used 37% fewer resources in the health care system (especially in the hospital system) during the two year follow-up. The direct saving more than balanced out the additional costs of the follow-up visits. To conclude, the economic analysis showed that follow-up nurse visits tend to be a cost-effective intervention (more QALY and less cost). It also showed that follow-up nurse visits to patients with complex chronic pain condition are effective, especially in those with poor quality of life, with depression and prone to suicide, or being treated with strong opioids.

Sweden: SBU

In 1992, SBU was set up as an independent public authority to critically evaluate the methods used to prevent, diagnose, and treat health problems. Generally, the topics selected are important for public health and individual quality of life. These issues involve common health problems and technologies with major economic consequences. Some projects focus on conditions for which treatment and outcomes vary throughout the country. High priority also goes to ethically controversial issues and interventions that require major organisational or staffing changes.

Box 6: Using HTA in public health/health promotion: The SBU in Sweden

Alcohol and drug abuse

The SBU report on treating alcohol and drug abuse led to an educational programme jointly with social service agencies. The work on national guidelines by the National Board of Health and Welfare is based on evidence presented in the SBU report. The report shows that several medications have scientific support as treatments. Prescriptions for one of these medications increased fourfold between 2000 and 2005. The largest increase occurred in 2002, the year following publication of the SBU report. After 2002, prescriptions increased by 50%.

Back pain

The SBU report on back pain showed that sick leave and bed rest are harmful when treating back problems. Several years after publication, the sick leave rate attributed specifically to back pain declined substantially. Other factors, such as changes in the economy, probably contributed to this decline. But one likely factor is SBUs well-publicised conclusion that these patients should continue with normal daily activities as far as possible.

HTA and public health: the future

The focus in this section has been to obtain a better overall view of the use of HTA in public health and health promotion. The view that few economic evaluations have been done in this field is not supported by the literature. The evidence base has been expanding rapidly and the growing interest by policy makers in funding such studies shows that they recognise the importance of the economic case. Most studies have focused on a few topics, and US research is dominant.

There are, of course, many practical and methodological challenges to conducting more studies in this area. A key challenge is generating evidence that complex interventions have any effect, and considering to what extent this may be generalisable. Another challenge is to explore whether focusing on the QALY as a main outcome measure (as NICE recommends) is always appropriate; if not would cost benefit analysis be a better option? In practical terms, policy makers might find cost consequences analysis makes more sense as it explicitly recognises the limitations of economic evaluation.

In the absence of robust data on effectiveness, there is scope for a simple threshold analysis. This would mean assessing the potential level of effectiveness needed in order to make an intervention cost effective. Given the potential cost savings from many interventions, the improvement required may well be modest. This may help policy makers decide whether to intervene even though the evidence base is weak. A better approach would be to use data as they become available to assess cost effectiveness retrospectively.

Many public health interventions require major collaboration between public health professionals and health economists. The economic benefit of investing in many public health areas is potentially high, but well designed evaluations must be undertaken before any large scale investment. The private sector will not do this because there is little opportunity for return on investment. Governments will have to fund these evaluations – or make better use of existing evidence – if they want to ensure that public health interventions get the same attention as health care interventions.

HTA in public health has methodological problems. Is there enough information on economic outcomes and on the context in which public health interventions are delivered? Are the evaluations good enough, with control groups and appropriate study design? Can the economic findings be adapted to local settings?

From a policy perspective, there is increasing recognition that the determinants of health, as well as lifestyle factors, have a significant influence on population health. Many of the key contributors to poor health in Europe are avoidable and many of these factors require action outside the health care system. So it is important to invest in effective interventions that will help to reduce the impact of these factors. Better understanding and a stronger evidence base would require actions beyond those in England, Denmark, and Sweden. If it is difficult to carry out evaluations, they could make their case for investment by adapting existing information to the local context. Finally, the implementation process needs to be strengthened: even the recommendations of NICE, which has clear links to the policy-making process, are not always implemented.

e-Health and HTA

The need for information about health and health care varies, as does the need to contact care services. Parents with young children need quick, trouble-free access to primary care services, advice on the treatment of minor complaints and simple procedures for medical consultations and routine tests. People suffering from chronic conditions need simple, safe methods for monitoring and checking the progress of their illnesses, regular contact with their specialists, and access to information about new treatment (see Busse et al, 2008). Elderly people may need help and medical attention in their homes; providing them with the security, quality and continuity they need often requires coordinated support from several care providers. The health care services of the future will be based to a greater extent than today on the needs, wishes and circumstances of the individual. People will receive information and guidance individually, and patients will be able to become more actively involved in decisions about their care.

More and more people will seek individual, tailored solutions to their problems, take initiatives and make their own choices. Citizens will make the same demands of the health care sector as they do of other service providers. The market for health-promoting, care-oriented activities, services and products will grow, and the latter will be designed to meet user needs and wishes. Citizens will soon use the internet on an ever-increasing scale to learn more about health concerns, illnesses, symptoms, medicines and self-treatment. Health portals will direct users to quality-assured information and up-to-date research findings. They will also provide access to all available information on health care services, care quality and health products. Citizens will be able to choose among a range of alternatives. Personal advice and counselling will also be available.

This is already happening in many countries. Several using information and communication technology (ICT) to process patients and monitor their progress. Few have yet developed a national strategy for e-health (for example Sweden and Finland) and virtually none has an integrated approach to assess usefulness, effectiveness and cost-effectiveness. Nevertheless, e-health provides a good opportunity for further applications, including HTA, as the technologies used and the associated costs and societal benefits need to be assessed.

Empirical evidence on e-Health

In Sweden the work on e-health is grouped into six areas. The first three are establishing better basic conditions for information and communication technology (ICT) in health and elderly care. The last three are about improving e-health solutions and adapting these to patient needs. Education, training and research initiatives are crucial to all six areas, which are:

- bringing laws and regulations into line with extended use of ICT;
- creating a common information structure;
- creating a common technical infrastructure;
- facilitating interoperable, supportive ICT systems;
- facilitating access to information across organisational boundaries; and
- making information and services easily accessible to citizens.

The first stage of a long-term effort to improve national collaboration was to develop a national e-health strategy. The second phase, launched in 2006, involved gaining support for the strategy among the country's county councils, municipal councils and stakeholders. Issues such as scope, scheduling, financing and decision-making were also discussed.

Several other European countries have experimented with various aspects of e-health, creating health portals and using telemedicine. The European Commission has proposed a draft recommendation on e-health interoperability (EC, 2007a). It has also developed the concept of e-health as one of the lead market initiatives in Europe (EC, 2007b). There is no evidence yet of likely costs and benefits, and this makes it an area for that HTA could expand into.

4.4 Clear system for setting priorities

Not assessing all technologies will lead to distortions in decision making. Thus a clear process for prioritising and selecting topics must be established. As with all other health care resources, the resources of HTA should themselves be used cost-effectively.

No country assesses all health technologies, although some assess all new products and formulations before listing for reimbursement (for example Australia, Canada, Sweden, and in the United States). Where only some technologies are assessed, selection priorities need to be set. Yet, many HTA programmes have ill-defined processes for setting priorities and it is unclear what factors are considered or how topics are chosen. Not only will this practice distort decision-making, but it will also undermine perceptions of fairness and transparency.

Using a system for priority setting in practice

In the UK, NICE sets priorities based on six criteria:

- burden of disease;
- resource impact;
- clinical and policy importance;
- presence of inappropriate variation in practice;
- potential factors affecting the timeliness of guidance; and
- likelihood of the guidance having an impact.

A similar approach is followed by DAHTA@DIMDI, where a board of trustees uses similar criteria to decide on priorities.

The other common approach to determining priority for assessment is essentially a procedural one. In the Netherlands an HTA is conducted if there is an *a priori* case that a new drug should not be added to other existing drugs in the nation's therapeutic reference price system. The HTA is used to assess the incremental value (if any) a drug provides over existing medicines so as to determine whether a price premium is justified (and, if so, by how much?). A similar approach is being followed in Germany, where the G-BA can ask IQWiG to assess whether a new drug has insufficient benefit to be included.

METHODS FOR THE CONDUCT OF HTAS 5

HTAs need rigorous analytical methods if they are to retain the trust of stakeholders and the public. This requires clarity of process and methods as well as access to experts with appropriate methodological training.

5.1 Methods for assessing costs and benefits

Setting up appropriate methodologies is an essential part of the HTA process. Most HTA organisations have set up their own methods. Guidelines differ, often in important ways such as scoping the issues to be addressed, the range of evidence accepted, and the methods used. Some variation is appropriate because objectives and contexts can differ (for example reimbursement versus clinical guidance). HTA experts often have a healthy debate among themselves about some methodological issues, and often a virulent one with patient groups.

Cost measurement can be complex and includes:

- costs to the health care system, such as doctors and nurses, equipment, buildings, pharmaceuticals and other consumables;
- costs to other public services, such as long-term care of the elderly and disabled, social services, including social support after hospital discharge,
- costs to patients including travel costs to receive treatment, time off work, self-medication, co-payments for treatment; and
- broader social costs, particularly in terms of inability to go to work, care for others, or receive education.

HTA should not draw artificial distinctions between different types of health care expenditures (for instance, consider the impact of a medicine only irrespective of costs elsewhere in the health care system). Ideally, it should take a broader social perspective, with the impact of costs outside the health care system taken into account. Evaluations should consider indirect benefits such as productivity gains, and reduction in caregiver and personal time costs. When making decisions on pricing and reimbursement they should also take into account the priorities of patients, the nature of the therapeutic market and availability of alternative treatments, the perspective of medical specialists, affordability concerns, and effects on macro-economic growth.

Silo-budgeting – assessing costs and benefits within a narrow cost-centre – runs counter to the true objective of HTA, which is to help decision-makers obtain the most health-gain and economic benefit from their investment. Yet health care administrators rarely take the broader view that health care expenditure is an investment not a cost. More discussion is needed of the wider macro-economic aspects of health care decision-making.

Some countries issue guidelines on handling methodological issues. Some outline which costs to include. As data is not always transferable across countries, HTA agencies often ask that resource consumption and related costs are based on national data. Most guidelines also require a high degree of transparency in cost calculations. Transparency demands that costs are identified accurately, presenting the amount of resources consumed separately from the respective cost, and detailing all data sources.

Given the need to use resources cost-effectively, the methods used for HTA must be 'fit-for-purpose'. A comprehensive, well-conducted, EBM review is a necessary first step in the assessment process. The methods for this review should be specified in advance and should use the best available evidence. Well-conducted RCTs will provide high quality evidence, but evidence from rigorous quasi- and non-experimental studies will usually be required in order to address issues such as effectiveness, comparative effectiveness, and different effects in different clinical populations.

New analyses or re-analyses of existing data may also be needed, depending on the purpose of the assessment. These analyses will often use economic decision-analytic or simulation models, for example to project health and economic consequences over time. In some cases it may be difficult to have meaningful data at all, and short-term clinical trial data must be linked with data on patient-relevant health outcomes and long-term costs. Typical examples include the evaluation of health promotion programmes, screening programmes, diagnostic procedures, or treatment of slow developing chronic diseases. There are several modeling techniques and the choice should depend on the research question.

Empirical evidence

Some countries such as Sweden allow all costs to be included in an HTA; the SBU for instance includes productivity losses. The Netherlands and the UK use only direct costs. As regards indirect costs, there is a lack of agreement on how to account for productivity loss, in terms of employing a human capital[8] or friction cost[9] approach. Moreover, there is disagreement on whether to include the cost of extra years of life following successful treatment. There is inconsistency on whether to include in changes to quality of life any opportunity losses related to leisure activities and time spent on household duties. In France, the pricing negotiation with CEPS is usually led from a narrow and short-term budget perspective, with the drug cost to health insurance being by far the main point considered. The 'silo' organisation of budget holding and the short-term political pressures for delivering results prevents any structural and long-term impact from being considered. The Netherlands is willing to consider an indirect cost perspective, although such costs extend beyond budget constraints. However, the wider costs are typically presented separately from system-related costs so may have limited impact on decision-making.

Sophisticated statistical and methodological techniques are often useful to address known data shortcomings. However, the resulting complexity may reduce clarity and transparency. Thus these techniques should be used only when necessary. Occasionally, this issue has led to heated debate, such as when NICE insisted on *probabilistic sensitivity analysis* in its methods guidelines.

5.2 Evidence and outcomes

HTAs need data from experimental, quasi-experimental, observational, and qualitative studies, integration of both endpoint and validated surrogate data, and assessment of the incremental impact of, and trade-offs among, multiple clinical, economic and social outcomes in clinically relevant populations.

Rigorously conducted RCTs may be considered the reference standard for clinical evidence, but they are not generally sufficient for health technology assessments. RCTs have important, well recognised, practical limitations: the number of questions that can be asked, sample size, length of follow-up, inclusion of a broadly representative population, generalisability, subgroup analyses and types of outcomes assessed. Moreover, they are not immune from bias from data specification, selective enrolment and incomplete data collection, recording, coding and follow-up. Thus, information that is important to HTAs must often be obtained from quasi- or non-experimental data and studies, including rigorously conducted observational studies.

Similarly, surrogate endpoints often need to be considered and extrapolated to outcomes and endpoints that RCTs can not consider well. Sophisticated analytical frameworks and methods can reduce bias in non-experimental studies, but can not eliminate them. Despite this, unless HTAs consider all relevant information across the full range of study designs, and assess this evidence according to validity and generalisability, their analyses will be flawed and the assessments potentially wrong.

Clinical benefits, risks, and costs must be defined broadly in order to include all relevant outcomes. As well as mortality and morbidity, outcomes considered should include impact on patient functional status and quality of life and economic outcomes (direct and indirect medical costs, productivity effects) for patients and also for other relevant parties (family, employer, and society as a whole). Apart from the economic/QALY-type judgments (or whatever similar unit of effectiveness is being used), the analysis should also consider unmet medical need, clinical judgment, prevalence of the condition, patient preferences, public health impact, and impact on society.

Medical interventions are not just 'good' or 'bad' – rather, their performance, outcomes and value vary across patients and clinical conditions: how good; in which people/patients; and under what conditions? Variations in clinical benefit, risk, and cost must be assessed across relevant patient and population subgroups. This is particularly true with analyses where there are trade-offs in outcomes among the interventions being compared.

In New Zealand, an attempt to support the national health strategy and the district health boards has led to a methodology that monitors the response of services and treatments to disease and the consequent impact on population health status (www.rmianz.co.nz/pdfs/BHO%20Report/section4.pdf). The population health outcomes approach measures the effectiveness of programmes by examining optimal population health outcomes in the longer term. These outcomes are where more and more people are receiving services and treatments that prevent or delay more serious health complications. They also include outcomes where more and more people with a serious disease are receiving the services and treatments they need to improve health outcomes and reduce complications.

8 The human capital approach values a health improvement on the basis of future productive worth to society from being able to return to work. Values have to be added for activities that are outside traditional definitions of paid work, such as staying at home, being retired or unemployed. Consequently, this approach suffers from problems of how to value a number of health improvements. This is a narrow view of the value of improved health and is now seldom used. The human capital approach uses the gross wage rate as the measure to determine productivity losses caused by changes in paid working time resulting from health care programmes. The alternative is the friction cost approach.

9 The friction cost approach assumes that production losses are confined to the period needed to replace the 'sick' worker. The human capital and friction cost approaches produce similar estimates when the health problem results in a short-term effect on productivity, but when long-term disability and mortality are the focus of attention, there can be significant differences between the two approaches.

A period of 10 years is used as the timeframe for analysis, which contrasts with the annual planning processes and the medium-term view taken by the government. The 10-year period was chosen to reflect the time it takes to observe changes in health outcomes, and can be extended if necessary. The outcomes measured include:

- changes in the population receiving different 'menus' of services and treatments, measured in terms of the estimated numbers of people involved;
- estimated changes in the numbers of people requiring secondary and tertiary health care or other publicly funded treatments for complications that could be delayed or prevented;
- changes in the size of government funding of the publicly provided health services and treatments;
- changes in tax revenue from those with the disease; and
- changes in economic productivity because of the way in which a disease is treated and the implications for the numbers of days disabled.

5.3 A societal perspective

HTAs should adopt a broad perspective to optimise efficiency and benefits, and to avoid potentially harmful decisions and policies that could result from self interest. The perspective of HTAs is often restricted because a decision-maker has a specific mission and perspective. For example, IQWiG in Germany takes the perspective of the community of German citizens insured by statutory health insurance. In the United Kingdom, NICE only considers National Health Service (NHS) and Personal Social Services (PSS) costs in its appraisals, and excludes costs to other public sector budgets, to patients and families and to the broader economy However, NICE can take into account a technology's impact on other public sector budgets when appraising public health. A public health campaign to reduce substance abuse, for example, can consider the potential savings in the costs of crime, whereas an evaluation of a drug maintenance programme can not. In the US, government-funded analyses often restrict consideration to the direct clinical benefits and risks to patients.

Such narrow perspectives distort HTAs, health care decisions and health. In many health systems, pharmaceuticals are budgeted separately from other medical services. In these situations, the impact of drugs on overall clinical and cost-effectiveness and resulting clinical and cost offsets may not be fully considered and may be underestimated.

In addition to the importance of optimising societal resources, there are often advantages of using a broader perspective for the HTA, even for decision makers with limited budgets or programmes. For example, examining the costs to patients and families might suggest whether individuals would be likely to follow their treatment, or suggest how much more people might pay to have extra treatments covered. Such analyses will help to guide management decisions and improve patients' health.

In all countries, an HTA must meet the needs of many decision makers. The more decentralised the health care system, the greater the challenge. Therefore it makes sense to keep the assessment broad. This helps decision makers identify those costs and benefits most important to them. In such cases, a broad perspective will highlight significant differences and subsequent distortions between alternative decision makers.

The TLV in Sweden, the DACEHTA in Denmark and the CFH in the Netherlands explicitly include a societal perspective in their national guidelines. A societal perspective is also included when submitting evidence to these agencies and policy-makers are happy to consider it. However, it is unlikely that decisions about funding take this perspective into account. For example, in France, a societal perspective is considered at SMR (assessment of therapeutic benefit) level, in terms of the (new) technology's public health impact. It is not considered when prices are being negotiated.

5.4 Addressing uncertainty

HTAs involve uncertainty, in particular over the value of estimates and their effect on costs and benefits. Most HTA organisations will want sensitivity analyses on all the variables to test or verify the robustness of the findings. As countries have different requirements for sensitivity analysis, they must be substantiated and well documented; most countries usually recommend or require this. This documentation is particularly important when assessing new technologies, where the data for the evaluations is seldom clear.

In order to account for uncertainty, and to take into consideration the long-term effects of individual technologies, most HTA organisations use discounting, typically applying an annual rate between 2.5% and 10% to both costs and benefits.

There is always the possibility that a final decision will be made when a technology is launched and that this will be negative on cost-effectiveness grounds. This is controversial, because little 'real world' data will be available before launch. This increases uncertainty around the cost-effectiveness estimate and increases the chance of two types of error:

- approving a medicine that turns out not to be cost-effective in practice; and
- rejecting a medicine that would have proved to be cost-effective in practice.

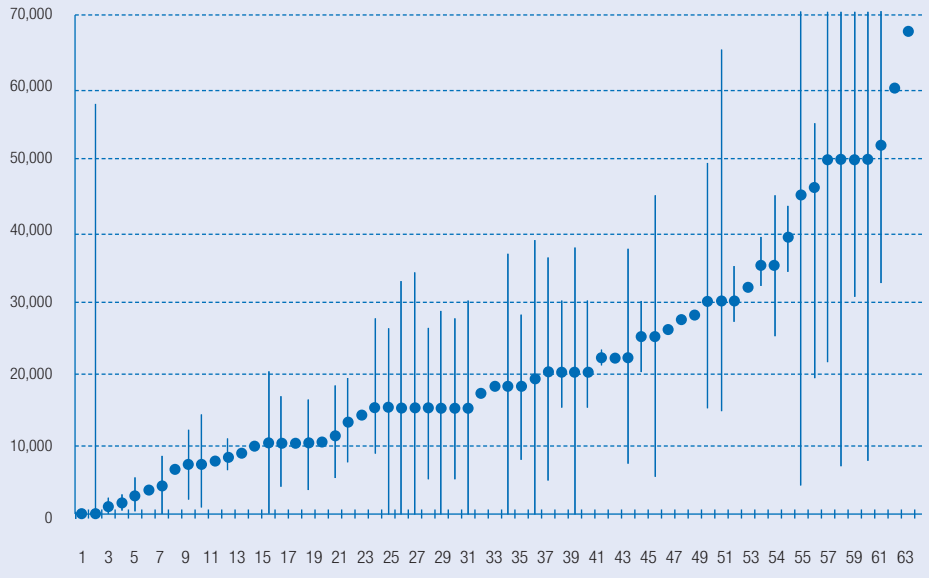
In the first case, the decision is reversible: approval can be withdrawn or reimbursement denied, although it can be difficult to change clinical practice at this stage. In contrast, rejection at launch makes it difficult to collect the 'real-world' data that could give a better estimate of cost-effectiveness. It has been argued that pharmaceuticals should have the chance of being assessed on real-world evidence. Uncertainty will be greater the less understood the disease processes, the longer the duration of the condition and the less well-defined the relationship between short-term clinical end-points and the final end-points of survival and quality of life. HTA bodies often make a provisional decision at launch which can be amended with further data.

There is no agreement on what constitutes an adequate evidence base or on the best time to conduct an HTA, and the answers on both are likely to vary from technology to technology. Nevertheless, many decision-making bodies are applying clinical and cost-effectiveness considerations to new technologies at the time of launch.

The uncertainty should be addressed through a partnership between HTA agencies and manufacturers, which may involve submitting new data when available. The partnership should continue with data maintained and used. Conditional reimbursement may be a valid way forward because it allows flexibility for all parties without compromising access.

Figure 1 shows the NICE point estimates of cost/QALY with the applicable range for a number of assessments undertaken by the institute. It highlights the limitations of point estimates given the degree of uncertainty that exists. In this light, other parameters need to be considered.

Figure 1: NICE point estimates of cost/QALY for 63 assessments



5.5 Consider and address generalisability and transferability

In theory an HTA agency in one country could economise by using assessments from others. However, it would need to consider whether this evidence will be relevant to its own decision-making. This is more controversial for some types of evidence than others. For example, evidence on clinical effects from a randomised trial in one country may be generalisable. Effect sizes coming from the pooling of international trials may well be applicable across countries and therefore used for cost-effectiveness models in a range of settings.

In comparison, the cost inputs into will be far less easily generalisable from one setting to another. Variations in health care systems and clinical practice mean that resource use estimates from one setting may not be transferable to another. Variations in unit costs and prices between different countries also challenge any attempt to apply cost estimates from one setting to another.

Other factors which should be taken into account are whether the comparators relevant to decisions made in one country are applicable to others, and whether utility weights used in estimating QALYs are applicable to different societies. In addition to reviewing existing economic evidence, therefore, an HTA body may seek evidence on cost-effectiveness that applies specifically to its own decision-making context.

It is widely recognised that clinical evidence is the most easily transferred between markets or countries. HTA can contribute by providing a core review of clinical evidence. However, it also needs to consider differences in clinical practice from country to country. Current standards of care are unlikely to be the same for all conditions. Core components that could be transferred include:

- systematic reviews of efficacy data; and
- evidence of safety.

Overall, economic evidence is less transferable. Standards of care differ and the economic dynamics of the health care market, and value judgements about social and ethical priorities, vary widely from country to country. Therefore, what may not be considered economically viable in one market could be a benefit to another.

Country-specific components include:

- clinical interpretation against local practice;
- demographics and unmet need;
- health policy agenda;
- local comparators;
- true economic costs used in economic models;
- cost effectiveness thresholds;
- ethical considerations;
- organisational consequences;
- local resource use;
- treatment patterns; and
- the structure of an economic model.

Generalisability and transferability across patients, populations, countries and systems become more problematic the broader the range of stakeholder and decision-maker perspectives and preferences. Using a broad range of data will tend to enhance generalisability and transferability.

6.1 Involvement of key stakeholder groups

The role of stakeholders

The main aim of HTA is to provide those involved in health care funding, planning, purchasing, and investment with accessible, useable, and evidence-based information that will guide their decisions about the use of technology and the efficient allocation of resources.

HTAs have many technology-related policymaking needs and perspectives across a diverse array of stakeholder groups. Organisations and processes include a range of stakeholders, including physicians, pharmacists, health economists, insurance and industry representatives, and patients. Most recommendations on whether a technology will be reimbursed are determined first by scientific members (physicians, epidemiologists) experienced in evaluating medicines. Their decisions are corroborated with academic bodies, representatives from patient organisations, health economists, and (in the case of NICE) health service managers.

All agencies have some level of stakeholder involvement, although participation across various agencies will differ. It has been proposed that patients and consumers – the end users – should have greater participation. An OECD study (2005) concluded that patients and consumer groups were the least involved in the assessment and decision-making processes. Patient perspectives were taken into account indirectly through safety, effectiveness, and quality of life measures, but such indicators may not adequately reflect important broader values (preference for one treatment over another, acceptability of various side effects). Measures of such preferences can play a major part in assessing new technologies and, therefore, may provide useful insights into the 'real world' value of technologies. Although few countries support a formal and integral role for patients, some are starting to recognise the importance of involving patients or consumers. NICE has set up a Citizens' Council to gather public perspectives on key issues that inform the development of guidance documents.

A greater role for industry representatives has also been proposed. It is argued that this will improve the decision-making process and support innovation through greater collaboration with HTA bodies, payers, and other relevant policy-makers. However, industry involvement is controversial because of concern that greater collaboration may compromise the objectivity of the assessment process.

Stakeholder involvement in the review and decision-making process is generally resource-intensive. But it may increase relevancy and greater trust in the evidence produced. Accordingly, better engagement may improve assessments, reduce the number of appeals, and result in improved implementation of HTA recommendations and guidance (Drummond, 2006). In particular, patients and their organisations should play a more central role in prioritising and assessing health technologies so that we can move towards a more consensus-based policy process.

HTAs are more likely to be used by decision makers if reports and practice guidelines are available and if there is a prior commitment to use the assessments effectively. As the cost-effectiveness of a technology can change over time, it is also important to keep reviewing the recommendations. This needs greater participation and collaboration among stakeholders, and in particular among HTA personnel, government officials, industry representatives, health providers and patients. Stakeholders may mistrust the evidence and subsequent recommendations if they do not understand the process properly.

Overall, stakeholders (patient groups, medical sector, industry) should be able to actively submit evidence and comment on draft reports; they should also be able to access the rationale for the final decision. Stakeholders should also remain involved throughout the review process. They should also be able to request a meeting with the competent authorities to present their views, feedback, objections, etc. Finally, all relevant stakeholders should play an active role in the reassessments that occur with changes in clinical need or to the evidence base.

In Sweden, both the TLV and the SBU involve stakeholders before assessments are released. These stakeholders include health economists, medical experts and professionals, and representatives of consumer and patient groups. Before making a final recommendation, the TLV invites manufacturers as well as the Swedish Parliament to provide input on the forthcoming decision. If the manufacturer is still unhappy, it can appeal to an independent court. There is dialogue from early on in the process between industry and the TLV to make sure, for example, that any plans to acquire more evidence meets the authority's expectations. In general, these discussions have been helpful, but are not binding on either side.

The SBU engages health care providers, health economists, representatives from health care organisations, researchers and HTA agency staff. Its brief assessments (Alert Reports) are published on the internet for review and comment, and revised if necessary. The information goes to about 4,000 health care professionals. SBU also produces special topic papers (White Reports) that explore health care problems or interventions that may need to be assessed. These documents are the starting point for future systematic reviews. Stakeholders can comment on the Alert Reports, provided they have a subscription to the service.

In England and Wales, as part of the NICE technology appraisal process, stakeholders are able to submit evidence at the start of the review. This can include clinical and economic viewpoints, and NICE accepts evidence from technology manufacturers, expert clinical witnesses, and patient representatives. All stakeholders, including competitor manufacturers, are able to comment on the external academic evaluation report and the draft recommendations proposed by the appraisal committee.

In France, manufacturers submit a whole dossier on the technology to be evaluated by the Transparency Commission. The dossier has a predefined framework (product presentation, clinical trials, and other relevant information). The drug assessment, mainly comprising the determination of the ASMR level (improvement in provided medical service), is submitted to the vote of the 20 members of the Commission. One representative of the Pharmaceutical Manufacturers Association (LEEM) is present during the discussion but has no voting rights. Manufacturers can comment on the provisional Transparency Commission Advice, request a meeting and appeal against the final decision. The fact that the manufacturer does not vote is largely accepted as a sign of expertise-based assessment. But the Transparency Commission debates should be made public as a guarantee of transparency. As AFSSAPS (registration agency) has done since 2006, the Transparency Commission is expected to issue a report of its discussions on its internet site in the future. Currently, it does not.

Interaction with HTA agency before assessment/review

Communication between the HTA assessment body and manufacturers while a drug is being developed is particularly appropriate because the assessment will be made around the time of the product launch. These interactions are helpful in several ways. First, they can alert HTA bodies to forthcoming technologies that may need to be scheduled into the HTA programme as part of a 'horizon-scanning' or 'early warning' system. It can help the HTA plan for its future resource requirements. An early indication of whether a new product is likely to meet the selection criteria can aid the planning process.

Second, this communication allows both sides to discuss the most appropriate format for the HTA (part of a drug class, part of a clinical guideline etc) and to develop an early outline of the scope of the appraisal. This would help companies to understand the requirements for their own products and the HTA body to set relevant and achievable objectives. Different approaches might be appropriate depending on factors such as the current state of knowledge, the nature of the disease and the type of innovation. For example, different approaches might be used if the product is a new chemical entity, an existing chemical entity used in a new indication, or a revised formulation of an existing product.

Third, discussions can act as a forum for providing scientific advice on generating the evidence needed to satisfy the HTA. Current HTA mechanisms tend to be less well equipped for performing this function than registration processes.

Fourth, they can help to align the HTA process with the parallel licensing process, where the desire is to conduct an HTA around the time of launch, and also to take account of possible delays in licensing or adjustments to the therapeutic indication.

Fifth, they can provide an opportunity to discuss the appropriate timing of the appraisal. Early dialogue can assist the HTA body to decide whether the evidence base at launch is likely to be adequate to formulate what recommendations it should make at this stage, whether additional data should be collected for the pre-launch development process or whether the HTA should be undertaken post-launch. It can also help to develop a research plan for specifying data that can only be collected post-launch. Decisions made at the time of launch should routinely be reviewed to take account of subsequent data collection.

Finally, interactions between the HTA agency and manufacturers enable them to discuss the data requirements for specific types of technologies (orphan drugs, surgical procedures, devices).

Early communication with the HTA Agency is useful, but only if the agency makes its requirements explicit. Communication before an assessment should help the HTA agency become familiar with the technology being developed and the manufacturer understand what the requirements will be. Some technologies (such as orphan drugs) may need a different type of assessment; this, as well as the data required, should be discussed well ahead of any formal submission.

Best practice in this context would mean that manufacturers are able to streamline their data and evidence and make it available to the competent authorities ahead of any submissions (or resubmissions). It also means that they work with the competent authorities with a view to optimising the information needed and further streamlining the evidence to fit the criteria these authorities require. Agencies that offer this opportunity to manufacturers include NICE in England and Wales, TLV in Sweden and DACEHTA in Denmark.

In Sweden, the TLV holds pre-development meetings to confirm that the manufacturer's plans to develop evidence for resubmissions meet authority expectations. These discussions have generally been helpful, but are in no way binding on either party. In the NICE assessment process, stakeholders are involved in developing the draft scope.

Appeals procedures

Researchers, evaluators and stakeholders are often unable to agree. Given the potential impact of HTA reports, these disputes should not be taken lightly. HTA agencies have set up appeals procedures for when a stakeholder disagrees with a decision. Typically, they appeal if the decision is perceived to be unfair, or perverse in the light of the evidence submitted, or if the agency in question is perceived to have exceeded its powers.

Fully independent appeals procedures should be able to reassure stakeholders. The appeals process could be managed independently as it is important that it is seen to be fair and appropriate. There needs to be a process to ensure that appeals are handled efficiently and independently. The grounds for appeal should extend to a different interpretation of evidence. When HTA is part of the pricing and reimbursement process, the requirements will be different, although transparency and balance remain essential: the Transparency Directive should apply with regard to deadlines, assessment criteria and appeal processes.

In England and Wales, NICE has a formal appeals process, although this is not truly independent. It is run by the institute and is chaired by the chairman of NICE. The appeal is the final part of a process intended to ensure that the final guidance is robust. Organisations representing patients and carers, health care professionals and manufacturers can appeal against final advice given by the independent advisory committee on a specific medicine or treatment.

The TLV in Sweden has well-defined appeals processes. After a preliminary decision, sponsor representatives may present their arguments directly to the TLV. If the manufacturer is still dissatisfied, it can appeal to an independent court. In Denmark, DACEHTA has no appeals process. It is possible to go to an independent court of law, although this is a measure of last resort. In Germany, applications to IQWiG are not submitted from sponsors of the technologies, and there is no consultation in the process or any opportunity to appeal.

Absence of conflict of interest

The major HTA agencies should be seen as stakeholders similar to hospitals and payers. In this context, manufacturers need to be able to track their procedures so that the appropriate material will be ready when needed. This includes early talks with the HTA agency, particularly when important new products are being developed.

The HTA agency must be seen as competent in terms of adequate skills and complete absence of conflicts of interest. The assessment process needs to be robust and independent.

It is useful to distinguish between *assessment* and *appraisal*. Assessment refers to assembling evidence, often involving the systematic identification and synthesis of evidence on clinical effectiveness and cost-effectiveness and potentially the generation of new evidence. Appraisal, on the other hand, refers to the process of using this evidence to make recommendations about a given technology. This involves judgements about the applicability of evidence, the cost-effectiveness thresholds, and wider social considerations.

The assessment should follow defined methods and be replicable in different settings. Appraisal, however, involves *value judgements*, including budget impact analysis, which may vary from country to country. Although appraisal is also replicable, based on individual preferences for market prices as well as for QALYs, these market prices are context dependent. The distinction between assessment and appraisal means that they can be carried out by different bodies. Overall, they are different procedures, and should be kept separate.

Those who review the evidence both for the assessment and the appraisal should have sufficient skills and expertise and should be free of any conflict of interest (such as academic conflict of interest, when an academic is asked to perform an assessment on a topic that he has published on). Assessment and appraisal should not be performed by the same group, and stakeholders should be able to comment on the choice of experts.

NICE keeps assessment and appraisal separate. The institute has the resources and skills for a limited number of appraisals each year. It outsources the production of evidence to outside academic organisations and maintains that this avoids conflict of interest. The latest version of the institute's code of practice now says:

'A personal non-pecuniary interest in a topic under consideration might include, but is not limited to:

- a clear opinion, reached as the conclusion of a research project, about the clinical and/or cost effectiveness of an intervention under review;
- a public statement in which an individual covered by this code has expressed a clear opinion about the matter under consideration, which could reasonably be interpreted as prejudicial to an objective interpretation of the evidence.'

In Denmark, a different body (the Danish Medicines Agency) takes decisions on reimbursement. They can use HTAs from DACEHTA, but this is rarely done because the industry does not have to send health economic data in their application, and the Danish Medicines Agency (reimbursement body) is not obliged to take these data into account anyway. Products and diagnostic procedures used in hospital are paid for out of hospital budgets. Therefore, the DACEHTA is essentially performing evaluations for hospital products and procedures and the Danish Medicines Agency is using an independent institute to perform HE evaluations for GP products.

6.2 Availability of data

Data requirements

The health impact of guidance will depend not only on the disease burden associated with a particular condition and the effect of treatment but also the extent to which HTA can influence clinical practice. This will depend, in turn, on the evidence and how much inappropriate variations in clinical practice or undue inequalities of access would take place without guidance. These factors should be considered when prioritising technologies for appraisal.

The more complete the evidence base, the more authoritative the guidance. Making recommendations on established technologies may be a more efficient use of scarce HTA resources than making recommendations on new ones. Targeting potentially obsolete technologies could provide opportunities for disinvestment and, therefore allow more investment in newer technologies. The lack of data available at the time of a launch may limit the ability of decision makers to develop robust guidance, and could mean that HTA is delayed while further data is collected. On the other hand, providing a preliminary indication of the cost-effectiveness of a new technology may have greater influence on the use of new technologies than older technologies. An early appraisal has the added advantage of highlighting the main areas of uncertainty and indicating directions for further research.

Selection decisions are influenced by the characteristics of individual diseases and technologies. However, the balance between the 'old and the new' may also depend on the overall balance in use between old and new technologies. If the spread of new medicines is seen to be slow, it makes sense to focus more intensely on the review and introduction of new medicines. On the other hand, where potentially obsolete technologies are seen as persisting, or overused, greater priority should be given to retroactive reviews.

Finally, clinical and cost-effectiveness evidence are often complementary. They tend to provide information for groups of patients rather than for an individual patient, although treatment decisions are patient-centred, rather than group-centred.

Assessment reports should be subjected to peer review before they are made public. Treatment options should be patient-centered, not group-centered. The more complete the clinical evidence, the more authoritative and robust is the guidance; this suggests that technologies should be given a chance to prove themselves in the community before being assessed (*ex ante* vs. *ex post* assessment). Finally, just as decisions need to be made about investing in new technologies, similar decisions need to be reached about disinvestment, achieving efficiency savings and reducing waste.

NICE in England and Wales and TLV in Sweden have mechanisms aiming at transparency and independence in the production and review of evidence. They also allow continuous reassessment, when new evidence becomes available.

There is no conclusive evidence that disinvestment decisions are actively pursued in individual HTA initiatives. This is a sensitive point and needs to be clearly communicated regarding rationale as well as any substitute technologies being introduced in the disinvested technology's place.

Ex ante vs. ex post assessment

Those carrying out HTAs should seek all available data, whether confidential or not. When confidential data are used, confidentiality should be defined as narrowly as possible, and efforts should be made to make the evidence publicly available as soon as possible, to maintain transparency and improve understanding of and trust in decisions. During an HTA, some of the most important data may be confidential (such as unpublished clinical trial data). Handling confidential data varies substantially among HTA bodies. NICE considers confidential data in its assessments but excludes the information from public versions of the technology assessment reports.

Transparency is an important aspect of all HTA processes, but it needs to be balanced against the desire to make the best possible decisions based on all available data. Explicit processes should be developed to allow confidential data to be used, while protecting confidentiality.

Understandably, governments and other third-party payers want to use HTA to assess the value for money of new technologies when they are launched. Industry supports the use of HTA to speed up access to cost-effective new treatments. There is therefore a strong case for rapid review at the time of launch from the perspectives of both industry and the purchaser. However, while good quality Phase III data is available at the time of launch, there is often limited knowledge of the long-term value (both in terms of clinical effects and the broader consequential benefits, and in terms of costs) in relation to other alternatives used in routine clinical practice. Governments need to be a little more sophisticated, and not assume that rigid yes/no decisions are always possible at launch. Uncertainty is not always factored into HTA processes, and needs to be seen in the broader perspective of drug development. It is likely to become more prominent with the growth of personalised medicine and of special cases, such as orphan drugs.

Any HTA assessment at launch must be flexible enough to handle uncertainty and must be driven by good judgement. In some cases, uncertainty may be such that it is appropriate to delay an initial HTA until after the launch.[10] In the intervening period, the underlying principle must be 'when in doubt, say yes' and request from the manufacturer to produce additional evidence. In the meantime, the solution could be coverage subject to evidence development (CED).

Overall, there are no hard and fast rules about the best timing of HTA. When it takes place the HTA procedure should be fast. The combination of fast approval and CED offers the potential for useful technologies to be covered and for patients to benefit from them.

Importantly, a product's real impact emerges over time through exposure to the market. Manufacturers should therefore be able to submit health outcomes information to the relevant government bodies throughout a product's lifecycle.

Post-launch it is valuable to have a range of data sources, as well as RCTs. This also means that observational data have a significant role to play. "Experiment, observation and mathematics – individually and collectively – have a crucial role to play in providing the evidential basis for modern therapeutics and, as a result, hierarchies of evidence should be replaced by accepting and, indeed embracing, a diversity of approaches" (Rawlins, 2008).

10 With the exception, of course, of cases when an HTA is required by a reimbursement authority in order for that authority to reach a decision on coverage. If an HTA body is responsible for pricing and/or reimbursement decisions they must take decisions within 180 days in accordance with the EU Transparency Directive.

The entire range of data can help to build up a picture of a drug's impact in relevant patients, in the patient population as a whole and in subgroups. Governments and other third-party payers may consider one or more of the following models:

- formal review after an agreed period such as two or five years;
- case by case agreement with the company as to what follow-up is needed (agreement on design and 'end-points'; and
- contract involving commitments on volume and/or risk- and cost-sharing.

Which model to use depends on the circumstances. If the system involves negotiating prices and volumes, model 3 may be appropriate. However, the limited evidence on specific 'risk sharing' contracts (such as the MS Scheme in the UK) is that they are expensive and can delay access to treatment because patients have to be enrolled in complex monitoring procedures. Looser agreements may be more appropriate. On the other hand, where governments and other third-party payers intervene less, model 1 may be the most desirable because it would be consistent with the ethos of the health care system.

In all cases the assessment of 'risk' (of deciding to reimburse a cost-increasing intervention that will later be shown not to have been worth the extra money) is kept separate from the assessment of budget impact. In other words, the emphasis should be on cost-effectiveness rather than overall costs. This is to avoid the budget silo mentality whereby suboptimal decisions are made because of a focus on a narrow budget heading, rather than on the overall efficiency of the health care system.

Because a product's impact on health and the health care system emerges as it moves out into the market, manufacturers should be able to submit health outcomes information to the relevant government bodies throughout a product's lifecycle. HTA organisations should deal with them appropriately. Post-launch assessments are desirable because more robust data is available. Nevertheless, the precise specifications of these assessments must be clear from the start and may vary according to the ethos of the health care system involved. Both parties should be able to request reassessment in the light of new evidence. Finally, the introduction of important new evidence should be allowed while the review is in progress.

The Swedish Dental and Pharmaceutical Benefits Board (TLV) provides an example of good practice. The Medical Products Agency (MPA) mainly reviews clinical and economic evaluations submitted by manufacturers as part of an application package for reimbursement; it does not consider individual medical indications. However, the TLV can decide that reimbursement for a drug should be allowed for a certain indication or patient subgroup. Thus it may allow reimbursement for a more limited indication than the drug was originally licensed for by the Medical Products Agency. Before making a final recommendation, however, manufacturers and the Swedish parliament can provide input to the TLV. If the manufacturer is still dissatisfied with the final decision, it can appeal to an independent court. Importantly, however, the TLV gives manufacturers the time to generate their own effectiveness data to support originally submitted cost-efficacy evidence, thus allowing faster access to market.

6.3 Monitoring implementation

Implementation of HTA findings needs to be monitored, so that the original investment is protected and findings implemented fairly. The impact of the findings should be monitored in all settings, but especially in those jurisdictions where the HTA has been done. Since cost-effectiveness and patient demand can change over time, it is important to review the recommendations of HTA agencies consistently.

A process must safeguard the implementation of all decisions made and evaluate the impact of the technology both in terms of budgetary impact and health gain (such as improvement in agreed-upon health indicators). There should also be a process to monitor the impact of the recommendation on health indicators and the health care budget. It should be recognised, however, that 'arm's length' HTA agencies will find monitoring difficult, as this is the payers' competence.

It also will be useful to explore mechanisms for encouraging greater implementation of new technologies. For example, in a health care system like the UK NHS, which has global budgets and salaries for doctors, financial incentives (such as fees for particular procedures) can be used to encourage or discourage the adoption of particular technologies. There is considerable interest in payment for performance, as in the NHS prescribing incentive schemes. On the other hand, financial incentives may often be underused. HTAs should be evaluated with regard to their validity and clinical impact over time (for example how often subsequent data demonstrate errors in initial determinations) as a 'quality control' measure, with the HTA process and methods modified as required.

The Healthcare Commission is the health watchdog in England. It has a statutory duty to assess health care organisations, and award annual performance ratings for the NHS. It sets standards by which each NHS organisation is measured and assessed. Two of these standards relate to the implementation of NICE guidance. The implementation of NICE technology appraisals falls under the core standard C5a, which means it is a standard that hospital trusts must meet. The implementation of NICE clinical guidelines comes under the developmental standard D2a, which means it is a standard that a hospital trust must seek to meet over a period of time. The Healthcare Commission, therefore, has the power to mark a hospital down if it is not adhering to NICE guidance.

Despite that, a recent report in the United Kingdom (Audit Commission, 2005) found that some NICE guidance was not being implemented in the NHS because of inappropriate use of allocated funding, lack of 'horizon scanning' and poor planning. One concern of technology manufacturers is that HTA may be used to contain costs: negative guidance will always be implemented, but positive guidance may not because of the resource implications.

Evidence from several places indicates that the results of HTAs are not always implemented (Drummond and Weatherly, 2000; Sheldon et al., 2004). In Denmark, there is no process for follow-up and audit. It is up to the pharmaceutical industry to follow up the HTA decisions made by DACEHTA (though generally it is in their interests to do so). DACEHTA is a part of the National Board of Health and, consequently, the Ministry of Health, so it has the competence to monitor decisions, but not necessarily the resources. This has resulted in several cases not being followed up officially despite new evidence questioning previous findings.

In Sweden, there is an apparent disconnect between HTA agencies and the bodies that set up priorities and decide on which technologies will be reimbursed. This disconnect becomes even more pronounced when decisions are made nationally and regionally. While there is a clear process to dissemination results, a more complex picture emerges when it comes to how this information is used in both national and local decision-making. Sweden's decentralised health care system makes it difficult to assess the true impact of TLV, for example, on decision-making and priority setting. Assessments are most effectively used for decisions on resource allocation and treatment guidelines at the intermediate (hospital) and clinical levels. TLV decisions on coverage influence recommendations from local formulary committees. But since county councils are responsible for drug spending and most local formulary committees lack health economic expertise, many local decisions are more restrictive than those made by the TLV. To that extent, national and local decision-making tends to be uncoordinated.

6.4 Technology foresight and horizon scanning

Although the range of topics covered by HTA agencies is broad, some areas (for instance, less sophisticated and preventive technologies) tend to be understudied. HTA bodies rarely update their assessments to keep abreast of research and development, presumably because resources are limited. Assessments that have been carried out early in the product life-cycle have had some impact by identifying areas of uncertainty and highlighting areas for further research.

Similarly some HTA agencies have developed 'early warning' and 'horizon scanning' systems. Health service providers can use these to identify new and emerging technologies that might require urgent evaluation, consideration of clinical and cost impact, or modification of clinical guidance activities. Such programmes have been set up in the Netherlands, Sweden, and the UK through the EuroScan Network. While there is limited evidence regarding their impact on decision-making, there is some concern that premature assessment may be biased against new technology.

The purpose of horizon scanning is to proactively draw attention to the health issues and developments that may be relevant to government policy and associated agenda-setting. It also involves identifying ethical and legal aspects of public health-related developments that may have policy implications.

Effective horizon scanning allows for the most appropriate scheduling of technology reviews. HTA organisations should be:

- alert to innovative new technologies in the development pipeline and have an 'early warning system';
- able to identify areas of uncertainty and highlight areas for further research;
- able to anticipate important innovations in diagnosis and treatment;
- receptive to early-stage discussion with manufacturers; and
- able to avoid any form of premature assessment that introduces biases against new technologies.

Under the auspices of DACEHTA in Denmark, the pharmaceutical industry is encouraged to contribute to the early warning system by sending in materials and forecasts. This is voluntary, but could act as a lever for the industry, which has the best knowledge of products about to enter the market. A positive HTA opinion at launch could pave the way for a much easier introduction into the system, instead of waiting for DACEHTA to look at the product after launch.

In the Netherlands, the Council for Health Research advises the government on policy issues related to health research (www.zonmw.nl/en/home.html). The central remit of the council is to indicate priorities for research. The remit includes 'horizon scanning' and the council focuses on:

- preventive and curative health care;
- nutrition and food quality;
- environment and health; and
- work and health.

Selecting topics for horizon-scanning is based on relevance to government policy and associated agenda-setting. With regard to health care, the Council's secretariat takes part in EuroScan to identify significant emerging health technologies. Another important aspect of horizon scanning involves identifying ethical and legal aspects of developments that may have policy implications. The various organisations supported by the council and entities have completed many HTA assessments and pieces of research, mainly based on extensive literature review and consultation with expert groups. The Health Council and Health Care Insurance Board publish 20-30 reports each year.

7 USE OF HTA IN DECISION-MAKING

7.1 Timeliness and independence of HTA

HTAs should be conducted when they can inform key decisions about the spread and use of health technologies, and they should be kept up-to-date. This requires timely studies by manufacturers and other advocates, and sometimes reimbursement conditional on enrolling patients in a study to look at safety, effectiveness, and cost-effectiveness. HTA is not a 'one-shot' activity, and assessments need to be revised as new data become available. Some organisations commit to regular review of their decisions. NICE, for example, reviews its guidance every three years, or more often if new and important information becomes available.

Some of the data needed to assess the true value of a new technology (long-term safety; uncommon adverse events; effectiveness as opposed to efficacy) can be gathered only after the treatment has been used in clinical practice for some time. Therefore, the timing of assessments should be consistent with key steps in the development of new technologies and their introduction into the health care system. The goal should be to allow reimbursement decisions to be made as soon as possible after market authorisation. This will minimise the risk of wasting resources on treatments that provide little or no added value, or are unsafe. Manufacturers and other advocates must generate the relevant information in anticipation of HTA assessment, which, in turn, requires that they know what data will be required. In highly selected situations, several payers and HTA programmes have implemented a form of 'conditional reimbursement' or 'coverage with evidence development' for new technologies with promising evidence of major potential clinical impact, but which do not meet current standards (for example, limited population spectrum or longitudinal follow-up). Conditional reimbursement is formally linked to requirements for structured, defined data collection and specified further study, usually requiring enrolment in ongoing studies in order for a service or product to be reimbursed. Examples include the UK Multiple Sclerosis Risk Sharing Scheme, and recent initiatives in Australia and in the Netherlands for drugs and in Ontario (Canada) for devices and procedures.

While the criterion of timeliness must be safeguarded, HTA should be separate from the regulatory review for the grant of a marketing authorisation. The regulatory review (either through the EMEA or a national competent authority), must be based on the objective and scientifically verifiable criteria of efficacy, safety and quality. Some approaches have been developed to enable companies and licensing bodies to interact during the development process but using a different legal framework, which tightly constrains the relationship between company and regulator. In the less strictly controlled environment of HTA, there is more scope for companies to engage in ongoing dialogues. Most HTAs are independent of the licensing process. In Denmark, marketing authorisation and HTA are handled by the same ministry, but the bodies dealing with each aspect are different and disconnected.

7.2 Communication with decision-makers

The structure of a health care system, and in particular the balance of local autonomy or central control, will influence how HTA is organised. Where pricing and reimbursement decisions are made centrally, HTA will also tend to be done centrally. Occasionally, regional HTAs may be justified by the structure of health services and the way taxes and/or national insurance contributions are collected (as in the Canadian provinces or in Spain). The downside of regional HTAs is that different regions may have different criteria for accepting new technologies, and this could lead to inequity in spread and access.

Where HTA is used to develop guidance to the health service, the use of central processes may reflect the desire to address unequal access between regions (such as 'postcode rationing'). It may be appropriate for licensing decisions to be made at a supranational level (as in the EU), but this is not appropriate for assessments, which anyway should be independent of the licensing process.

Overall, it seems reasonable that smaller countries should do their HTAs at a national level. In some larger countries there may be grounds for HTA to be conducted at regional level and at state/provincial/regional level, though this does not seem relevant in Europe with perhaps the exception of Spain. HTAs should not be done at supranational or international level. HTA bodies operating at supranational level, such as EUnetHTA, could focus on generating reports that summarise the evidence, and not seek to make policy decisions.

The TLV in Sweden takes a centralised approach to assessing and evaluating a product C/E for a combined decision on price and reimbursement. The Pharmaceutical Benefits Reform of 2002 was passed to increase the cost-effective use of public-financed pharmaceuticals and to ensure drug benefits are equivalent across the country. The reform set up an independent government agency, the Dental and Pharmaceutical Benefits Board (TLV), to meet this end, as well as to increase the transparency of priority-setting. The TLV has significantly changed the principles of pricing and reimbursement of drugs. Decisions are now based on cost-effectiveness data rather than being automatically reimbursed.

Appraisal priorities are established by the number of sales in each therapeutic group. For each appraisal, the board considers the three basic principles underpinning the Swedish health care system: human dignity, need and solidarity, and cost effectiveness. It also bases its decisions on the cost-effectiveness and marginal utility of products. In April and June 2004, the TLV published working guidelines for evaluating drugs that had already been approved, as well as general pharmacoeconomic guidelines (see chapter 8).

The TLV mainly reviews clinical and economic evaluations submitted by manufacturers as part of their application for reimbursement for a specific product. The board can decide that reimbursement for a drug should be allowed for a certain indication or patient subgroup. Consequently, the TLV may allow reimbursement for a more limited indication than the original market approval licence. Before making a final recommendation, however, manufacturers and the Swedish Parliament can provide input. Between 2002 and 2005, the TLV made decisions on 107 products, with most approved with unconditional reimbursement.

7.3 Integrated vs. arm's length HTA

In some countries, HTA evidence is submitted by manufacturers and used by members of the reimbursement committee to negotiate access to reimbursement and other lists. Such examples can be found in the Netherlands and Denmark. In other countries independent, arm's length institutions (NICE in England and Wales, SMC in Scotland, TLV in Sweden) are involved in *managing* various aspects of the HTA, thus leaving payers to review the HTA and take decisions based on it.

Overall, two models seem to be at work. In the integrated model, responsibility for reviewing HTAs lies within the respective ministries or health insurance funds. In the arm's length approach, payers evaluate independently-produced HTA evidence. In both cases, the ministry of health (and, often the ministry of social affairs or social security) oversees part of the process, but, in the arm's length model, payers do not initiate or produce HTA evidence.

Evaluations also differ. In general, the type of assessment will affect which organisation will do the evaluation. Some HTA bodies, for example, conduct the actual assessment in in-house committees, while others coordinate independent reviews by external bodies. Where HTAs are focused on publishing guidance, the HTA body is usually at arm's length of the payer.

Independent reviews have benefits and drawbacks. Independent reviews may be more transparent and help prevent or resolve potential disputes. They can widen the expertise available and bring broader perspectives to the process. Stakeholder involvement as part of an independent process can be highly effective.[11] The review and decision-making process may be expensive, but it may lead to the evidence being more relevant and more trusted. One implication of an independent assessment is that an appeals process has to be in place to address disagreement and to ensure that all stakeholders can voice any concern. Accordingly, greater engagement may lead to better overall assessments, reduce the number of appeals, and result in improved implementation.

To that end, HTA bodies also have different roles in the decision-making process once the assessment is complete. In some countries (as in the UK), the HTA body can be responsible for developing guidance and recommending reimbursement; in others these decisions are mainly decided and implemented by national authorities, insurance representatives, or independent self-governing bodies. Some HTA committees are also involved in negotiating product price and reimbursement with manufacturers.

Overall, the independence of HTA agencies and their reviews should be favoured over a process guided by political expediency. Independent reviews lend greater transparency and bring broader perspectives to the assessment process. Nevertheless, they can lead to miscommunications between those conducting the assessment and the ultimate decision-makers.

11 Independent reviews may introduce methodological challenges, such as use of particular study designs (RCTs) and potential disconnects between the economic model and systematic review. Moreover, a decentralisation of responsibilities may result in coordination inefficiencies, divergent agendas and methodologies, and opportunities for miscommunication between those conducting the assessment and the ultimate decision-maker(s).

Within NICE, the appraisal committee is separate from the academic groups that prepare the evidence and reports, which helps to ensure independence. Decisions are endorsed (or not) by the health ministry. NICE only reviews technologies likely to have major health implications, budgetary impact, or controversy over effectiveness. The technology appraisal committee (TAC) appraises the evidence and makes recommendations on a product's clinical and cost-effectiveness. NICE is not bound by these recommendations. There are more than 60 TAC members, including statisticians, physicians, pharmacists, economists, NHS management, patient advocates, and industry representatives. NICE consults with patient organisations, professional bodies, manufacturers, and other experts to develop the scope of each technology review that it conducts. An independent academic centre is commissioned to prepare a technology assessment report. Stakeholders are invited to comment on the assessment documents. TAC then appraises the evidence and publishes a recommendation to be submitted to NICE. Stakeholder organisations may appeal. If there is no appeal, and if NICE accepts TAC's recommendation, guidance is sent to the NHS to be adopted by the primary care trusts within three months. TAC's initial assessments and final appraisal determinations are posted on NICE's website; these documents contain cost, clinical, and economic data. NICE's appraisal process takes 52-62 weeks.

In Denmark, the Danish Centre for Evaluation and Health Technology Assessment – DACEHTA (www.sst.dk/Planlaegning_og_behandling/Medicinsk_teknologivurdering.aspx?lang=en) – is a department of the National Board of Health, so there is total dependency on the payer. The HTA may be part of the reimbursement process. It is possible to perform an independent HTA but there is no formal appeal process in place.

7.4 Affordability in the context of HTA

Affordability vs. appraisal

HTA often considers the broader macroeconomic impact of health technologies on national health care budgets, resource allocation across different health programmes, regulation and other policy changes on technological innovation, investment, technology transfer, and employment; this is a factual approach. It does not explicitly address questions of affordability; this is deemed to be a political question.

However, budget impact analyses do exist, increasingly conducted within the context of technology appraisals. They are in addition to the assessment process and give information on the likely economic impact of medical technologies. They are not critical in influencing the decision, and their role is limited to providing information to payers about the potential economic impact.

Overall, the HTA process should be independent of the question: can we afford this? This falls into the realm of political decision-making. Equally, budget impact analysis should not influence the decision but inform the implementation of the decision. It is important that the link between HTA findings and decision-making processes is transparent and clearly defined.

The French market access system has the advantage of separating (in theory) technology assessment from affordability. Drug evaluation is conducted by an independent institution, the Transparency Commission, which proposes reimbursement strictly on clinical grounds; pricing negotiation is the next step, initiated by an executive structure, the Economic Committee (CEPS). It is not entirely clear, however, whether the decisions of the Transparency Commission are directly inspired by economic considerations.

Explicit value judgments and a rigid threshold

Independently of whether data generated in one country are transferable to others, those involved in the appraisal process will need to make several value judgements when formulating their recommendations. These will vary from country to country. One variable is the importance of cost-effectiveness in the decision-making process. Typically, there will not be a rigid threshold (such as cost per QALY) below which technologies are accepted and above which they are rejected. The maximum acceptable cost-effectiveness ratio will vary between countries as does the willingness to pay for health gain. When a cost-effectiveness threshold is used as part of the decision making process, this should be made explicit, along with the basis for choosing the threshold and its importance relative to other factors. Such factors might include aspects of the benefits not adequately captured by the QALY or judgements about the appropriate distribution of benefits across groups, or the severity of disease. Also, other factors may have a bearing on the decision-making process, leading to some patient groups having higher priority than others. Finally, there may be differences in the weighting to be given to cost-effectiveness versus other relevant factors.

Because of concerns about fairness and for historical reasons, most European health care systems put limits on patient choice and competition. This brings a greater risk of HTA being used inefficiently – as a cost containment tool delaying access to innovative new treatments. Any value judgments should be made explicit upfront and open to discussion. Thresholds should be made explicit, along with the basis for their choice and their importance relative to other factors. Thresholds for cost-effectiveness analysis should reflect society's willingness to pay. Aside from the economic/QALY – type judgments (or whatever unit of effectiveness countries are using) other factors that should be considered are

- unmet medical need;
- clinical judgment;
- prevalence of the condition;
- patient preferences;
- public health impact; and
- impact on society.

Aspects that should be included in HTA analysis comprise:

- clinical;
- economic;
- budgetary;
- ethical;
- patient-reported outcomes (PROs); and
- public health impact.

United Kingdom

In the UK the costs considered in determining the cost per QALY for technologies is restricted to those incurred by the NHS and Personal Social Services (PSS). This excludes the major costs patients and carers can incur, and therefore places no value on them. An example of this is the review of Alzheimer's disease. The costs of full-time institutional care funded by the patient were excluded from the calculation, resulting in an evaluation that inflated the cost per QALY for Alzheimer's drugs. The resulting recommendation was based on this inflated QALY, meaning that it was more cost-effective to the NHS to let patients' Alzheimer's disease progress so that they were admitted to institutional care earlier (where some fund themselves), rather than use drugs such as acetyl-cholinesterase inhibitors which delay the progression to full-time care.

Another interesting case was the refusal of a health authority to pay for an orphan treatment, thereby denying funding of a treatment for a number of rare disorders. The decision reflected constraints, but also the fear that further treatments of similar cost and for similar conditions would stake a significant claim on scarce resources. In this case, it is not clear how clinical judgment, unmet medical need and patient preferences were considered.

In 2001, the West Midlands region in the UK was funding enzyme replacement therapy for Gaucher's disease, the only lysosomal storage disease that had a specific treatment at the time. In 2002, a new enzyme was licensed for Fabry's disease, and primary care trusts needed to decide whether to fund it. There was no framework for making such a decision. Although the evidence supporting enzyme replacement therapy was thin, this was not the main issue. Even if the drugs were 100% effective, the question remained whether they produced enough benefit to justify their cost, given other claims on resources.

At the time, it was known that an enzyme replacement therapy would soon become available, and similar treatments for other lysosomal storage diseases were on the horizon. West Midlands primary care trusts decided, therefore, to develop a coherent commissioning approach to these orphan drugs that was compatible with providing comprehensive health care and their legal duty to stay within budget.

The West Midlands specialist services agency formally investigated the ethical, legal, and other policy considerations of funding orphan drugs. It commissioned reports on the public perspective, ethical issues, and clinical and cost effectiveness and sought legal advice. The public was reluctant to engage in prioritisation. A typical response was that 'NHS treatment should be provided regardless of cost if it could improve a patient's condition' with more money simply being made available through taxes.

After lengthy deliberations, the agency concluded that rarity and being identifiable were not in themselves overriding factors when making the decision. No reasonable argument could be made that distinguished patients with rare disease from those with common conditions, and all patients are potentially identifiable if they have a treatment need that is not being met. The cost effectiveness for all enzyme replacement therapies was over £200,000 for each quality adjusted life year (QALY), well above the UK threshold, believed to be in the region of £30,000 per QALY.

Primary care trusts wanted a consistent, justifiable policy. Lawyers advised that it would be inconsistent to fund treatment for one lysosomal storage disease and not another unless there was a principled argument to distinguish them. There was none. This meant that when trusts were funding enzyme replacement therapy for Gaucher's disease, they should also fund treatments for the other lysosomal storage diseases. However, the trusts were also advised that they had to continue funding a service simply because it had been funded in the past.

The commissioning group's recommendation, endorsed by the boards of all 30 primary care trusts, was not to support funding of enzyme replacement therapy for Fabry's disease, mucopolysaccharidosis 1, and new patients with Gaucher's disease. The drugs were considered poorly cost effective. The potential long-term costs, possibly reaching £20m per patient, could not be justified on the grounds of fairness given that many more patients, with equal capacity to benefit from treatment, would be deprived of treatments.

The case caused considerable consternation, and the Department of Health decided to move commissioning for lysosomal storage diseases to the national level. For two years from April 2005 treatments for these diseases were commissioned by the national specialist commissioning advisory group. It has placed no restrictions on the use of enzyme replacement therapy in accordance with licensed indications. However, the new commissioning arrangement did not bring with it new funding: the costs are directly levied from primary care trusts. Moreover, the cost to trusts doubled, from about £3.2m to £6.7m and 'to be of such an order of magnitude ... as to significantly distort and limit budgets available to PCTs to commission and develop other services in 2005-06' (West Midlands Specialised Commissioning Group, letter to Department of Health, 8 June 2005).

France

In France, apart from objective criteria such as efficacy, safety and the drug's position in the therapeutic strategy, the 'public health interest' introduces a population-based and realistic perspective to the evaluation and represents an emerging value in French health technology assessment. Three items help to define the public health interest as defined by the Transparency Commission rule:

- the impact on the population (how will the drug impact on overall health?);
- the public health priority (does the drug address a defined public health priority?); and
- the impact on disease management (will the drug significantly change the health care organisation?).

The public health interest can be an appropriate means of evaluation domain when clinical differences are not easy to prove.

7.5 Value-based pricing and HTA

Recent interest in pricing medical technologies (in particular pharmaceuticals) has focused on the idea that pricing should be a value-based concept. The UK Office of Fair Trading recently called for the abolition of the Pharmaceutical Pricing Regulation Scheme (PPRS) in favour of a value-based pricing (VBP) scheme which evolved from the HTA assessments produced by NICE. There seems little opposition to pricing being a value-based concept, assuming of course that value can be defined appropriately. Two important questions are how to define value, and whose value is being considered.

The general argument is that all regulation has associated costs and benefits; this also includes HTA in the context of value-based pricing. There are two types of efficiency to consider: *static efficiency*, which relates to the pricing of a product about to enter or already on the market; and *dynamic efficiency*, which relates to future market conditions. Given the difficulties of securing both at the same time, there may be an optimal trade-off.

Within the context of HTA, value based pricing sets a maximum price of a technology based on an *ex ante* evaluation for a new technology and a rolling *ex post* evaluation of existing technologies. This could be supplemented with risk-sharing contracts if there were insufficient evidence to allow a full *ex ante* appraisal, with price dependent on achieving treatment benefits, and non-linear pricing[12] arrangements for different indications and for sub-group applications. Within the UK, for example, the evaluation would be based on the existing NICE cost-effectiveness evaluations. It would be similar in Sweden with the TLV assessment. Under these circumstances, the emphasis moves towards static efficiency (with the emphasis on value for money at launch) and away from dynamic efficiency.

Several problems exist in using HTA which relate to existing use in decision-making and proposed use to establish VBP in certain settings. A major issue is the use of clinical trial results to establish effectiveness. Such trials are normally intended to establish safety, tolerability and efficacy within a tightly controlled population. They are normally short term and do not establish the long-term health effects required for a comprehensive cost-effectiveness analysis. The results from these trials are currently aimed at a different set of regulatory bodies than those concerned with pricing and reimbursement. Modelling is increasingly acceptable and should be used because health economic data on endpoints and resource use are not routinely incorporated within clinical trial studies. If QALYs are to reflect the outcome over which surplus is to be evaluated (as is the norm in some agencies such as NICE, TLV), then most products will have to transform clinical trial outcome measures into QALYs. Given that pricing and reimbursement is needed on launch, the *ex ante* fast-track appraisal method places heavy demands on the evaluation data. In order to produce assessments of comparator products within limited time periods, this would require head-to-head studies or indirect comparisons through some form of meta-analysis of the new product. It is unlikely that this information would be readily available across the board, or that clinical trials, which are increasingly designed with a global perspective, would be cut to fulfill regulatory criteria in one market for pricing purposes. There may in any case be different standard comparator therapies in different geographical markets. Data limitations will therefore be inevitable.

Assuming a standard method for the preferred measure of health benefit (such as the QALY) and applying a strict threshold value, subgroup analysis – while it can lead to a more flexible regulatory pricing mechanism – would also place undue pressure on the data required to substantiate benefit claims. Even substantiating a claim across a small number of subgroups would require considerable amounts of data. Moreover, if VBP is attached to a risk-sharing analysis, given circumstances where there is a lack of data available to perform an *ex ante* analysis (for example with chronic disease treatments), subgroup analysis will be even more unlikely as the risk transfer to companies increases with an increasing number of subgroups. Such risk-sharing schemes could also erode patent protection because the length of time needed to establish regulatory worth is increased. Data availability is, therefore, again the major constraint.

Ex post risk-sharing is only seen as a means of dealing with situations where there is insufficient data for an *ex ante* consideration. The time taken to implement of *ex post* risk-sharing is of interest. Too short a time will not enable overcoming of data constraints and will not provide much incentive to participate; too long could lead to distortion of the perceived gains in static efficiency with firms gaining undue producers' surplus. Non-linear pricing within a VBP environment relies on greater availability of data and a greater willingness of companies to accept risky pricing strategies.

Given that the VBP is premised on an incentive with respect to dynamic efficiency that is meant to persuade firms to invest in those areas where health benefit is greatest, it is not clear whether non-linear pricing will work. Long lead times mitigate against a firm *ex ante* considering non-linear pricing as a strategy unless they have pursued a very sophisticated data collection and pricing strategy from the start. As investment progresses, the firm would have to gather evidence on subgroups and on a range of indications (assuming it had the foresight to see the aggregate rewards early in the investment cycle).

Alternatively, if a firm became aware of potential benefits of market segmentation it would have to start collecting data at a late stage of development. Such data constraints are not insurmountable but they are substantial and have to be faced as an additional investment to secure value-for-money pricing. It would seem of doubtful regulatory efficiency to allow firms to pursue extensive *ex post* evaluations or risk-sharing agreements on the basis of non-linear pricing proposals.

12 Nonlinear pricing is a broad term that covers any kind of price structure in which there is a nonlinear relationship between price and the quantity of goods. An example is affine pricing, a situation where buying more than zero of a good gains a fixed benefit or cost, and each purchase after that gains a per-unit benefit or cost. Sliding-scale price contracts achieve a similar effect, although the terms are stated differently. The price decreases with volume produced, achieving the same financial transfer over time, but the transaction is always based on units sold, with the fixed cost amortized into the price of each unit.

Most of the discussion above relates to issues of *static efficiency*. The use of HTA in explicit assessments of value has been less discussed with respect to *dynamic efficiency*. Manufacturers of medical technology invest long-term in research and development on the assumption that there is a chance of reward based on a product price set in accordance with achieved health benefits. These investments mainly take place in areas where the achievable health benefit is greatest. A combination of high disease prevalence and need potentially offer the highest returns. But a potentially long delay or a high risk for an individual firm may work against research and development. As a result, manufacturers may place lower value on research and development than society, leading to less investment than would be desirable.

Overall, HTA can help define 'value' of new medical technologies, although the use of HTA in 'value-based pricing' is subject to constraints, particularly related to data quality and availability. In addition, and for HTA to be used constructively in this context, both static and dynamic considerations should be taken into account and a balance found to ensure the best short- and long-term returns to society.

7.6 HTA and disinvestment

Evidence from HTA agencies suggests that work on disinvestment is not a priority. Only NICE in England explicitly recognises the need for disinvestment to be integrated into its guidance development by focusing on questions of effectiveness, ineffectiveness and harm as well as benefit. In practice, its remit does not include judgment on which technologies to disinvest from. This may be an area to focus on in future, particularly for high-volume technologies, which are superseded by newer interventions which are shown to be more effective.

7.7 Resourcing and expertise

HTA agencies must have sufficient resources, both human and financial, to carry out robustly the work entrusted to them by stakeholders and other competent authorities. Shortages in either result in delays to assessments and, possibly, a limited assessment programme. As resources are often restricted, HTA agencies tend to emphasise evaluating new technologies, rather than prevention policies or old technologies.

Appropriate resourcing will enable HTAs to be done in a timely fashion and may also broaden the remit to encompass public health and preventive technologies and disinvestment, in addition to investment decisions. Without appropriate expertise and funding, HTAs can be imprecise, inconsistent, and methodologically flawed.

FUTURE DEVELOPMENTS IN HTA 8

8.1 Defining best practice

It is becoming easier to define best practice now that HTA is being used in more countries. There have been several attempts to specify key principles for HTA, including those by the EUR-ASSESS project and the European Federation of Pharmaceutical Industry Associations. Agreement on best practice is becoming increasingly important, now that HTA is more often formally linked with reimbursement and coverage decisions for health technologies (Drummond et al., 2008a).

Within this context, and based on the material developed in the previous sections, we propose 15 principles; in addition to these seven important issues have been identified.

Principle 1: HTAs should have explicit and relevant goals and scope

A detailed scoping document should be developed before starting the HTA process, with broad stakeholder involvement. The document should focus on defining the questions to be addressed, plus the link between the HTA and any subsequent decisions about the technology to be assessed. This should help optimise the benefits.

Principle 2: HTAs should be unbiased, rigorous and transparent

Given the inherently complicated and controversial nature of HTA-based decisions and their importance to multiple decision-makers and stakeholders, the HTA process is best conducted independently of the body ultimately responsible for adopting, paying and implementing the HTA decisions. Furthermore, the HTA process and the detailed basis on which recommendations and decisions are made must be transparent.

Principle 3: HTAs should include all relevant technologies

Since potential inefficiencies exist in all forms of health care, all health technologies should be potential candidates for HTA. Otherwise, decision-making concerning the use of resources is likely to be distorted. Public health interventions and e-health should be included in the scope of HTAs and also subject to assessment.

Principle 4: HTAs should have a clear system for setting priorities

A clear process for prioritising and selecting topics needs to be established, because unless all technologies are assessed, there will be distortions in decision making about the investment and use of resources.

Principle 5: HTAs should incorporate appropriate methods for assessing costs and benefits

Development and consistent implementation of rigorous, analytical methods is required to engender stakeholder and public trust in the process and its findings. This requires clarity of HTA process and methods, as well as access to experts with appropriate clinical and multi-disciplinary methodological training.

Principle 6: HTAs should consider a wide range of evidence and outcomes

HTAs require data from experimental, quasi-experimental, observational and qualitative studies, integration of both endpoint and validated surrogate data, and assessment of the incremental impact of and trade-offs among multiple clinical, economic and social outcomes in clinically relevant populations.

Principle 7: HTAs should consider a full societal perspective

HTAs should adopt a broad societal perspective to optimise efficiency and societal benefit and to avoid and identify potentially distorted clinical decisions and health policies resulting from the narrow perspectives of various stakeholders.

Principle 8: HTAs should explicitly characterise uncertainty surrounding estimates

All data are imperfect point estimates of underlying distributions that incorporate a variety of errors. All analytical methods are subject to biases and limitations. Thus, extensive sensitivity analyses are required to determine the robustness of HTA findings and conclusions. The limitations of the analysis should always be acknowledged.

Principle 9: HTAs should consider and address issues of generalisability and transferability

Examination of the generalisability and transferability of HTA findings across clinical populations and policy relevant perspectives is required, given the inherent variability of disease, intervention responses and outcomes across patients, populations, providers, health care delivery sites and health care systems.

Principle 10: HTAs should actively engage all key stakeholder groups

HTA programmes should actively engage all key stakeholders in all stages of the HTA process, as this is likely to result in technology assessments of higher quality that are more widely accepted and stand a greater chance of being implemented. Moreover, such an open process will enhance transparency and trust in the process as stakeholders develop a greater understanding of the criteria and standards used. Contact with HTA agencies should also be encouraged at early stages prior to assessment or review.

Principle 11: Those undertaking HTAs should actively seek all available data

Those conducting HTAs should actively seek all available data, whether confidential or not. In situations where confidential data are used, confidentiality should be defined as narrowly as possible and efforts should be made to make it publicly available as soon as possible, in the interests of maintaining transparency and engendering understanding of, and trust in, decisions.

Principle 12: The implementation of HTA findings needs to be monitored

Implementation of HTA findings need to be monitored, both to ensure that the original investment in conducting HTAs is valuable and to ensure that findings are implemented fairly and even-handedly.

Principle 13: HTA should be timely but separate from other regulatory review

HTAs should be conducted when they can inform key decisions in the diffusion and use of health technologies, and assessments should be kept up to date. Accomplishing this requires timely conduct of studies by manufacturers and other advocates and, in selected circumstances, limited reimbursement conditional upon enrollment in a study to inform safety, effectiveness and cost-effectiveness. In addition, HTAs should be separate from regulatory reviews for the grant of a marketing authorisation.

Principle 14: HTA findings need to be communicated appropriately to different decision makers

Given the multiple audiences for HTA findings, effective communication strategies need to be developed to meet the disparate needs of different users.

Principle 15: The link between HTA findings and decision making processes needs to be transparent and clearly defined

A clear distinction needs to be made between the HTA itself and the resulting decisions. The link between the assessment and the decision will be different in various settings, but in all cases it should be transparent.

Several commentaries on these principles have been published and responded to (Drummond et al., 2008b). One concern is that the principles are idealistic and partly contradictory. For example, extensive stakeholder involvement may lengthen the time for an HTA and make it less timely. However, there seems to be broad agreement that existing HTA programmes should aspire to these principles and that jurisdictions seeking to establish HTA programmes should seek to apply them.

The issues that have been identified relating to the way HTA agencies operate are as follows:

Important issue 1: Technology foresight

It would be hugely beneficial for HTA agencies to have ‘early warning’ and ‘horizon scanning’ systems in place to identify new and emerging technologies that might require urgent evaluation, consideration of clinical and cost impact, or modification of clinical guidance activities. While there is limited evidence regarding their impact on decision-making, there is some concern that premature assessment may be biased against new technologies.

Important issue 2: Affordability in the context of HTA

Overall, the HTA process *per se* should be independent of the affordability question; the latter falls into the realm of political decision-making; at the same time, budget impact analysis should not influence the decision but inform the implementation of the decision. It is important that the link between HTA findings and decision-making processes needs to be transparent and clearly defined.

Important issue 3: HTA in the context of 'value-based pricing'

Although HTA can help define 'value' of new medical technologies, its use in 'value-based pricing' may be subject to constraints, particularly related to data quality and availability. In addition, and for HTA to be used constructively in this context, both static and dynamic considerations should be taken into account and a balance found in order to ensure optimal returns to society from both a short-term and long-term perspective.

Important issue 4: HTA and disinvestment

The need for disinvestment must be explicitly recognised and integrated into the scoping, researching and deliberation phases of guidance development by focusing on questions of effectiveness, ineffectiveness and harm, as well as questions of benefit, but, in practice, offering judgement on what technologies to disinvest from.

Important issue 5: Appropriate resourcing and expertise

HTA agencies should be appropriately resourced (i.e. funded and staffed). Appropriate resourcing will enable HTAs to be performed in a timely fashion and may also broaden the remit to encompass public health and preventive technologies and disinvestment, in addition to investment decisions. Without appropriate expertise and funding HTAs can be subject to imprecision, inconsistency, and methodological flaws.

Important issue 6: Operating in a partnership environment

Manufacturers and HTA agencies should operate in an environment of partnership. This should cover the treatment of uncertainty, but also the assessment of new data when these become available, and should be governed by a spirit of cooperation among the stakeholders. In an ideal system, obtaining conditional reimbursement could be a valid way forward and allows flexibility for all parties without compromising access.

Important issue 7: The use of mini-HTAs

Mini-HTAs are a management and decision support tool based on the reasoning involved in HTAs and can be used regionally or locally. Mini-HTAs should be seen as flexible and dynamic tools. As they are prepared locally or regionally, they can be developed further and adapted to local or regional objectives and to the current requirements of the decision-makers. It is important to define locally or regionally when a mini-HTA should be undertaken and it is also important to consider when a proposal for new health technology requires undertaking a more comprehensive HTA.

8.2 Standardising methods of economic evaluation in the context of HTA

Economic evaluation is a critical feature of HTA, but one in which there is still considerable debate about methods. For example, the recent methods guidelines from NICE in the UK (NICE, 2008) and IQWiG in Germany (IQWiG, 2008) could not be more different, despite being issued within months of each other. Therefore, the development of international standards for economic evaluation is essential if meaningful comparisons are to be made between different studies. However, there appear to be differences of opinion in several key areas.

Defining the decision problem

Probably the greatest difference between the respective approaches adopted by agencies such as NICE and IQWiG is whether the analyses are intended to inform decisions across all disease areas, or within a particular disease area only. A decision-maker may only have jurisdiction over therapies for cancer, for example, but this is not the way most health ministries or health insurers are structured. For instance, the approach followed by NICE would make most sense in many systems, since decisions on allocating resources are based on considering expenditures across all therapeutic areas.

Other key elements in the definition of the decision problem include specifying the comparators and the viewpoint adopted. In developing international standards one must consider all relevant comparators in the setting concerned, as stipulated by NICE. However, some jurisdictions specify a narrower range (Sculpher and Drummond, 2006).

With respect to the viewpoint adopted and the range of costs to be considered, there are few international methods guidelines that advocate a true societal perspective, although some do allow consideration of productivity changes, or costs falling on the patient and family. An international guideline for economic evaluation should probably adopt a broad societal perspective and then allow individual decision-makers to consider a narrower range of costs.

The role of evidence-based medicine in assessing economic benefit

The importance of good quality clinical data is well-recognised by those conducting economic evaluations. Most economists subscribe to the accepted hierarchy in the quality of clinical studies; namely, the highest quality evidence on relative treatment effect is obtained from systematic overviews (meta-analyses) of the relevant randomised clinical trials. Lower levels of evidence, in declining levels of quality are individual RCTs, non-randomised comparisons and observational studies, such as registries and clinical case series.

However, guidelines for different national methods vary in the role they see for these estimates of clinical effectiveness. Some guidelines, such as those proposed by IQWiG, are happy to see these estimates used as measures of economic benefit in economic evaluations. On the other hand, the guidelines proposed by NICE require the health gain to be estimated in quality-adjusted life-years (QALYs). In this case, the systematic review of RCTs becomes just one input, albeit an essential one, to the evidence considered. For example, observational studies may be required to help convert an intermediate outcome (e.g. change in HbA1c or LDL cholesterol) to a final outcome (e.g., change in coronary heart disease events or survival). In addition, estimation of the QALYs gained will require information on the effect the therapy has on the patient's quality of life. In short, economic modelling is essential to produce an estimate of economic benefit in cost-effectiveness studies.

In developing international guidelines, it is hard to imagine an approach relying only on data from systematic reviews of randomised controlled trials. Most of the existing national guidelines for economic evaluation allow some modelling, although few foresee a broad role. Decision-makers in most jurisdictions have residual concerns about economic modelling, because of the extent and nature of the assumptions involved. Initiatives to improve the methodological standards of models are essential to the growth of this approach (Weinstein et al., 2003, Phillips et al., 2004).

Despite its fairly broad acceptance, the QALY is clearly a measure of convenience rather than a measure of choice. It provides a reasonably informative weighted index of several of the key components of health gain that many decision-makers consider a pragmatic solution to the valuation problem. However, it is not, in any sense, a 'true' measure of health gain, since important value judgements are involved in defining the relevant dimensions of health and in making the trade-offs among them.

One obvious recommendation for international standards in economic evaluation is that the important consequences of the alternative therapies should be identified and measured in a cost-consequences analysis. This step, which is often overlooked, would ensure that all the relevant dimensions of clinical outcome are addressed and would add transparency to the calculation of QALYs.

As mentioned above, the assumption is that QALYs gained are in principle applicable across all areas of health care and, under the standard methods, they can be simply added. That is, 'a QALY is a QALY is a QALY' no matter to whom it accrues. Economists have had concerns about the simple addition of QALYs for some time (Williams, 2001; Nord 2001). However, more recently, a growing body of literature has suggested that the community might not be indifferent to whether a QALY is given to someone in very poor health (as compared with someone who is in near full-health), or to someone who is elderly (as compared with someone who is young). These factors have led the authorities in the UK to commission more research into how QALYs are valued by the general public (Dolan et al., 2008, Donaldson et al., 2008).

At the present time, the international standard would probably suggest that a cost-consequences analysis be performed and the health gain (in QALYs) estimated. Then, decision-makers may introduce other factors alongside the evidence of cost-effectiveness. These could include items such as the seriousness of the health condition, the availability of alternative therapies, the need for equity of access to care, and so on.

Assessment of value for money

Once the estimates of cost and benefit have been made, the decision-maker needs to make an assessment of value for money. As discussed above, this is called *appraisal* (the application of decision-making criteria), as opposed to *assessment* (the scientific analysis of evidence). In this context, it is important to point out that HTA is not a cost-cutting activity but a tool that should and must deliver added value to patients and society at large.

Under the NICE approach, where the evidence is summarised as an estimate of the incremental cost per QALY of the new technology compared to the old, the debate centres on the threshold willingness-to-pay. That is, what level of incremental cost per QALY is deemed reasonable? As Rawlins and Culyer (2004) point out, this is a societal value judgment to which there is no easy answer. At best there may be a relevant range of 'acceptable' cost per QALY, within which it is worth debating whether or not the new technology should be adopted.

The notion of a threshold value of the incremental cost-effectiveness ratio has been extensively debated (Birch and Gafni, 2003; 2007). Those involved in NICE's decision-making (Culyer et al., 2007) describe this as a deliberative decision-making process, where the decision-maker is 'searching for the threshold'. Certainly, it is envisaged that many of the factors referred to above (e.g., equity of access to health care) are important inputs to the decision.

An international standard for economic evaluation?

A proposal has recently been made for an international reference case for economic evaluation (Drummond and Rutten, 2008). However, more debate is required before such a reference case could be formally adopted. One area requiring exploration is which elements of methods could legitimately vary by jurisdiction and which elements should be standardised. For example, the principle that costs occurring in future years should be discounted to present values should probably be an international standard, but the discount rate could legitimately vary by jurisdiction.

Increasing international collaboration

Attempts to standardise the methods of economic evaluation represent just one aspect of international collaboration in HTA. Apart from several bilateral and trilateral arrangements, such as the recent cooperation between HAS, IQWiG and NICE, the main attempt at increasing international collaboration is the EUnetHTA project mentioned above. In the short term, progress in collaboration within the EU depends on how the various outputs of this project are received, the first being a proposal for a 'core' HTA. However, more generally, as more and more jurisdictions begin to require HTAs, the case for international collaboration increases.

Common methods

As mentioned above, the development of international standards in methods would increase the comparability between HTAs. In addition, if the methodological requirements of different jurisdictions were more similar, the burden on those making submissions to reimbursement bodies in multiple countries would be less. Therefore, attempts to standardise methods will probably be the most fruitful forms of international collaboration.

Common assessments

The 'core HTA' is an attempt to specify a template for an assessment that could potentially be used by decision-makers in several jurisdictions. The main argument for common assessments is that there is considerable duplication of effort if the same HTA is being conducted several jurisdictions at the same time. Of course, the progress in collaboration here will depend on the extent to which there is progress in agreement on common methods and requirements. (see also EUNetHTA, 2008; Velasco-Garrido et al, 2008).

The potential for common assessments is currently greater in the systematic reviews of the clinical data than in the economic evaluation component of HTAs. This is because, even if there were agreement on common methods for economic evaluation, various data inputs could vary from jurisdiction to jurisdiction, thereby affecting cost-effectiveness. The most obvious item varying from place to place is the cost of resource inputs, but other factors, such as clinical practice patterns, could also vary (Barbieri et al., 2005). A greater understanding of how these variations affect cost-effectiveness is required, as well as the development of methods to increase the international transferability of economic evaluations. The latter topic has been the subject of a recent task force convened by the International Society for Pharmacoeconomics and Outcomes Research (Drummond et al., 2008c).

Common decisions?

The final step in international collaboration would be to make a common decision, as is currently the case for drug licensing within the EU. Quite apart from the principle subsidiarity in health care decision-making within the EU, it is unlikely that there will be much progress in this area in the short run. First, different countries have different levels of resource to devote to health care. Since international prices of new health technologies do not vary greatly, it is likely that some countries will afford them and others not. Second, there is a distinction between assessment and appraisal. Different decision-makers, faced with the same assessment, may still come to different decisions about the same technology.

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