

Research Report

Title: Research to Inform Resource Allocation in Health and Social Care. Results of a Scoping Study

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The Department of Health's Policy Research Unit in Economic Evaluation of Health and Care Interventions is a 5 year programme of work that started in January 2011. The unit is led by Professor John Brazier (Director, University of Sheffield) and Professor Mark Sculpher (Deputy Director, University of York) with the aim of assisting policy makers in the Department of Health to improve the allocation of resources in health and social care.

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LIST OF ABBREVIATIONS

ASCOT – Adult Social Care Outcomes Toolkit
BWS – Best-Worst Scaling
CCG – Clinical Commissioning Group
CEA – Cost Effectiveness Analysis
DH – Department of Health
EEPRU – Policy Research Unit in Economic Evaluation of Health and Care Interventions
EQ-5D – EuroQol Five Dimension
GMS – General Medical Services
HRCS – Health Research Classification System
HRQoL – Health Related Quality of Life
HTA – Health Technology Assessment
ICECAP - Icepap Capability Measure
ICER – Incremental Cost Effectiveness Ratio
LA – Local Authority
LARF – Local Authority Ring-Fenced Budget
MRC – Medical Research Council
NHB – Net Health Benefit
NHS – National Health Service
NHS EED – NHS Economic Evaluation Database
NICE – National Institute for Health and Care Excellence
NIHR – National Institute for Health Research
PBC – Programme Budget Category
PCT – Primary Care Trust
PH – Public Health
PHIAC – Public Health Interventions Advisory Committee
QALY – Quality Adjusted Life Year
QoL – Quality of Life
QIPP – Quality, Innovation, Productivity and Prevention
SC – Social Care
SG – Standard Gamble
SHA – Strategic Health Authority
SPOT – Spending and Outcome Tool
TTO – Time Trade Off
VAS – Visual Analogue Scale
WELBY- well-being-adjusted life-year
WEMWBS - Warwick-Edinburgh Mental Well-being Scale

EXECUTIVE SUMMARY

BACKGROUND

The Department of Health faces a number of challenges in allocating resources. The first relates to the expectation that budgets available to allocate to various areas of health and care activities are unlikely to increase markedly in real terms. A second challenge is the possible change in the pattern of health and care need over time. A third challenge is to ensure that the most cost-effective prevention, treatment and care services are funded regardless of budgetary responsibilities

AIMS AND OBJECTIVES

The research aims to provide an initial scope of the types of appropriate analytical methods, evidence sources and research activities that will inform policy responses to these challenges. The objectives of the scoping project were:

- i. To define an analytical framework for assessing the benefits of reallocating resources within and between sectors.
- ii. To establish what types of research have been undertaken or are on-going relating to the cost effectiveness of medical services, public health, social care and non-health and social care spending that has an influence on health and well-being.
- iii. To describe relevant data sources that could be used for empirical analysis consistent with the analytical framework.
- iv. In collaboration with the DH, to hold a workshop involving relevant stakeholders to help to define the key policy questions and the research to address them.

ANALYTICAL FRAMEWORK

The analytical framework is based on the tools of cost-effectiveness analysis (CEA) to inform decisions with an objective of maximising benefits from constrained budgets. It is developed as an analytical support for decisions about resource reallocation, with a particular focus on shifts in resources between medical services (treatments), and preventive and care interventions. It introduces the concept of directed investment and disinvestment where the DH would identify specific interventions for additional funding and/or for disinvestment or reduced funding. This is distinguished from undirected investment and disinvestment where general budget transfers are implemented by the DH, but the specific investments and disinvestments relating to those transfers are left to other decision makers to define (e.g. at a local level).

Depending on the type of reallocation being considered and the budgets to which they relate, the framework defines the specific analyses to be undertaken and the evidential implications. The general approach assumes a common health outcome measure with relevance across treatment, prevention and care. In the case of undirected investment and disinvestment, estimates of the marginal productivity of the relevant budget(s) (cost-effectiveness thresholds) would be required. For directed investment or disinvestment, the costs falling on different budgets and health outcomes would need to be quantified, although the value of potential reallocation options would need to be benchmarked against relevant cost-effectiveness thresholds. Further developments of the framework are explored including how to deal with evidential uncertainty, handling costs and effects falling outside health and care budgets and the implications of potential changes in cost-

effectiveness thresholds over time. The implications of potentially different outcome measures between treatment/prevention and care are also explored.

EVIDENCE

The types of available evidence to populate the analytical framework are characterised. With respect to the costs and benefits of specific interventions, this is most abundant for medical interventions, particularly new treatments such as branded pharmaceuticals. There is appreciably less evidence relating to public health, and little evidence on social care interventions. The National Institute of Health and Care Excellence (NICE)'s activities in technology appraisal and public health are important contributors to the evidence base of UK studies; its new social care programme may deliver important evidence in the future. The National Institute of Health Research funds important primary research in all three areas. It can be expected, however, that evidence is available for a very small proportion of the interventions, programmes and services being routinely funded by the NHS and local authorities. There is a marked lack of cost-effectiveness evidence relating to candidate interventions for disinvestment.

Estimates of the cost-effectiveness thresholds relating to treatment, prevention and care budgets are a key source of evidence. Recent work using routine data to estimate the NHS cost-effectiveness threshold can guide investment in and disinvestment from NHS budgets. No estimates of the cost-effectiveness thresholds associated with public health expenditure by local authorities are available. Work is ongoing to estimate relevant thresholds for social care.

WORKSHOP

A workshop was undertaken in May 2014 involving a range of academic and public sector analysts, decision makers and other stakeholders. On the basis of a series of presentations regarding the analytical framework and available evidence, participants provided feedback and further ideas in small groups.

FURTHER RESEARCH

A series of research recommendations is presented. These mainly relate to the generation of evidence to populate the analytical framework:

- *Costs and benefits of specific treatment, prevention and care interventions.* There is a need to reassess priorities for the generation of evidence to guide directed and undirected investment and disinvestment, and to consider the best way of presenting this to decision makers.
- *Strengthening estimates of the NHS cost-effectiveness threshold.* Although recent work has been published, there is a need for this to be updated over time as new and improved data become available. Additional research can develop panel (longitudinal) econometric models to facilitate estimation of time lags between expenditure and outcomes. Future work could seek to provide more secure estimates of the marginal productivity of individual programme budget categories (PBCs). To support benchmarking, there would also be value in seeking to estimate thresholds for particular sub-groups of CCGs.
- *Estimates of cost-effectiveness thresholds relating to other budgets.* The research on the NHS threshold can provide a basis for estimating a threshold for public health expenditure. This could start by using pre-2013 NHS data which would include public health expenditure. It is

also feasible to use more recent local authority public health expenditure data alongside those from the NHS and relating this to outcomes, although the quality of data available is likely to constrain this work. Collaboration should be encouraged between researchers undertaking this work and those engaged with ongoing work on the marginal productivity of social care.

- *Changes in the value of cost-effectiveness thresholds over time.* Given the complex inter-relationships between factors likely to influence cost-effectiveness thresholds over time, a reliable predictive model for thresholds is unlikely to be possible. Research is feasible on how the value of alternative reallocation strategies might vary according to changes in thresholds over time, to assess what can be established about past changes in thresholds and to consider what this might imply about their future trajectories. A suitable means of deriving a discount rate which reflects the opportunity cost of capital and normative judgments about changes in the value of health with time is also important.
- *Outcome measures used in health and social care.* There are likely to be important differences between outcome measures relating to different activities. In particular, it would be expected that measures of health-related quality of life (used in treatment and prevention) may focus on somewhat different items than measures of care-related quality of life used in social care. A range of research methods is possible to estimate the relationship between these different types of outcome measure.

CONCLUSIONS

Decision makers responsible for allocating resources to health enhancing activities are constantly seeking to identify ways of improving population health from available resources. Decision makers will need to assess whether the positive health effects generated by new activities outweigh the health forgone by placing additional costs on the budget which necessitates disinvestment from other activities. CEA provides a set of analytic tools to inform these assessments.

There is evidence to drive the analytical framework offered by CEA to support decision making. There is, however, very little evidence on the cost-effectiveness of social care, and the proportion of treatment, prevention and care interventions that are routinely offered in the UK for which there is formal evidence on cost and effects is likely to be very small. There are also no estimates of the cost-effectiveness thresholds in public health budgets held by local authorities.

An extensive programme of further research could, therefore, be initiated to feed into future analysis supporting reallocation decisions. Much of this would cover the generation of evidence relating to the costs and effects of specific interventions, and making this accessible to decision makers. Improving and extending estimates of relevant cost-effectiveness thresholds would also be a priority.

1. INTRODUCTION

1.1. BACKGROUND

The Department of Health faces a number of challenges in allocating resources over the next 5 to 10 years. The first relates to the expectation that budgets available to allocate to various areas of health and care activities are unlikely to increase markedly in real terms; indeed, it may not be possible to retain the real value of resources at their current levels. A second challenge is the possible change in the pattern of health and care need over time. This partly relates to the increasing proportion of elderly people in the population,[1] but also to the long-term implications of current trends in risk factors for disease such as increases in obesity.[2] Stemming from the fact that budgets devoted to potentially health-enhancing activities are now distributed between the NHS and local authorities, the third challenge is to ensure that the most cost-effective prevention, treatment and care services are funded regardless of budgetary responsibilities. Indeed, this challenge can be widened to include potentially health-enhancing activities within other areas of the public sector (e.g. education and housing).

Table 1: Estimated annual funding by area of expenditure and control of budget

Source of funding	Control of funding	Treatment	Preventive medicine	Social care
NHS budget (£95.6bn 2013/14)[3]	Allocated to CCGs	£65.6bn (2013/14)		
	Allocated to NHS England	£25.4bn (2013/14)	£1.8bn (2013/14)	
	Allocated to LAs for preventive and care investments			£0.9bn (2013/14)
	Other NHS spending	£2.9bn (2013/14)		
Other Government funding	Funding of preventive medicine, as of 2013 majority LA controlled ¹		£2.7bn (2013/14)	
	LA funding of adult social care ¹			£13.8bn (2013/14) ²
	LA funding of children and family social care ¹			£6.6bn (2013/14)
Total		£93.6bn	£4.5bn	£21.3bn

¹ Department for Communities and Local Government, 'Local authority revenue expenditure and financing: 2013 to 2014 budget, England', 2013

(<https://www.gov.uk/government/publications/local-authority-revenue-expenditure-and-financing-england-2013-to-2014-budget>)

Funding of the three areas of focus in this report (treatment, prevention and social care) has undergone substantial recent change, with the 2012 Health and Social Care Act leading to the replacement of primary care trusts (PCTs) and strategic health authorities (SHAs) with clinical commissioning groups (CCGs), with the latter responsible for the majority of the NHS budget associated with spending on treatments. In addition, the Act shifted control of prevention (public health) budgets away from the English NHS towards local authorities. The transitional nature of the current allocation of budgets, and challenges relating to the timely reporting of relevant data, makes an assessment of the size of the three budgetary areas and who holds budgetary responsibility difficult. Table 1 brings together publically available data on the estimated total size of each budget and where budgetary responsibility resides.

1.2. AIMS AND OBJECTIVES

The Policy Research Unit in Economic Evaluation of Health and Care Interventions (EEPRU) is working with the Department of Health (DH) to provide an initial scope of the types of appropriate analytical methods, evidence sources and research activities that will inform policy responses to these challenges. On the basis of this initial scoping project, subsequent substantive longer-term research activities will be defined, some of which EEPRU may undertake.

The objectives of the scoping project were:

- v. To define an analytical framework for assessing the benefits of reallocating resources within and between sectors.
- vi. To establish what types of research have been undertaken or are on-going relating to the cost effectiveness of medical services, public health, social care and non-health and social care spending that has an influence on health and well-being.
- vii. To describe relevant data sources that could be used for empirical analysis consistent with the analytical framework.
- viii. In collaboration with the DH, to hold a workshop involving relevant stakeholders to help to define the key policy questions and the research to address them.

2. ANALYTICAL FRAMEWORK

2.1. OUTLINE OF KEY CONCEPTS

The analytical framework is based on the tools of cost-effectiveness analysis (CEA) to inform decisions with an objective of maximising benefits from constrained budgets [4]. There are a number of key concepts which are outlined here and developed further in subsequent sections.

2.1.1. Budget constraints and opportunity costs

To guide decision making, economic analysis needs to reflect the importance of budget constraints. [5] There are a several budgets which, to varying degrees, are under the control of the DH and which are relevant to health enhancing activities:

- The NHS budget for treatment, prevention and care activities
- Local authorities' 'ring-fenced' budgets for public health and prevention activities, some of which is prescribed by the DH
- Local authorities' general budgets to deliver a range of services including social care and potentially health-enhancing activities (e.g. environmental services)
- Other public sector budgets funding programmes that are potentially health enhancing or that have objectives that are potentially impacted by treatment, prevention and care activities

For those responsible for making allocation decisions *within* these budgets, CEA can help to identify opportunities for reallocation. That is, to identify new activities for which there is evidence of a potential to improve benefits to patients, clients and the public. Any additional cost of delivering those services will fall on fixed budgets which can safely be assumed to be fully allocated at any given time. Therefore, additional costs can only be managed by displacing existing activities which can be expected to result in disbenefits to others (i.e. opportunity costs). The objective of CEA is to guide decision makers on the net benefit associated with the reallocation: an assessment of whether the benefits of the new activities outweigh their opportunity costs.

From a DH perspective there may be a case for reallocation *between* budgets, but the principle remains the same: would such reallocation be expected to result in a positive net benefit? The difference is that new services would be funded by one budget but opportunity costs may fall on another.

2.1.2. Outcome measures

Comparing the benefits from new interventions and programmes with opportunity costs requires (dis)benefits to be measured in comparable units. For budgets associated with health and care enhancing activities, it is not unreasonable to assume that health is the relevant measure of outcome. For CEA this would typically be implemented in terms of quality-adjusted life-years (QALYs) – a generic measure of health reflecting any changes in survival duration and health-related quality of life (HRQoL). The assumption of comparable measures of health benefits seems reasonable for treatment and prevention. It is uncertain whether exactly the same measure of

outcome would also be appropriate for social care activities. This issue is explored further in Section 3.1.4.

Policy makers are likely to consider a wider set of outcomes than net gains in population health in assessing the value of reallocation. In the context of making decisions about new medical technologies, for example, the burden of the disease interventions are treating (and presumably preventing) has been considered important.[6] CEA can support these assessments based on additional benefit measures, but two important analytical steps are required. The first is a 'rate of exchange' between health gain and the other types of outcome. The second is to be able to capture additional outcomes in the measure of opportunity cost. It should be noted that once a specific benefit is defined, such as health, and the opportunity costs associated with resource reallocation within a fixed budget recognised, the conceptual and practical differences between CEA and cost-benefit analysis are limited.[7]

2.1.3. Measuring opportunity costs

Any expansion of treatment, prevention or care activities is likely to incur opportunity costs. In the context of service delivery systems with fixed budgets, these opportunity costs fall on other types of patients/clients in terms of forgone health, so they are central to decision making. For economic analysis the challenge is how opportunity costs can be estimated. There may be scope for decision makers to specify services which will be displaced (down-scaled or removed) to free-up the resources to provide new services. In such cases opportunity costs represent the estimated benefits of those displaced services.

In complex systems, however, it may not be possible to specify exactly what activities are displaced, and decisions about how to identify resources for new activities may be left to other decision makers in the system, for example at a local level. In which case the opportunity cost associated with a particular additional burden on the budget can be taken from an estimate of the marginal productivity of the system. That is, the change in health outcomes associated with a marginal increase or decrease in the budget estimated across the system. This is the correct conceptual and empirical basis of the cost-effectiveness threshold used in CEA.[8, 9]

2.1.4. Directed and undirected reallocation

These concepts provide a means of categorising reallocation options, as shown in Figure 1. In principle, it is possible for the DH to define the specific activities it wants funded from particular budgets - for example, specific preventive or care activities. This can be defined as directed investment. An alternative is for the DH to increase a general budget and to leave other decision makers to determine the specific new or additional activities to be funded, which can be termed undirected investment. In fact there is a spectrum along which the DH can be more or less prescriptive about the particular new services delivered. This may be accompanied by the DH providing information and commissioning research on the costs and benefits of particular interventions and programmes which local decision makers can use to inform decisions about specific investments.

The same logic applies on the disinvestment side. Services to be displaced to free-up the resources for new or expanded services could be specified centrally (directed disinvestment), or they could be

left to the discretion of other decision makers at various points in the system (undirected disinvestment). Again, the information and research provided by the DH would offer a resource to other decision makers about specific disinvestment activities.

Figure 1: Directed and undirected investment and disinvestment

		Investment	
		Directed	Undirected
Disinvestment	Directed	Specified new activities in PH and SC <i>Specified existing activities displaced</i>	General increase in PH and SC budgets <i>Specified existing activities displaced</i>
	Undirected	Specified new activities in PH and SC <i>'Top slicing' existing budgets</i>	General increase in PH and SC budgets <i>'Top slicing' existing budgets</i>

2.1.5. Measuring costs and benefits over time

Health and care enhancing activities will vary in their time profiles of costs and benefits. Most care activities and many treatment interventions both impose costs on budgets and deliver improved outcomes in the short term and, in some instances, costs and outcomes accrue at similar rates over time. In contrast, prevention generally involves up-front costs with the promise of improvements in outcomes and cost savings over the longer-term. Investment in new infrastructure such as building or the training of additional clinical specialists can be seen in the same way: committing additional resources (and incurring opportunity costs) in the short-term with a view to generating greater benefits in the future.

Although budgets are fixed over relatively short periods, CEA aggregates costs and outcomes over relevant time horizons, which are often the life-times of the patient/client groups, in order to generate an appropriate estimate of changes in health benefits and opportunity costs. In doing so, assumptions are made about opportunity cost of committing resources today to deliver treatment, care and prevention rather than investing more generally to grow the resources for use in generating future benefits. Assumptions are also made about the marginal productivity of the budgets over time. These assumptions are explored further in Section 2.4.4.

2.2. REALLOCATION WITHIN THE NHS

A key objective of commissioning in the NHS is to maximise gains in population health subject to the constraint of the available budget. Although there are numerous other objectives and constraints, a concern with the identification of programmes which generate gains in population health is central to the remit of national and local decision makers within the NHS. NHS funding is used to deliver a huge range of activities. Although a large proportion of these can be described as disease management (diagnosis and treatment of disease), prevention and care remain part of the scope of NHS activity. Thus NHS decision makers need to assess the value of reallocation *within* the NHS budget – between different activities within the broad areas of disease management, prevention and care; and between those areas of activity.

To establish the cost-effectiveness of reallocation opportunities within the NHS budget some consideration of whether reallocation will involve directed or undirected (dis)investment is needed, as described in Figure 1. Table 2 considers each of the four types of reallocation, the assessment necessary to establish whether the reallocation is consistent with NHS objectives and details of the CEA to inform the assessment. If the DH takes a directed approach to defining the investment activities in care or prevention, and to specifying the wider NHS services for disinvestment, then to assess whether there is a positive impact on net population health the estimated total costs and benefits of the specific activities need to be estimated and compared. The assumption would be that the costs of investments would need to be matched by the savings from disinvestments, so the impact on net population health would simply reflect the estimated total benefits of investments and disinvestments.

In the case of directed investment and undirected disinvestment, the total benefits associated with the specified investments in care or prevention would be based on estimates of the benefits associated with those interventions and the size of the relevant population(s). These would be compared with an estimate of the expected total health benefits forgone. This would be based on an estimate of the marginal productivity of the NHS budget (i.e. the NHS cost-effectiveness threshold).

Undirected investment can be characterised as the process of allocating additional resources to one broad area of NHS activity, this could be assumed to be a *programme budget category* (PBC) associated with care or prevention;ⁱ there would, however, be no prescribed interventions, with this being left to local decision makers. The health gained from this policy can be based on an estimate of the marginal productivity of the relevant PBC. This represents the benefits that can be achieved by giving resources to the specific PBC, whereas the NHS cost-effectiveness threshold is an estimate of the marginal productivity across all programme budgets in the NHS and is appropriate when the activity is not specified to a particular programme budget. If the DH seeks to fund this undirected investment by specifying a series of disinvestment activities relating to particular services, then the health forgone would be based on the estimated total benefits of those activities. If no particular

ⁱ A PBC is one of a number of broad groups to which the entire volume of NHS expenditure is allocated according to primary diagnosis

disinvestment activities are specified, then forgone health would be estimated based on the NHS cost-effectiveness threshold and the total resource value of the disinvestment.

Table 2: Assessments and analysis for alternative approaches to reallocation assuming benefits and opportunity costs can be assessed in generic units of health

Type of reallocation	Assessment	Analysis		
		Reallocation within the NHS	Reallocation within LA ring-fenced budget	Reallocation between the NHS and local authority
1. Directed investment and directed disinvestment	Are the health benefits of specific new investments greater than the health forgone resulting from the specific disinvestments, assuming all costs fall on the NHS budget?	$NHB = h_I - h_D$ <ul style="list-style-type: none"> - Assuming $C_I^{NHS} = C_D^{NHS}$ and fall entirely on the NHS - h_I = health gain from investment - h_D = health forgone from disinvestment - C_I^{NHS} = additional NHS cost of investment - C_D^{NHS} = NHS cost recouped as a result of disinvestment(s) 	$NHB = h_I - h_D$ <ul style="list-style-type: none"> - Assuming $C_I^{LARF} = C_D^{LARF}$ falling entirely on local authority ring-fenced budget - h_I = health gain from investment - h_D = health forgone from disinvestment - C_I^{LARF} = additional LA cost of investment - C_D^{LARF} = LA cost recouped as a result of disinvestment(s) 	$NHB = h_I - h_D$ <ul style="list-style-type: none"> - Assuming $C_I^{LA} = C_D^{NHS}$ - h_I = health gain from investment - h_D = health forgone from disinvestment - C_I^{LA} = additional LA cost of investment - C_D^{NHS} = NHS cost recouped as a result of disinvestment(s) and reallocated to LA
2. Directed investment and undirected disinvestment	Are the health benefits of specific new investments greater than the health expected to be forgone through displaced activities?	$NHB = h_I - \frac{C_I^{NHS}}{k_{NHS}}$ <ul style="list-style-type: none"> - k_{NHS} = cost-effectiveness threshold for the NHS budget 	$NHB = h_I - \frac{C_I^{LARF}}{k_{LARF}}$ <ul style="list-style-type: none"> - k_{LARF} = cost-effectiveness threshold for the ring-fenced local authority budget devoted to public health 	$NHB = h_I - \frac{C_I^{LA}}{k_{NHS}}$ <ul style="list-style-type: none"> - Assuming $C_I^{LA} = C_D^{NHS}$ k_{NHS} = cost-effectiveness threshold for the NHS budget

<p>3. Undirected investment and directed disinvestment</p>	<p>Are the health benefits associated with allocating additional resources to a programme budget associated with care/prevention greater than the health forgone resulting from specific disinvestments?</p>	$NHB = \frac{C_I^{NHS}}{MP_I^{NHS}} - h_D$ <ul style="list-style-type: none"> - Assuming $C_I^{NHS} = C_D^{NHS}$ and fall entirely on the NHS - MP_I^{NHS} = marginal productivity of programme budget within the NHS associated with investment activities 	$NHB = \frac{C_I^{LARF}}{MP_I^{LARF}} - h_D$ <ul style="list-style-type: none"> - Assuming $C_I^{LARF} = C_D^{LARF}$ falling entirely on local authority ring-fenced budget - MP_I^{LARF} = marginal productivity of programme budget associated with investment activities 	$NHB = \frac{C_I^{LA}}{k_{LA}} - h_D$ <ul style="list-style-type: none"> - Assuming $C_I^{LA} = C_D^{NHS}$ - k_{LA} = cost-effectiveness threshold relating to local authority budgets (ring-fenced or general depending on the nature of the investment)
<p>4. Undirected investment and undirected disinvestment</p>	<p>Are the health benefits associated with allocating additional resources to an NHS programme budget associated with care/prevention (estimated by the marginal productivity of that budget) greater than the health expected to be forgone through displaced activities?</p>	$NHB = \frac{C_I^{NHS}}{MP_I^{NHS}} - \frac{C_I^{NHS}}{k_{NHS}}$ <ul style="list-style-type: none"> - Assuming $C_I^{NHS} = C_D^{NHS}$ and fall entirely on the NHS 	$NHB = \frac{C_I^{LARF}}{MP_I^{LARF}} - \frac{C_I^{LARF}}{k_{LARF}}$ <ul style="list-style-type: none"> - Assuming $C_I^{LARF} = C_D^{LARF}$ falling entirely on local authority ring-fenced budget 	$NHB = \frac{C_I^{LA}}{k_{LA}} - \frac{C_I^{LA}}{k_{NHS}}$ <ul style="list-style-type: none"> - Assuming $C_I^{LA} = C_D^{NHS}$

2.3. REALLOCATION BETWEEN THE NHS AND LOCAL AUTHORITY BUDGETS

A large proportion of health enhancing prevention and care activities are funded from non-NHS budgets. Since April 2013, local authorities have had the remit to improve the health of their local population, and have been responsible for public health including services for sexual health and the prevention of drug and alcohol misuse.[10] Many of these services are funded from ring-fenced public health budgets. General local authority budgets are used for other potentially health-enhancing services – for example, those relating to transport and the environment. They are also used to fund social care services including residential accommodation for those who are in need of care because of age, illness or disability, which they cannot otherwise obtain.

The types of assessments set out in Section 2.2, and the analyses that can be undertaken to inform them, are more complicated when services are funded from different budgets. In particular, in considering disinvestment and channelling released resources to enhanced prevention and/or care comparisons across sectors are required. Assuming the measure of outcome (health) is appropriate and sufficient in treatment, prevention and care and that no (dis)benefits spill over to other sectors, the health benefits of new or additional investments can be estimated from the appropriate evidence base. The benefits forgone, however, will depend on the source of the funds for the new investments. In the context of there being no real-terms increase in overall budget allocation of health and care, there seem to be three main scenarios relating to the funding of new investments.

2.3.1. Funding from within local authority ring-fenced budgets

The first scenario is that all new investments, presumably in prevention rather than care, would come from local authorities' ring-fenced budgets. Table 2 summarises the implications in terms of assessment and analysis. This would amount to the DH specifying particular prevention activities for investment (directed investment), which would be funded from disinvestments within the ring-fenced budget which would be specified by the DH (directed disinvestment) or not (undirected disinvestment). Although less likely to be relevant, the DH could require undirected investment by local authorities in prevention, funded by directed disinvestment; undirected investment and disinvestment within a common public health budget would seem to have little policy relevance.

Under this scenario, the assessments which would be necessary, and the analysis which could be undertaken to support these, would be very similar to those detailed in Section 2.2 and Table 2. The difference would be that the relevant cost-effectiveness threshold would be that relating to the ring-fenced public health budget (k^{LARF}) rather than to the NHS. Also, for undirected investment, estimating the gains in population health would require an estimate of the marginal productivity of the relevant programme budget categories within the ring-fenced budget into which investment was being directed (MP_I^{LARF}).

2.3.2. Funding from the NHS

A second scenario is that new or additional investment in prevention or care activities, as part of local authority budgets, would be funded by disinvestments from the NHS budget. Investments could relate to the activities of local authorities' ring-fenced budgets or of their more general

budgets. Disinvestment could be directed or undirected by the DH. Table 2 outlines the assessment and analytical implications relating to this scenario depending on whether or not the investment and disinvestment are directed or undirected.

The details are similar to those relating to reallocation within the NHS. In particular, opportunity costs in terms of health fall on the NHS budget, and would be estimated from the NHS cost-effectiveness threshold (k^{NHS}). The differences relate to the estimation of the total health benefits of new or additional investment in prevention and care within local authority budgets. Table 2 indicates that this could be estimated by the cost-effectiveness threshold of local authority budget (k_{LA}). Depending on how the investment is specified, this could be the general or ring-fenced local authority budget or a combination of both. Alternatively, the undirected investment could relate to a particular programme budget category within local authority budgets.

2.3.3. Funding from within general local authority budgets

A third scenario is that directed investments in prevention or care would be funded from local authorities' general budgets rather than from the NHS or ring-fenced public health budgets. This could take the form of, for example, investment in new or additional specified or unspecified prevention activities in the ring-fenced public health budget being funded from disinvestment in services funded by local authorities' general budgets. Now the assessments and analysis summarised in Table 2 would be complicated by the fact that the opportunity costs would not just fall on population health. This is because general local authority budgets provide other types of services which generate outcomes other than health. For example, whether directed or not, disinvestment may come from services relating to transport, the environment or education. Further, local authorities could potentially increase council tax to fund investment, with the opportunity costs falling on the local tax payers in terms of lost consumption. In establishing whether the benefits of the investments are greater than the (dis)benefits of the disinvestments, there would be a need to consider benefits and opportunity costs in commensurate units. This issue, and its implications for the analytical framework, are considered further in Section 2.4.

2.3.4. Examples of investment and disinvestment decisions in the NHS

Table 3 outlines some examples of directed and undirected investment and disinvestment decisions. This has been populated with evidence taken from the literature where possible. However, it has not been possible to identify reliable evidence on potential candidate interventions for directed disinvestment from the NHS; therefore, a hypothetical treatment is used. The table aims to demonstrate the type of evidence needed to make these decisions.

Table 3: Examples of investment and disinvestment decisions

	Directed investment and directed disinvestment	Directed investment and undirected disinvestment	Undirected investment and directed disinvestment	Undirected investment and undirected disinvestment
Assessment that needs to be made	Are the health benefits of specific new investments greater than the health forgone resulting from the specific disinvestments, assuming all costs fall on the NHS budget?	Are the health benefits of specific new investments greater than the health expected to be forgone through displaced activities?	Are the health benefits associated with allocating additional resources to a programme budget associated with care/prevention greater than the health forgone resulting from specific disinvestments?	Are the health benefits associated with allocating additional resources to an NHS programme budget associated with care/prevention (estimated by the marginal productivity of that budget) greater than the health expected to be forgone through displaced activities?
	$NHB = h_i - h_D$	$NHB = h_i - \frac{C_i^{NHS}}{k_{NHS}}$	$NHB = \frac{C_i^{NHS}}{MP_i^{NHS}} - h_D$	$NHB = \frac{C_i^{NHS}}{MP_i^{NHS}} - \frac{C_i^{NHS}}{k_{NHS}}$
Example question	Is directly investing in increasing the numbers of brief GP consultations where brief advice on physical activity is given worthwhile when the disinvestment is funded by removing an activity, X, which generates QALYs at an ICER of £20,000 per QALY?	Is directly investing in increasing the number of GP consultations where brief advice on physical activity is given worthwhile when the disinvestment to fund it is undirected?	Is giving extra funding to the respiratory disease programme budget for prevention efforts worthwhile when the disinvestment is funded by removing an activity, X, which generates QALYs at an ICER of £20,000 per QALY?	Is giving extra funding to the respiratory disease programme budget for prevention efforts worthwhile when the disinvestment to fund it is undirected?
Evidence	Increasing the number of brief GP consultations to increase physical activity will result in additional costs to the NHS of £58.5 million (C_i^{NHS}) but result in an additional 33,814 QALYs (h_i). [11] <i>Reducing spending on X by £58.5 million results in 2952 QALYs lost.</i>	Increasing the number of brief GP consultations to increase physical activity will result in additional costs to the NHS of £58.5 million (C_i^{NHS}) but result in an additional 33,814 QALYs (h_i). [11] The marginal productivity of the NHS budget (k_{NHS}) has been estimated at £12,936 per QALY [9]	The marginal productivity of the respiratory disease programme budget has been estimated at £1,998 per QALY (MP_i^{NHS}) and the marginal productivity of the NHS budget has been estimated at £12,936 per QALY (k_{NHS}). [9] Reducing spending on X by £5 million results in 250 QALYs forgone.	The marginal productivity of the respiratory disease programme budget has been estimated at £1,998 per QALY (MP_i^{NHS}) and the marginal productivity of the NHS budget has been estimated at £12,936 per QALY (k_{NHS}). [9] Consider a transfer of £5,000,000.
Is the investment worthwhile?	$NHB = 33,814 - 2952 = 30,889 \text{ QALYs}$	$NHB = 33,814 - \frac{£58.5m}{£12,936} = 29,292 \text{ QALYs}$	$NHB = \frac{£5m}{£1,998} - 250 = 2253 \text{ QALYs}$	$NHB = \frac{£5m}{£1,998} - \frac{£5m}{£12,936} = 2116 \text{ QALYs}$

The results presented here are indicative and subject to caveats. In particular:

- It is assumed that the size of any transfer will not alter the marginal productivity of expenditure
- There is assumed to be no efficiency losses resulting from transfers
- The marginal productivity for the respiratory programme budget has been estimated without interactions (i.e. does not account explicitly for one programme budget having an impact on health effects in another)

Given these caveats, these should be viewed as examples of the types of analyses which would need to be undertaken to inform investment and disinvestment decisions.

2.4. EXTENDING THE ANALYTICAL FRAMEWORK

The analytical framework described above could be extended in a number of ways. In part, this depends on the policy objectives and nature of proposed investment and disinvestment activities.

2.4.1. Variation between health and care outcomes

A core assumption of the analytical framework is that outcomes of interventions and programmes relating to treatment, prevention and care can be expressed in comparable units of health benefit. This is likely to be implemented using QALYs to reflect the impact of interventions on changes in length of life and HRQoL. Whilst this may be considered a reasonable assumption in considering reallocations between treatments and prevention activities, it is likely that care activities need to be evaluated using a somewhat different set of outcomes, even if these are related to health. Appendix A considers some of the practical issues associated with measuring benefits and opportunity costs in health (prevention and disease management) compared with social care. In particular, it considers ways in which two instruments developed to measure 'quality of life' in health (EQ5D) and social care (ASCOT) could be made comparable.

1.4.2 Equity considerations

The analytical framework as presented aims to maximise the appropriate measure of outcome regardless of to whom those outcomes may accrue. From a policy perspective there may be characteristics of the recipients of a service which makes their outcome more socially valuable. In the context of medical technologies, for example, health benefit accruing to patients with diseases which confer a large health burden may be given additional weight compared to the improved health of other types of patients. The use of weighted QALYs or cost-effectiveness thresholds to reflect disease burden as part of the government's value-based pricing initiative can be seen as one approach to reflecting equity considerations in CEA.[6, 12]

The Health and Social Care Act of 2012 conferred a legal responsibility on the DH to reduce inequalities, covering both public health and NHS services. Ideally, therefore, economic evaluation to support policy would consider the distribution of additional benefits offered by resource reallocation as well as their magnitude. Although still at a developmental stage, recently published work by Asaria *et al* sets out how to consider trade-offs between health maximisation and

minimising unfair variation in health using a distributional cost-effectiveness analysis framework.
[13]

1.4.3 Costs or effects falling on other sectors

The analytic framework outlined in Sections 2.2 and 2.3 effectively assumes that only two sectors incur costs and (dis)benefits associated with treatment, prevention and care; namely, the NHS and local authorities. To the extent that the remit of local authorities involves two types of budget – the ring-fenced public health budget and the more general budget for local authority services – the framework may extend to three budgets. Some interventions and programmes may, however, have costs and effects which ‘spill-over’ to other sectors. This may take the form of effects on net consumption – that is, impact outside the budget constrained public sector on private individuals’ and companies’ decisions about production, employment and consumption. For example, medical technologies and prevention programmes affecting survival duration may impact on production (through workforce participation) and consumption; the net ‘wider social benefit’ on production minus consumption is likely to be a function of factors including the age of the target population the types of disease and gender.

Other types of intervention may impact on other budget constrained parts of the public sector. This is likely to be particularly true of some prevention programmes. For example, public health activities designed to reduce drug dependency may have the primary objective of enhancing population health. If effective, however, such programmes may have spill-over effects on other areas of the public sector such as criminal justice (through less crime driven by drug use) and education (through increased participation and attainment). These effects may take the form of reduced costs and/or improvements in types of outcomes for which decision makers on those sectors are held accountable.

It is often recommended that a ‘societal perspective’ is adopted in economic evaluation undertaken of potentially health enhancing activities.[14, 15] That is, that the estimated measure of value in an analysis reflects all costs and consequences, no matter where they fall. This contrasts with many decision making bodies internationally which are primarily interested in analysis that incorporates costs falling on budgets for which they are responsible and effects which relate to objectives for which they are held accountable.[5] For example, the National Institute for Health and Care Excellence (NICE) technology assessment programme currently focuses mainly on costs falling on the NHS and health effects.[16] In part this focus by organisations responsible for resource allocation in health on a narrow perspective regarding costs and effects reflects the challenge of aggregating wider impacts in a metric representing ‘social value’. This is likely to reflect the fact that trading gains in population health against other consequences, such as impact on net consumption and education outcomes, is something sector-specific decision makers feel uncomfortable with given their remit. Indeed, more generally, a complete specification of such trade-offs would be defined in a formal social welfare function over which social consensus would be impossible. The other reason for a focus on a narrower perspective by decision makers is the reality of budget constraints. Descriptions of a societal perspective in economic evaluation in health care generally ignore the implication of budget constraints. In particular, the fact that decisions to fund new interventions which impose additional costs on fixed or constrained budgets generate opportunity costs in terms of health is given little or no attention. Rather than being seen as ‘administrative nuisances’,

budgets can be seen as a legitimate means by which central government delegates decision making responsibilities given their inability to define a complete and consensual social welfare function.[17]

In analysing the options facing NICE in broadening its perspective in economic evaluation, Claxton *et al* made a series of recommendations which has wider implications for the use of economic evaluation to support decision making, some of which are relevant here.[5] Firstly, budget transfers may be a means of operationalising a broader perspective. With respect to the comparison of a single budget-constrained health care sector (e.g. NHS) and the wider economy, and assuming that the NHS cost-effectiveness threshold (k_{NHS}) is less than the rate at which individuals are willing to forgo consumption for health benefits (the willingness to pay for health, v), then transfers will only be appropriate into the NHS from the wider economy. This may be appropriate when interventions do not generate a net health benefit from an NHS perspective (i.e. they are not cost-effective) but offer positive consumption value.

Secondly, budget transfers can be appropriate between the health sector and other budget constrained parts of the public sector (e.g. education and criminal justice). This may be appropriate when a given intervention is not cost-effective in one sector (that sector would lose by its introduction) but would be considered cost-effective in another (that sector would gain). The transfer would be from the gainers to the losers and would take the form, in effect, of a compensation test: if the losers can be made not worse off and the gaining sector can demonstrate a net gain in the benefits it generates, even after the transfer.

Thirdly, the use of budget transfers as a vehicle to implement a wider perspective and more fully reflect the costs and consequences of interventions on other sectors would need to meet some important conditions. These would include the need to establish that the inevitable transaction costs associated with their estimation and implementation could be justified on the basis of the resulting gains in important social objectives. There would also be a need to assess whether the transfers would be marginal with respect to the budgets impacted – if not, the estimated cost-effectiveness thresholds may not hold.

Undertaking analysis which reflects a wider array of costs and consequences of interventions than those falling on a single sector is, therefore, more challenging than sometimes considered. The main implications for this report are likely to relate to the assessment of the cost-effectiveness of some prevention activities. As discussed in Section 3, NICE's public health programme has shown that the costs and effects of many of interventions it evaluates fall on several sectors.

1.4.4 Prioritising investment and disinvestment decisions

Alternative approaches to the reallocation process outlined in Table 2 and Section 2 are centred on directed and undirected investment and disinvestment. Whatever the approach taken, there will inevitably be a need to prioritise the types of interventions and programmes for investment and disinvestment. In the context of directed investment and disinvestment, specifics would presumably be defined from the centre. In the case of undirected investments and disinvestments, that responsibility would be handed to other decisions-making bodies such as NHS England, Public Health England, CCGs and local authorities. The analytical framework focuses on a key factor in this

prioritization process: the expected net impact on population health of treatment, prevention and care interventions. There are some additional considerations that would be necessary.

The first relates to the importance of estimates of the marginal productivity of budgets (cost-effectiveness thresholds) even in the context of *directed* investment and disinvestment. The framework outlined above presents a directed investment as being worthwhile as long as its health benefits are greater than the health forgone from directed disinvestments. However, if the directed investment generates health at a higher cost than the relevant cost-effectiveness threshold (formally, the incremental cost-effectiveness ratio (ICER)ⁱⁱ is greater than the relevant threshold), then it would be inappropriate to undertake that investment. This would be the case even if specific disinvestments have been identified which would free-up sufficient resources to fund the investment at an opportunity cost less than the health benefit offered by the investment. This is because the threshold indicates what is being (or should be) achieved in terms of health productivity at the margin with the relevant budget and, therefore, provides the benchmark against which all new investments should be assessed. In the case that the directed investment generates health at a higher cost than the relevant cost-effectiveness threshold, implementing the directed investment would lead to less health gains than an undirected disinvestment.

Exactly the same logic applies in the case of directed disinvestments: these should not be initiated if their ICER is less than the relevant cost-effectiveness threshold even if there is a matching directed investment generating more health than the disinvestment. Rather, this is also how decision makers other than the DH would have to consider investments and disinvestments that are not directed from the centre. The relevant threshold would act as the benchmark for all new or additional investments in care and prevention, as well as disinvestments. Only disinvestments with ICERs greater than the cost-effectiveness threshold should be selected.

A related issue is the basis for transferring resources from one budget to another to fund directed or undirected investments – for example, a transfer from the NHS to local authorities. The relevant threshold relates to the actual marginal health productivity of the budget, not what it could be if ideal investment and disinvestment decisions are taken. So the cost-effectiveness threshold of the budget from which resources are to be taken is the correct basis to assess the suitability of the transfer, not the threshold that might be obtained at some point in the future based on a series of undefined efficiency gains. Also, in considering such a transfer, the DH would need to assume that local decision makers responsible for resource allocation from that budget are constantly assessing specific investment and disinvestment decisions against the benchmark threshold.

A second additional consideration in prioritising investments and disinvestments decisions is uncertainty relating to estimates of cost-effectiveness. The framework in Sections 2.2 and 2.3 relates to the *expected* impact of interventions on population health – effectively based on the mean costs and benefits of the alternative interventions. However, expected impact is estimated from available evidence about the underlying diseases the interventions are seeking to prevent or influence, as well as the costs and effectiveness of the interventions or care programmes. This will

ⁱⁱ That is, the incremental cost per additional unit of effect of a more costly and more effective intervention versus a comparator.

inevitably lead to uncertainty in estimated impacts on net population health for both investments and disinvestments. For central and local decision makers, the question is whether there is *sufficient* evidence to justify resource reallocation. Traditional inferential statistics provides no guide to this issue as it is not focused on the objectives and constraints of decision making. [5] The main consideration is whether decision makers can expand their decision options beyond the simple ‘invest/disinvest’ dichotomy. For example, when allowing for evidential uncertainty makes a crucial difference to expected net population health, can decision-makers initiate, commission or demand further research to reduce that uncertainty, and provide input into specifying that research? Would commitment to particular investments or disinvestments in the context of significant uncertainty limit the scope for research to be undertaken to establish whether these decision were correct and, if not, whether they should be reversed? Can decision makers delay the investment/disinvestment decisions until other information comes to light such as research from outside the UK, price changes or the availability of new interventions for the relevant client/patient group? Do investments/disinvestments commit ‘up-front’ resources which, should the decision ultimately be shown to be wrong by research or other information, would not be reversible?

Work to outline the assessments decision makers need to make in the context of uncertainty, and the analyses which can inform these assessments, has been undertaken to inform NICE’s technology assessment programme.[18] In particular, the framework helps to inform NICE’s committees about when they might decide to reject or accept a new technology, or to provide positive guidance ‘only in research’ or to offer ‘approval with research’. This work lays the basis for how uncertainty in evidence can be reflected in central or local decisions regarding resource reallocation between treatment, prevention and care. How such decisions can be linked to further research – for example, that commissioned by the National Institute for Health Research – may warrant further consideration.

An important question may be whether the evidence available regarding the costs and benefits of medical interventions is stronger than that relating to prevention and care. This will be considered further in Section 3.

1.4.5 Allowing for costs, effects and thresholds varying over time

The appropriate time horizon for evaluation is the period over which costs and/or benefits might differ between the alternatives being considered. For example, in the context of medical and preventive interventions which have a potential impact on mortality, this would require a life-time time horizon to provide an estimate of differential survival duration.[4] Although this often requires modelling and assumptions informed by relevant evidence, the need for long-term time horizons for many economic evaluations is recognized by NICE.[16]

As shown in the analytical framework in Sections 2.2 and 2.3, any additional costs of interventions falling on a fixed budget impose opportunity costs in terms of forgone health. The rate at which health is forgone for a given additional cost depends on the cost-effectiveness threshold k . Following a particular intervention, costs can be imposed at different time points. For example, the management of HIV requires use of anti-retroviral treatment throughout a patient’s life, often incurring costs for many years into the future. In evaluating such long-term therapy, the health forgone in future years will depend on the cost-effectiveness threshold in those years. However, in

comparing similar mutually exclusive interventions (e.g. two forms of chemotherapy for breast cancer), the distributions of costs and benefits over time tends to be similar, and assumptions about changes in k over time are unlikely to have a major impact on which therapy is considered cost-effective. For these comparisons, modelling changes in k over time is not generally undertaken. Rather, such changes are assumed to be reflected in the discount rate applied to benefits accrued in the future.[19]

In the context of assessing the net impact on population health of reallocating funding from, say, a medical treatment to a preventive intervention, this distribution of costs and benefits over time might be quite different between the investment and the disinvestment. For many medical treatments, both costs and benefits are likely to accrue at a similar rate over time. By their nature, preventive interventions are more likely to exhibit a different pattern whereby costs are committed early but benefits (and cost savings) do not accrue until later. This pattern would be true, for example, of a public health programme designed to encourage children to eat healthily with the objective of reducing the rate of obesity which is a risk factor for longer term health problems associated reductions in population health with medical costs. In comparing interventions with such a different pattern of costs and benefits, changes in k over time can have an impact on whether the reallocation of resources is expected to have a positive impact on population health.

This is shown in Figure 2 which compares the present values of the net health benefit for a treatment with a cost of £1,000,000 per annum and generating 100 QALYs per annum over a 10 year period, with a preventive intervention which costs £9,000,000 in year one and produces 1000 QALYs in year 10. For each intervention at every point in time costs (C_t) are translated into benefits forgone using k_t relevant at that time-point, and netted off the health benefits the intervention generates at that point to produce a net health benefit at each time point (NHB_t) in terms of QALYs:

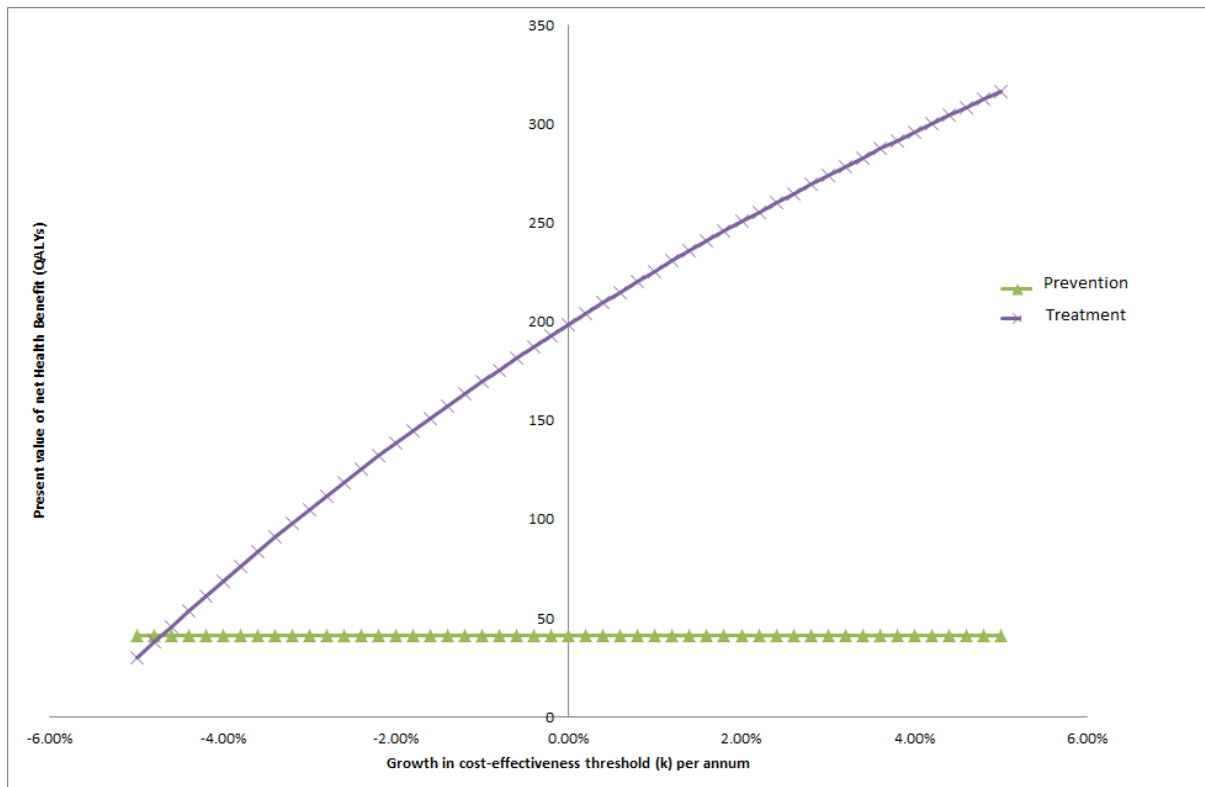
$$NHB_t = h_t - \frac{C_t}{k_t} \quad (\text{Equ 1})$$

Using a constant discount rate of 3.5% per annum, the figure shows how the present value of the future flow of net health benefits for each intervention varies with the growth in k . For the preventive intervention all costs fall in year 1 which impose opportunity costs in terms of health only in that year (at the year 1 threshold which is assumed to be £13,000). Therefore, when assuming a fixed discount rate, negative or positive growth in k has no impact on the present value of the future stream of net health benefits for the prevention intervention. This is quite different for the treatment because it imposes costs on the budget in each year. When k is assumed to be constant over time (growth in $k = 0.00\%$) and with a fixed discount rate of 3.5% per annum, treatment will obviously generate a greater present value of the flow of net population health over 10 years than prevention.

However, negative growth in k means that future costs are expected to displace more health (i.e. as the denominator in Equ 1 above gets smaller health forgone increases). As a consequence the net health benefits of the treatment option will be lower in future periods. The difference in the present value of flow of future net health benefits between the two types of intervention reduces with

falling k until, with a negative growth of approximately 4.7% per annum, the present value of net health benefits are the same for treatment and prevention. With positive growth in k over time, the future costs of treatment are less important as they displace less health, net health benefits of treatment increase and the impact is to make the treatment's superiority, in terms of the present value of 10-year net health benefit, greater.

Figure 2: The impact of growth in k on differences between prevention and treatment on the present value of net health benefits. It assumes a constant discount rate on benefits of 3.5% per annum which does not change with growth in k .

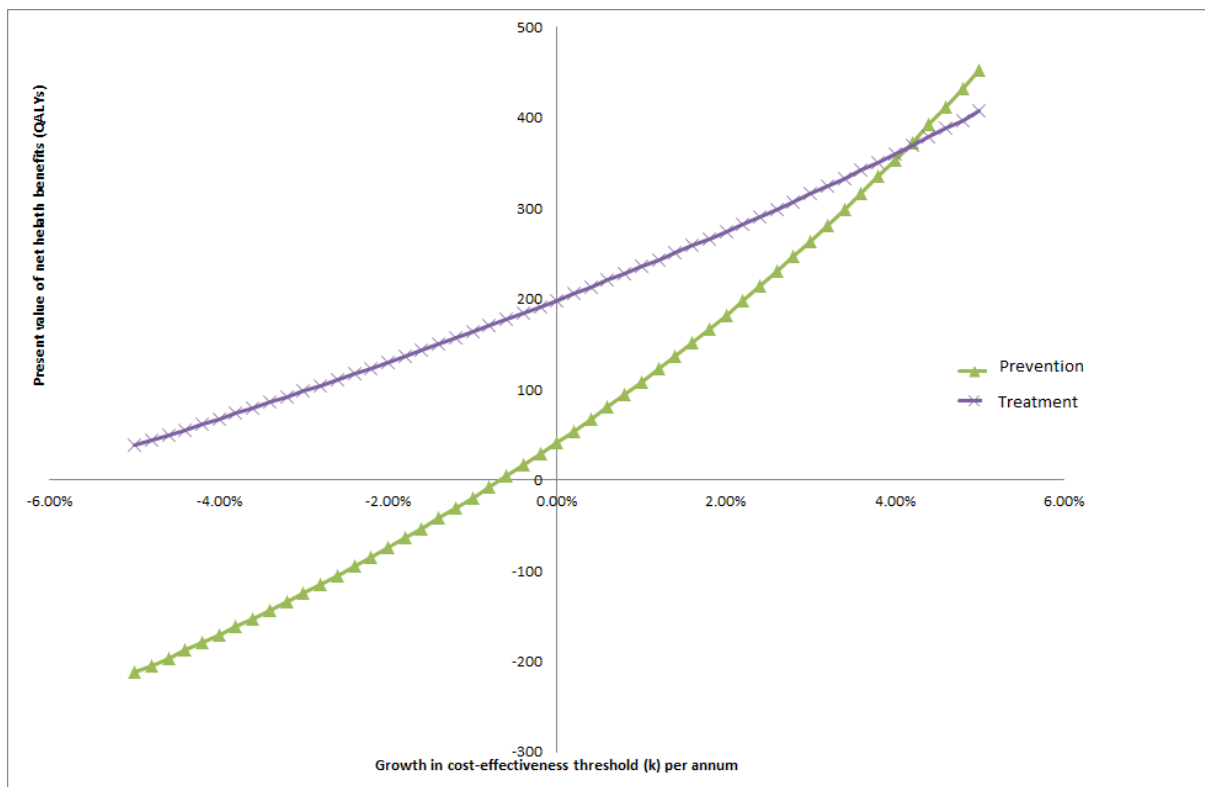


The analysis in Figure 2 assumes a 3.5% discount rate per annum regardless of the growth in k . This effectively means that the discount rate on health is unrelated to changes in k . However, there may be a normative judgment that growth in k reflects the growth in the value of health over time. [19] In which case, when the growth in k is modelled explicitly, the appropriate value of the discount rate on health benefits will be the opportunity cost of capital minus the growth in k . [19] This will have quite different implications for the difference in the present values of future net health benefits between treatment and prevention, as shown in Figure 3. When k is constant (growth is zero), so the opportunity cost of capital and the discount rate on benefits are equal (assumed 3.5% per annum), treatment generates the same additional present value of future net benefits in population health as in Figure 2. With positive growth in k , however, there are two factors to consider. The first is again common to the scenario shown in Figure 2: the rate at which health is forgone falls, so costs falling in the future are less important as they displace less health, so costs falling in the current period are relatively more valuable. The second factor is that there is also an impact on the relative value of future and current health. If the discount rate on health benefits is taken as the opportunity cost of capital minus the growth in k , positive growth in k means future health is

relatively more valuable than current health. Conversely, for a negative growth in k , the rate at which health is forgone in the future increases, so costs falling in the future are more important as they displace more health. But negative growth k also means future health is less valuable relative to current health, so a judgment can be made that the discount rate on benefits increases over time. The difference between Figures 2 and 3, therefore, is that it reflects the potential impact of growth in k on the discount rate for health benefits. As a result, Figure 3 shows a quite different shape to that in Figure 2, and indicates that, with negative growth in k , treatment is increasingly more attractive than prevention. However, with positive growth in k , prevention is likely to be considered the better option at a growth rate in k above about 4.1%.

Given the potential importance of changes in k over time when considering the types of reallocation relevant to this report, there are good reasons to separate out any future changes in k from the discount rate on health benefits. This would be the case whether or not the appropriate discount rate on benefits is considered to reflect in the growth in k over time. How k may be expected to change in the future is likely to matter when judging the appropriateness of the types of reallocation considered in Sections 2.2 and 2.3. A range of factors will determine this rate of change.[9] This includes the extent of any real terms increase or decrease in the relevant budget(s) over time, changes in the productivity of the services funded through the budget and the extent of 'health production' outside the relevant budget and whether this acts as a complement or a substitute to health production inside the budget.

Figure 3: The impact of growth in k on differences between prevention and treatment on the present value of net health benefits. It assumes the discount rate on benefits is equal to the opportunity cost of capital minus the growth in k .



3. EVIDENCE TO INFORM THE ANALYTICAL FRAMEWORK

This section considers the extent of the evidence available to populate the analytical framework outlined in Section 2. It covers the evidence relating to the cost-effectiveness of specific treatment, prevention and care interventions, and well as available estimates of relevant cost-effectiveness thresholds.

3.1. THE COST-EFFECTIVENESS OF SPECIFIC INTERVENTIONS

3.1.1. Evidential requirements

In the case of directed investment and disinvestment, there are clear evidence requirements relating to the cost-effectiveness of specific treatment, prevention and care interventions. In the case of DH direction, this evidence would be needed to define suitable interventions for investment and disinvestment. For undirected changes, other decision makers – particularly at a local level – would need to have such evidence available to guide investment and disinvestment.

This evidence would ideally have the following characteristics:

- Estimates of the expected costs and health outcomes of candidate interventions for investment or disinvestment.
- The comparison of these estimates to the range of mutually exclusive alternative interventions which are or could feasibly be used in the NHS for the relevant patient/client group. These comparators could include management strategies, such as the sequencing of pharmaceuticals or diagnostic tests, as well as specific interventions.
- Costs and benefits would be estimated to reflect current NHS practice, resources and prices.
- Estimates of cost-effectiveness should provide separate estimates of costs falling on different budget constraints. This would be in order to reflect the different opportunity costs of resources (marginal productivity) relating to those budgets. For example, the cost implications (which may be positive or negative) of preventive interventions falling on the NHS, local authority and other budgets (e.g. criminal justice) should be presented separately.
- If the main focus is changes in population health, the health outcomes associated with candidate interventions should be presented in terms of a generic measure reflecting changes in survival duration and HRQoL. This facilitates comparison with the changes in health outcomes associated with matching (dis)investment or interpretation alongside estimated of cost-effectiveness thresholds. The QALY represents the most widely used measure for this purpose.
- The estimates of cost-effectiveness should adequately reflect the full range of evidence available. This would relate to the epidemiology of the disease being treated or that is the target of prevention, its impact on HRQoL and budget-specific costs, and the effectiveness and cost of treatment, prevention and care interventions. The key principle is that evidence is not drawn selectively to estimate cost-effectiveness.
- Heterogeneity in the underlying evidence, to the extent that it suggests materially different estimates of cost-effectiveness for alternative sub-groups of patients/clients, should be reported. In the context of such heterogeneity, investment and disinvestment decisions

may need to relate to sub-groups rather than to the entirety of particular patient/client groups.

- The uncertainty associated with the various types and sources of evidence is adequately reflected in the analysis.[20] Ideally this would provide the overall likelihood of the candidate interventions offering net gains in population health (conditional on alternative estimates of cost-effectiveness thresholds) on the basis of probabilistic sensitivity analysis, together with some indication of implications of wrong decisions regarding the use of the interventions and hence the potential value of further research.

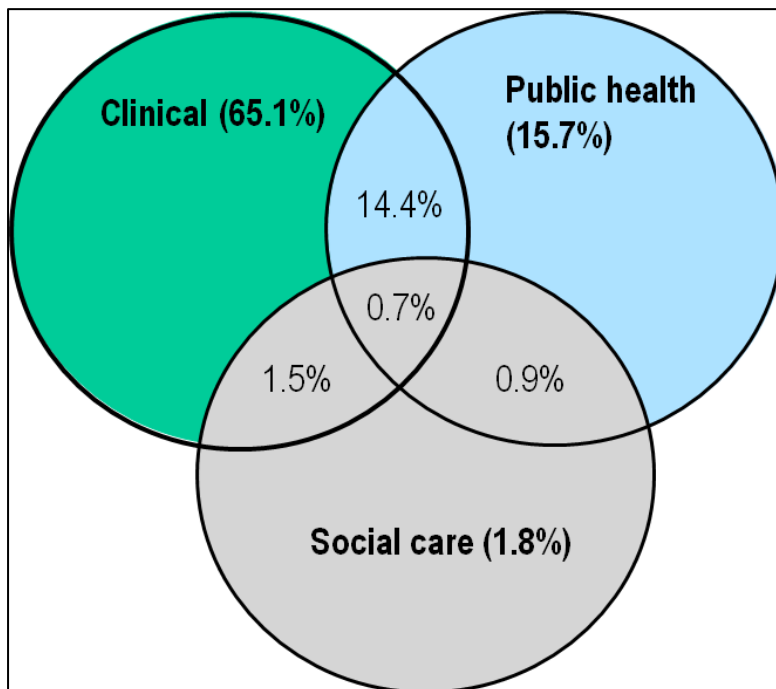
Outlining these characteristics is not to suggest that only 'ideal' studies can be incorporated into the analytical framework. It should be anticipated that much of the evidence base will have serious weaknesses which limits its value to inform the framework. However, understanding these weaknesses and seeking to quantify their implications for the magnitude and direction of bias in their results, and for related measures of uncertainty, will allow the maximum use of available evidence.

A body of cost-effectiveness evidence on interventions has developed over the last 25 years or so. The evidence base is, however, much more developed for medical services than for interventions in public health or social care. The NHS Economic Evaluation Database (NHS EED) (<http://www.crd.york.ac.uk/CRDWeb/>) provides a useful overview of the quantity of evidence available. Figure 4 shows how economic evaluation evidence in the database relates to the different types of intervention of interest. Nearly 80% of available studies relates to medical interventions. Relative to the available evidence on the cost-effectiveness of prevention and care, therefore, there will be a firmer base for decision making for medical technologies and interventions. However, NHS EED reveals that only 18% of studies are focussed on the UK, and only 23% are 'cost-utility' studies which would suggest they use QALYs as the measure of benefit.

3.1.1. Cost-effectiveness of medical services

Although the evidence base is greater for medical interventions, it is still likely to be very small in comparison to the number of clinical interventions and treatments which exist and are currently used in the NHS. There appears to be little evidence on the proportion of NHS activity for which there is cost-effectiveness evidence, although some clues may come from the international literature. Neumann *et al* looked at the extent to which cost-utility studies (QALY-based CEAs) had reflected areas of high medical need as indicated by disease burden in the USA. The study found a relatively large proportion of studies in high burden areas such as diabetes, HIV and breast cancer, but a relatively small share in high burden areas such as depression, injuries, substance abuse and chronic obstructive pulmonary disease.[21] Chambers *et al* identified 267 individual coverage decisions for National Coverage Determinations by the Centres for Medicare and Medicaid Services in the USA.[22] Of these 64 (24%) had economic evaluation evidence associated with them.

Figure 4: Distribution of economic evaluation studies across different types of intervention and programme in from the NHS Economic Evaluation Database (n=18,743)

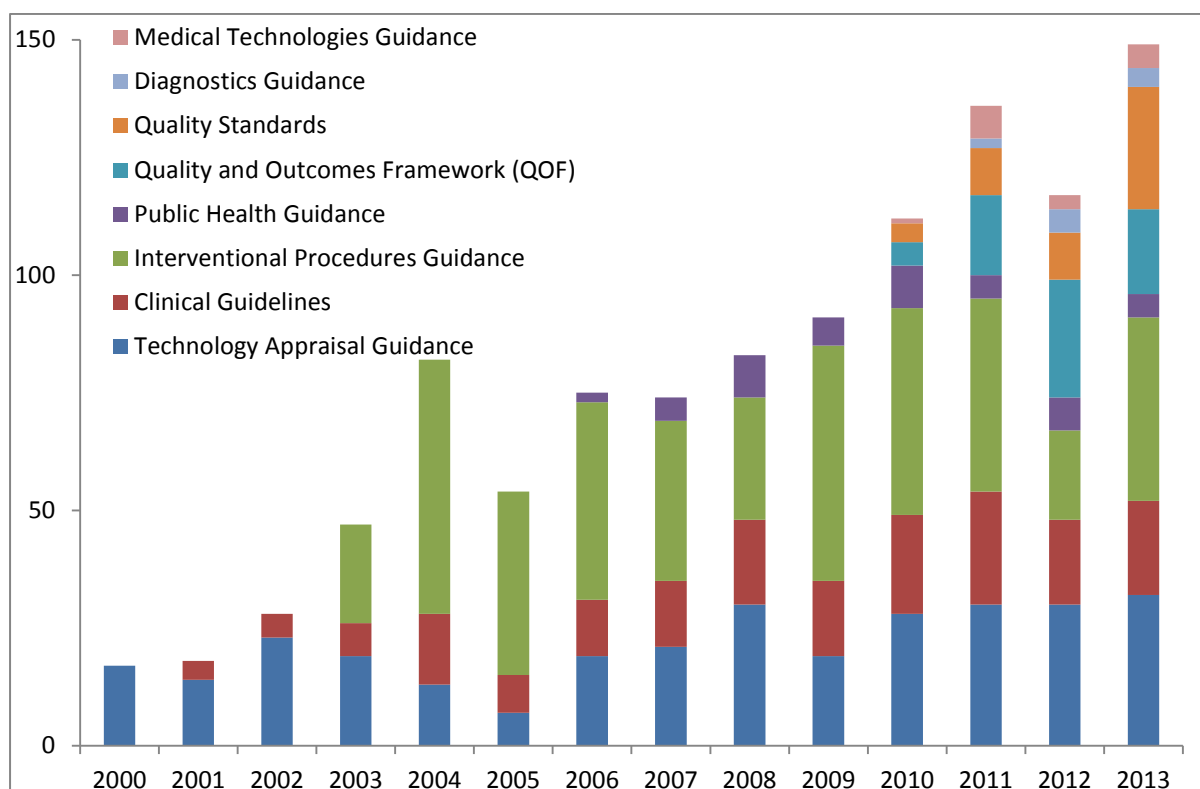


Within the UK, a range of research has been undertaken to develop the evidence base for cost-effectiveness of medical services. Two bodies, in particular, are responsible for this developing evidence base: the National Institute for Health and Care Excellence (NICE) and the National Institute for Health Research (NIHR).

National Institute of Health and Care Excellence (NICE)

Since 1999, NICE has provided the NHS with evidence on the effectiveness and cost-effectiveness of potentially health-enhancing interventions. Figure 5 shows how the guidance has been distributed over the different programmes of NICE's work over time. Originally there were two programmes, clinical guidelines (providing evidence on appropriate pathways of care for patients) and technology appraisals (providing evidence on specific interventions). A large number of additional programmes are now part of NICE's remit including, very recently, social care and safe staffing which are yet to produce guidance. Most of the activities shown in Figure 5 generate economic evidence, with the exception of the Interventional Procedures Programme.

Figure 5: Distribution of NICE guidance over time [23]

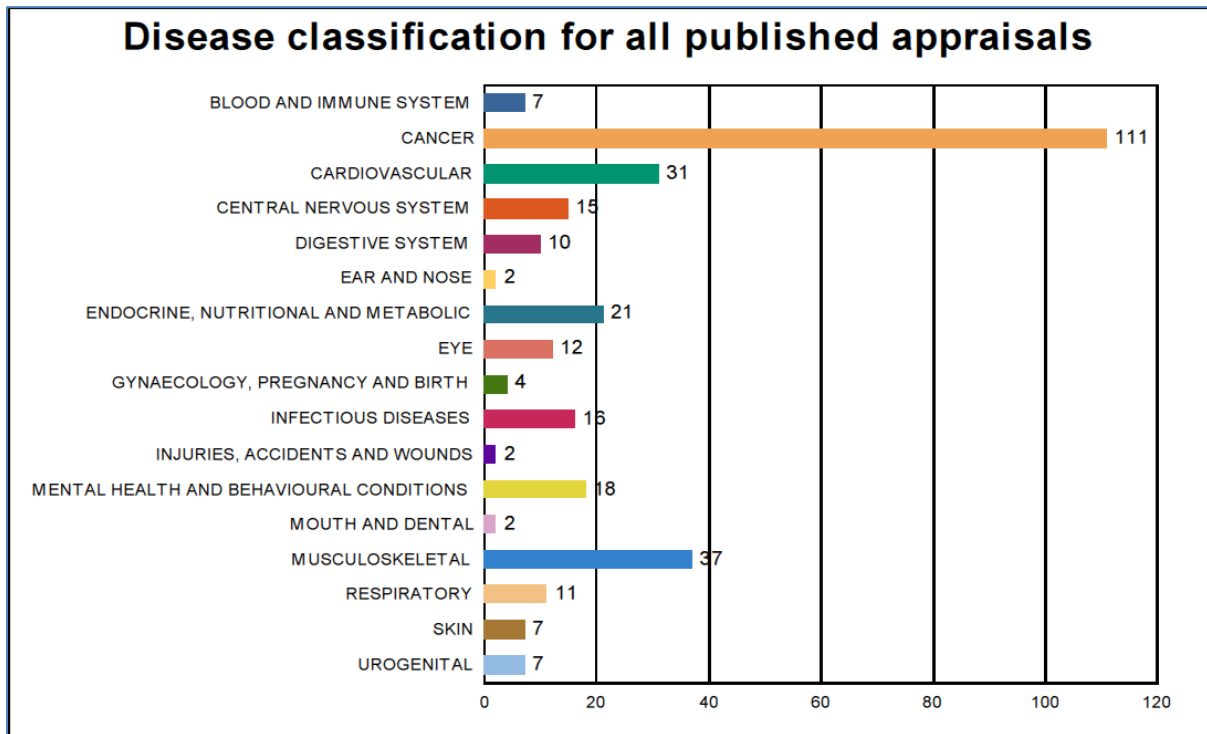


The programme for which cost-effectiveness evidence has been most central is technology appraisal. Appraisals relate primarily to newly licensed pharmaceuticals with a much smaller consideration of older pharmaceuticals and therapeutic devices. Each of these provides estimates of the cost-effectiveness of the relevant technologies versus appropriate comparators. Figure 6 provides a summary of the distribution of technology appraisals over a range of clinical areas. New therapies for cancer dominate (n=111, 35% of all appraisals), and some large areas of clinical practice are likely to be under-represented (e.g. injuries accidents and wounds (n=2, 0.6%), and gynaecology, pregnancy and birth (n=4, 1.3%).

NICE has published 179 clinical guidelines ranging from the treatment of schizophrenia (CG1) to the management of pressure ulcers (CG179).[23] Most guidelines include cost-effectiveness evidence, although generally this does not cover all aspects of care within a particular clinical area.

Since 2010, NICE's Medtech programme has produced guidance on a relatively small number of therapeutic and diagnostic devices (17 and 11, respectively). The former generally provides only cost and outcome data, the latter includes full CEA. Full details of the work undertaken by NICE can be found at www.nice.org.uk.

Figure 6: Distribution of NICE’s published technology appraisals across clinical areas (Jenniffer Prescott, NICE, personal communication)



National Institute for Health Research (NIHR)

The NIHR commissions research that supports decision making by professionals, policy makers and patients. Its activity is distributed over a number of programmes including Health Technology Assessment (HTA), Health Services and Delivery Research and the Public Health Research Programme. The largest programme is HTA which has been running since 1993 and has seen a major increase in its funding (approximately £75 million in 2013-14). This is also the NIHR programme which is most likely to include economic evaluations, with these being typically undertaken alongside clinical trials or systematic reviews.

Figure 7 summarises the number of completed projects funded as part of the NIHR’s main research programmes. It breaks these down between those relating to all NIHR programmes and those funded specifically by the HTA programme. It shows the distribution of these projects between Health Research Classification System (HRCS) research activity codes. The largest proportion of completed projects relate to treatment evaluations, most of which are likely to include some form of economic evaluation. There are also 192 completed projects defined as relating to prevention. Figure 8 shows the same completed projects (distinguishing all NIHR projects from those funded by the HTA Programme), but distributed across health categories. This suggests quite an even distribution of projects, although cancer, cardiovascular and generic health are the largest categories.

Figure 7: Completed NIHR projects by HRCS research activity codes[24]

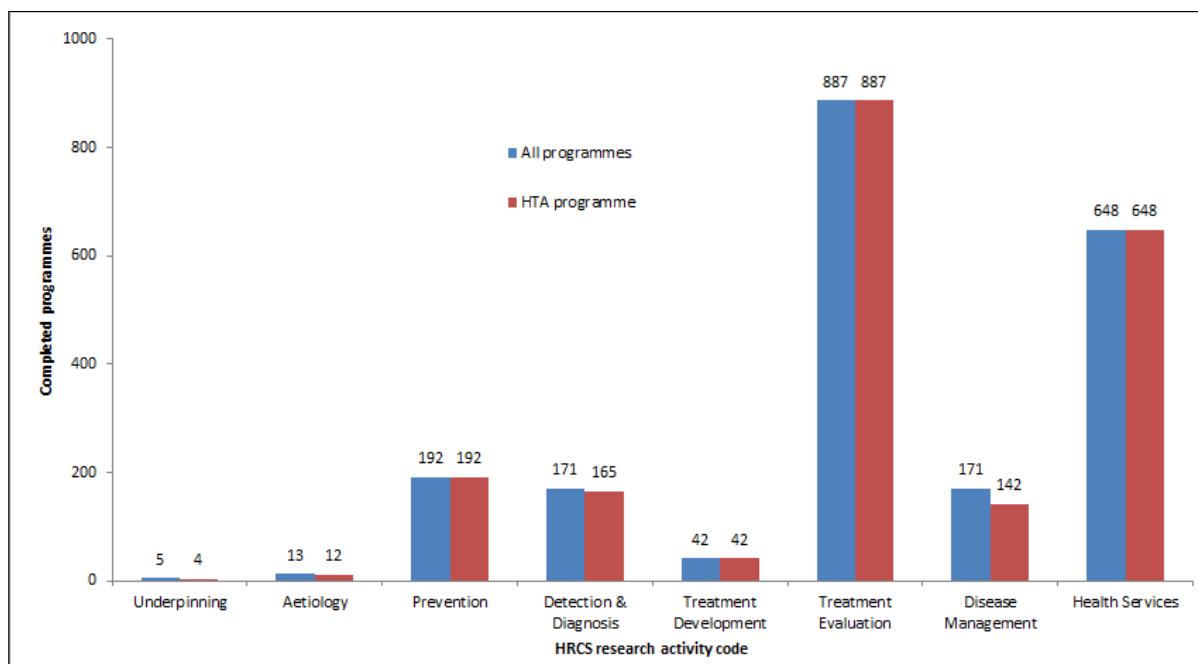
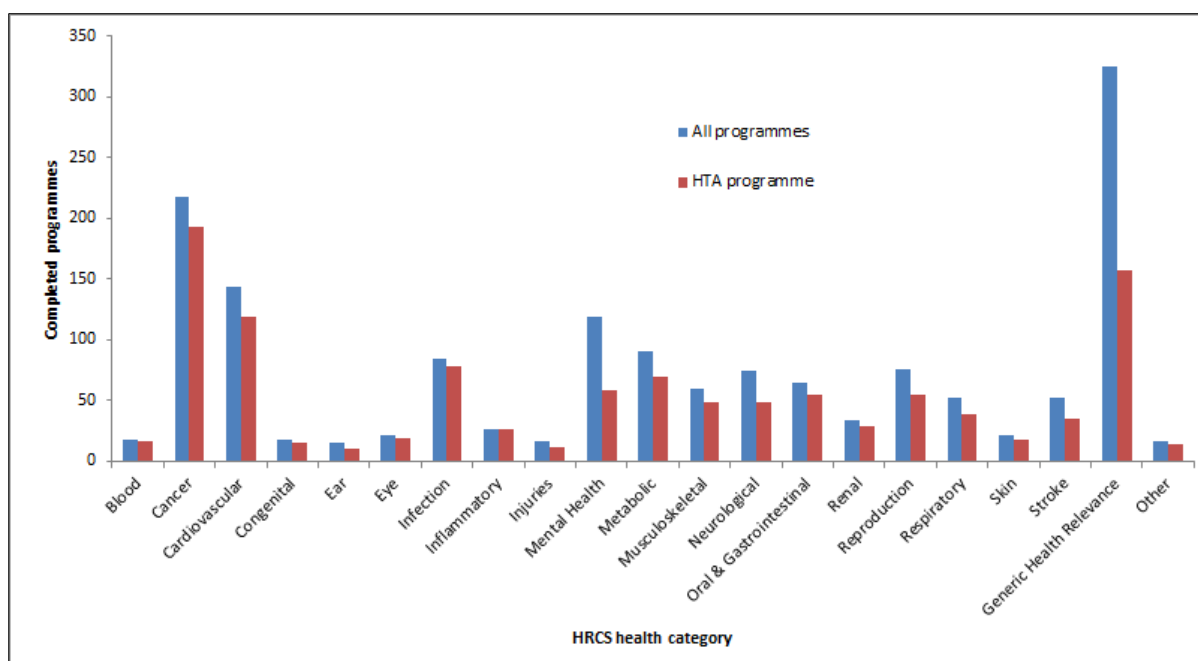


Figure 8: Completed NIHR projects by HRCS health categories[24]



Disinvestment

There appears to be no published breakdown between economic evaluations primarily informing investment decisions and those relating to potential disinvestments. Indeed, such a categorisation would be challenging, not least because last year's investment could be next year's disinvestment.

However, there seems to be good reason to think that the majority of economic evaluation studies in the published literature relating to medical services focus on new medical technologies; in particular, branded prescription pharmaceuticals. Although such studies may have been undertaken, mainly to inform investment decisions (pricing and reimbursement) in the UK and elsewhere, they may also be used to guide disinvestment. It would be expected that little cost-effectiveness evidence exists on a very large proportion of NHS medical services, particularly those relating to activities such as diagnostics and rehabilitation. Economic evidence relating to broader resource allocation issues in the NHS such as infrastructure development, staffing decisions and service configuration is likely to be vanishingly small. Potential candidates for disinvestment can be seen in these areas of NHS resourcing as well as in medical technologies.

Compared to the focus of the NICE and the NIHR on new interventions and programmes, there has been relatively little organised research with a primary objective of informing disinvestment decisions. NICE has sought to contribute to this type of evidence and provides a database of 'do not do recommendations' (<http://www.nice.org.uk/usingguidance/donotdorecommendations/>). NICE has concluded, however, 'that there are few obvious candidates for total disinvestment' and that 'many suggestions for total disinvestment are based on a "social judgment" about whether it is appropriate for the NHS to fund the intervention rather than evidence of poor clinical or cost effectiveness for example, cosmetic surgery or orthodontics'.^[25]

The Quality, Innovation, Productivity and Prevention (QIPP) programme, established in 2013, has aimed to make the NHS more efficient, with the effect of releasing funds for treating patients and to allow the NHS to respond to changing demands and new technologies.^[26] For example, guidance on cost-effective prescribing has been published under the QIPP work stream 'Medicines and procurement'. A total of 19 case studies in how to improve quality and productivity are detailed on the QIPP website (<https://www.evidence.nhs.uk/qipp>).

Programme budgeting and marginal analysis has been used in the context of disinvestment and may useful augment the analytical framework described in Sections 2.2 and 2.3.^[27]

3.1.2. Cost-effectiveness of public health activities

The cost-effectiveness of public health activities has been the focus of less research. Many reviews have found a poor level of evidence has hindered the setting of public health policy priorities,^[28-31] largely driven by a lack of investment in trials and data collection by private groups.^[29]

In the UK, NICE has been at the forefront of efforts to produce evidence on the cost-effectiveness of public health activities. NICE public health guidance makes recommendations for populations and individuals on activities, policies and strategies that can help prevent disease or improve health.^[32] The NICE Public Health Interventions Advisory Committee (PHIAC) considers and interprets evidence on the effectiveness and cost-effectiveness of public health interventions and makes recommendations on which to encourage. This guidance is produced to inform a range of stakeholders, including the English NHS, local authorities and the Department of Health.

Owen *et al* details 200 interventions considered by PHIAC.^[33] They found that 15% of interventions were both more effective and cheaper than their comparator, 85% of all interventions considered were cost-effective at a cost-effectiveness threshold of £20,000 per QALY and 89% were cost-

effective at a threshold of £30,000 per QALY. Of the interventions considered, smoking cessation accounted for the majority of the estimates (63.5%), physical activity accounted for 10.5%, alcohol prevention 7.5% and prevention of sexually transmitted diseases 7%.

Whilst PHIAC has been successful in producing evidence on a wide range of public health activities, an important limitation of the approach taken has been the failure to account explicitly for costs (and indeed non-health outcomes) falling on different sectors and budgets. Instead, costs are typically aggregated across sectors. This ignores the opportunity costs associated with the budgets on which costs fall. In the context of the analytical framework presented in Section 2, this limitation reduces the usefulness of a proportion of studies where there are expected to be spill-over effects outside the NHS and public health.

Costs of public health activities can fall into five categories; i.e. those falling on the NHS, local authorities' public health budgets, local authorities' general budgets, other public sector budgets and private consumption outside of the budget-constrained public sector. This breakdown is further considered in Appendix B, which has then been applied to the interventions considered in Owen *et al.*[33] The majority of PHIAC guidance resulted in a cost burden falling on the NHS (66% of guidance) and local authority public health spend (66%), with fewer falling on non-public health local authority spend (48%), the wider public sector (44%) or the private sector (12%). This analysis also showed that only one of the PHIAC guidelines considered interventions where the costs fall on only one of these categories.

A further issue with the evidence produced by PHIAC is the failure to identify current practice within the area in which the guidance is being issued. It is important to have some understanding of what activities are currently funded to make sure that the cost-effectiveness of any new interventions are estimated compared to the appropriate comparators (which would include current practice). Furthermore, to implement the sort of analyses suggested in Section 2, it would be necessary to know whether particular preventive interventions that are candidates for new investment are already being used in the NHS and, if so, how fully they have been implemented. The majority of economic evaluations undertaken to inform PHIAC implicitly assume that current practice implies no current activity in that area of public health. In this respect all ICERs reported are relative to a case of 'do nothing'.

The failure to consider current practice in public health, however, is not easily overcome. The recent transfer of responsibility for resource allocation in public health from NHS to local authorities and the associated decentralisation of decision-making have increased the challenge associated with characterising current national practice. The Health and Social Care Act (2012) obliges local authorities to provide a range of public health initiatives: the National Child Measurement Programme, population health checks, open access sexual health services and Public Health Advice Service to CCGs. However, the level of activity to be provided is flexible and many of the interventions are focused on data collection rather than specific preventive interventions. The collection of information on current practice in public health currently appears highly variable between local authorities.

NICE's role with respect to public health interventions and programmes is one of synthesis and modelling of existing evidence. The generation of primary evidence in the UK is, again, largely the responsibility of the NIHR generally. Key programmes include the NIHR's Public Health Research

Programme (<http://www.nets.nihr.ac.uk/programmes/phr>) (which has completed fewer than 10 studies to date) and the School for Public Health Research, and the DH's Policy Research Programme's Public Health Research Consortium (<http://phrc.lshtm.ac.uk/>). NHS England also commissions potentially relevant research in this area. A significant piece of research is being undertaken by the UK Health Forum, commissioned by Public Health England. They are developing a model of chronic diseases in the UK focusing on modelling scenarios for three key risk factors. Public Health England will then want to link the outcomes of this work to help to establish the cost-effectiveness of interventions that might be recommended or adopted at local and national levels.

3.1.3. Cost-effectiveness of social care

The economic evaluation of social care is associated with a number of challenges, as discussed in a report by the Social Care Institute for Excellence's (SCIE).[34] The first is the wide range of stakeholders involved in, and impacted by, investment and disinvestment decisions in social care requires the use of a broad analytical perspective to capture fully the social implications of any decision. However, the realities of applying such an approach are far from clear, as discussed in Section 2.

Secondly, the relatively poor understanding of the merits of the different measures of well-being relevant to social care (including ASCOT, OPUS and ICECAP) and the ability of measures of health, such as EQ-5D, to incorporate the outcomes of interest in social care, represents an existing challenge may be expected to be overcome as further research is conducted.

Finally, the consideration of equity in the funding of social care represents a challenge to the application of economic evaluation as there are no clear methods for incorporating such decisions within existing frameworks. SCIE's report[34] recommends the publication of full costs and outcomes on a range of population subgroups to facilitate a wide range of decision making strategies.

These challenges are reflected in the limited use of economic evaluation in much of social care. In their 2002 report, Sefton *et al.* conducted a systematic review of published social care economic evaluations between 1996 and 2000, finding only 30 internationally published studies, with no annual growth over the period.[35] In contrast a similar review found in an earlier five year period (1991-96) 450 health care economic evaluations had been published, with significant growth in number of publications over time. While it is unlikely that such divergent trends have continued, as policy maker interest and methods development have grown, there still exists a significant shortfall in the number of social care economic evaluations.

Curry conducted a review of cost-effectiveness evidence in preventive social care.[36] She found a wealth of qualitative information on the value of low-level interventions (e.g. providing slippers to prevent falls) but a lack of evidence proving causality to subsequent service use (e.g. hospitalisation due to falls) and, therefore, cost-effectiveness. Weatherley *et al.*, in a subsequent review of economic evaluations of long term care interventions, found a lack of clarity in the methods and reporting of results in studies.[37] They found 79% of the 29 studies reviewed included multiple outcomes; informal care was evaluated in 38% of studies (all using different values of time); 90% included costs falling on the health care sector, with 84% including broader costs. Recent work by Forder *et al.* has used survey data to examine the cost-effectiveness of care services in the UK.[38]

There are ongoing efforts in the UK to improve the evidence base of the cost-effectiveness of social care interventions. Since 2009, the School of Social Care Research (<http://www.sscr.nihr.ac.uk/>) has been working on developing the evidence based for adult social care practice by commissioning and conducting research. Whilst the majority of projects funded focus on best practice with limited consideration of cost-effectiveness, some of the research will include economic evaluation.

Since 2013, NICE has been responsible for developing guidelines and quality standards for social care in England through its NICE Social Care Programme.[39] The programme has produced only one draft guideline so far (SG1: Managing medicines in care homes), but eight are currently in development and are anticipated for publication during 2015 and 2016. In addition, a 'Social Care Guidance Manual'[40] has been produced against which all subsequent social care guidance assessments should be considered. The guidance reference case stipulates that the Guidance Development Group should be encouraged to consider the use of cost-effectiveness analysis in the consideration of guidance, with extensive detail on the appropriate estimation of costs and outcomes associated with the intervention and its comparators. However, the only published guidance (SG1) has no reference to cost-effectiveness. As a result, it is unclear as to what extent future guidance will employ estimates of cost-effectiveness to inform recommendations.

3.2. MARGINAL PRODUCTIVITY OF DIFFERENT BUDGETS

Central to the analytical framework described in Sections 2.2 and 2.3 are the cost-effectiveness thresholds associated with the different budgets between which resource reallocation is being considered. These are clearly central to undirected investment and disinvestment decisions, as these estimates of the marginal productivity of different budgets provide the basis for determining whether a re-allocation between one budget and another is likely to increase population health. As outlined in Section 2.3, however, the threshold estimates are also important in assessing the potential of directed investment and disinvestment opportunities. This is because they provide benchmarks for what can be expected to be achieved, at the margin in terms of health outcomes, from expenditure falling on the budget.

3.2.1. Marginal productivity of NHS expenditure

Although the interpretation of cost-effectiveness studies has always needed a cost-effectiveness threshold, these have generally been considered implicitly. NICE is one of very few decision-making organizations internationally to have been explicit about the cost-effectiveness thresholds it uses for decisions relating to the NHS.[41] NICE has been employing an explicit threshold range of £20,000 to £30,000 per QALY gained since its 2004 methods guide.[42] There have been numerous challenges to the threshold value [43, 44] (and criticisms of the lack of an evidence base for its estimation[45]). Several approaches to estimating the threshold have been considered including the use of previous NICE decisions and a detailed analysis of the specific investment and disinvestment decisions.[46] These methods have a number of major limitations, and have failed to generate a useable estimate of the threshold to guide decisions.

Recently published work by Claxton *et al.* was the first to develop and implement methods to quantify the cost-effectiveness threshold by directly estimating the marginal productivity of the

budget for the English NHS based on routinely available data.[9] The approach builds on previous econometric research which used PBC data across primary care trusts (PCTs) in the English NHS to estimate the relationship between variation in overall NHS expenditure and variation in mortality, and as such estimating the marginal productivity of NHS expenditure in terms of mortality.[47, 48] As part of the recent research, the econometric analysis was updated and further extensions were implemented including estimating the impact of marginal increases or decreases in overall NHS expenditure on spending in each of the 23 PBCs. These were linked to changes in mortality outcomes by PBC across 11 PBCs. The link between the econometric analysis and estimating the overall threshold in terms of QALYs involved (i) linking estimated effects on mortality to life years; (ii) accounting for the health (QALY) effects of changes in mortality due to changes in expenditure reflecting how HRQoL differs by age and gender; and (iii) incorporating those effects on health not directly associated with mortality and life year effects (i.e., the 'pure' HRQoL effects).

Full details of the methods and results from the study are available in the final report.[9] From the perspective of this report, some of the key considerations are:

- The central or 'best' threshold is estimated to be £12,936 per QALY based on 2008 expenditure and 2008-10 mortality data.
- Simulation methods used to reflect the combined uncertainty in the various estimates from the econometric analysis indicated that the probability that the overall threshold is less than £20,000 per QALY is 0.89 and the probability that it is less than £30,000 is 0.97.
- A number of sources of 'structural' uncertainty are also present in the analysis, particularly relating to the links between the econometric analysis and the threshold in terms of QALYs. On balance, the central or best estimate of £12,936 was considered, if anything, an overestimate.
- The central estimate of the threshold was based on estimates of the health effects of changes in expenditure across all 152 PCTs, some of which will be making investments (where expenditure is increasing) and others making disinvestments (where expenditure is reduced or growing more slowly) over the periods considered. The threshold was re-estimated for these different types of PCTs and, as would be expected, the central estimate of the threshold is likely to be an overestimate for disinvesting PCTs. This is relevant to decisions relating to the reallocation from the NHS towards local authority budgets.
- The same methods were used to consider how the cost per QALY threshold is likely to have changed from 2007 to 2008 as overall expenditure has increased. This provides some insights into how the threshold might be expected to change over time as, for example, overall expenditure and NHS productivity changes. This suggests that the overall threshold will not necessarily increase with growth in the real or even nominal NHS budget.
- The methods of analysis can identify not only how many QALYs are likely to be forgone across the NHS when additional costs are imposed on the NHS, but also where those QALYs are likely to be forgone and how they are made up, i.e., the additional deaths, life years lost and the HRQoL impacts on those with disease.

This research provides an empirical platform for the NHS cost-effectiveness threshold to inform resource reallocation decisions associated with medical, preventive and care interventions. However, this work could be extended to provide stronger support for decision making. This is discussed further in Section 6, but could cover updating the threshold over time; assessing the likely

trajectory of the threshold in the future and the implications for the balance in cost-effectiveness of medical versus preventive interventions; strengthening estimates of marginal productivity of specific PBCs; providing threshold estimates for different types of CCG to provide benchmarking for investment and disinvestment at a local and national levels.

3.2.2. Marginal productivity of public health expenditure

No previous research has been identified which has estimated the marginal productivity of public health budgets. Claxton *et al's* research to estimate the NHS threshold discussed in the last section reflected NHS expenditure on prevention and public health in several PBCs, although separate estimates of the marginal productivity of this activity were not possible.[9] Although there will undoubtedly be data challenges, updating and further development of this work can provide relevant estimates of the marginal productivity of local authority public health budgets in terms of population health.

Further work may be informed by Public Health England's current work to produce a Spending and Outcome Tool (SPOT) to help inform local authorities of how their spends and outcomes compare to other local authorities. The SPOT tool aims to incorporate all local authority costs by sub-category and any outcome measures that may be relevant to that category. They have previously produced SPOTs for CCGs and PCTs which considered costs by PBC and PBC-specific health outcome indicators (e.g. mortality from cancers, smoking quit rate, total sight tests per 100,000). The SPOT for local authorities is to be made publically available shortly. The tool will initially only contain data for 2013-14, but it is expected to be continuously populated into the future. Further details of the SPOT data are presented in Appendix C. There may also be value in establishing whether cost-effectiveness analysis, with explicit empirical thresholds, is used elsewhere in local authorities.

3.2.3. Marginal productivity of social care expenditure

Nothing as extensive as the research on NHS cost-effectiveness thresholds has been developed regarding the marginal productivity of social care budgets. However, some work has begun to emerge which may provide a useful guide to decision making. Recent work by Forder *et al.*, which has the objective of developing a method to estimate the incremental cost-effectiveness of home care services in older people based on survey data, may also constitute a valuable source of evidence on the marginal productivity of social care.[38] The authors used a production function method to establish the counter-factual in terms of the relationship between care-related quality of life and the intensity of the service available based on the cost of respondents' home care package. Care-related quality of life was measured using the ASCOT measure (see Section 2.4 and Appendix A). Across all clients in the survey, the estimated incremental cost per additional unit of care-related quality of life of a 1 hour change in care intensity (at the average level of intensity) was £50,311. The analysis is exploratory and relates to a particular area of social care expenditure, but can be considered a measure of marginal productivity. The extent to which it is directly comparable to estimates of the cost-effectiveness threshold in the NHS depends on whether the measure of benefit can be interpreted as a social care QALY. This would depend on the impact of care intensity on clients' survival duration and comparison of the ASCOT measure with measures of HRQoL such as the EQ-5D (see Appendix A). The authors are continuing work in this area as part the Quality and Outcomes Research Unit.

4. WORKSHOP

As part of this project a workshop was conducted, the aim of which was to receive feedback from participants as to the appropriateness of the methods proposed in the scoping project and the feasibility of their application given existing and future data. The workshop also aimed to identify the future research, data and analysis that would be required to populate the framework in such a way as reliably to inform resource allocation.

The workshop was chaired by Anna Dixon, Director of Quality and Strategy and Chief Analyst at the Department of Health, and was attended by policy makers and academics with expertise in economics, economic evaluation, health technology assessment, public health and social care. Organisations represented included the Department of Health, NHS England, NICE, Public Health England, the UK Health Forum, Brunel University, University of Kent, Kings College London, London School of Economics, University of Sheffield, and University of York. A full list of attendees can be found in Appendix D.

The workshop included a series of presentations followed by group discussions and a plenary discussion to finish. These are briefly discussed below.

4.1. PRESENTATIONS

Below is a brief description of the presentations. The slides from the presentations are available at <http://eepru.org.uk/>.

- Anna Dixon welcomed all to the workshop and set out the policy challenges which have led to the research being conducted.
- Mark Sculpher, University of York, presented the conceptual framework for considering resource allocation decisions in and between health care, public health and social care which was developed for this research.
- John Brazier, University of Sheffield, discussed methods for valuing outcomes for economic evaluation. He discussed problems in comparing the cost-effectiveness of interventions across sectors resulting from the use of different outcome measures and presented methods for tackling this issue.
- Lesley Owen, NICE, presented on the work conducted by NICE in public health and the work of the NICE Public Health Interventions Advisory Committee.
- Julian Forder, University of Kent and London School of Economics, presented on economic evaluation in social care and work currently being undertaken by NIHR PRU on Quality and Outcomes (QORU).
- Karl Claxton, University of York, presented on research to estimate cost-effectiveness thresholds. He presented recent work on estimating the NHS cost-effectiveness threshold and discussed how this approach could be further developed for the NHS and extended to public health.

4.2. GROUP AND PLENARY DISCUSSIONS

As part of the workshop, participants were allocated into small groups and were asked to discuss the conceptual framework and current and future research needs. Details of the questions, the table allocations and notes from each table are included in Appendix D. Below is a brief summary of some of the key themes which arose from both the group and plenary discussions.

4.2.1 Directed versus undirected investment

- It is important to consider the current institutional arrangements and take account of the issues of local versus national decision making.
- Given local authorities have greater control over public health budgets and that aspects of social care budgets are not controlled by local or national decision makers, significant aspects of resource allocation would have to remain undirected.
- There is a need to consider the role of the centre in providing information in the form of guidelines, rather than mandating activities.

4.2.2 Outcome measures

- It is important to be able to establish outcomes but it may not be desirable to have one common outcome measure (such as well-being) across all types of investment.
- There will, however, be a need for a measure of 'exchange rates' between outcomes so that trade-offs can be made.
- Local authorities will be interested in wider outcomes than just health from public health activities (e.g. externalities such as educational achievement), and these must be taken into account when valuing investments.

4.2.3 Complexity of funding

- Funding of interventions in public health and social care is complex.
- The costs falling on different budgets needs to be accounted for.
- Costs can include unpaid carer activities as well as co-payments to recipients. These complexities need to be considered when establishing the value of investments.

4.2.4 Wider considerations

- It is important to consider outcomes other than those to the individual receiving care.
- Given government priorities, it will be important to consider the implications of investments for growth and GDP.
- Much more attention needs to be given to equity and equality issues.

5. POTENTIAL FUTURE RESEARCH

On the basis of the analytical framework and the review of available evidence, a number of areas of future research have emerged for further consideration. These are summarised below together with indicative time estimates for the work.

5.1. COSTS AND BENEFITS OF SPECIFIC TREATMENT, PREVENTION AND CARE INTERVENTIONS

Section 3 indicates that there is a more extensive evidence base relating to the cost-effectiveness of medical interventions than of prevention and care activities. In comparison to the number of medical, prevention and care interventions, programmes and services that are currently funded from NHS and local authority budgets, this evidence base is likely to be very small. The evidence is also likely to provide a minimal coverage of the vast range of alternative types of services and interventions that could be delivered. Whether or not investment and disinvestment is directed or undirected, national or local decision makers require evidence on the cost-effectiveness of specific activities. Although NICE and NIHR are generating cost-effectiveness evidence, there is a case to review whether studies could be more effectively prioritised, particularly those related to potential disinvestments. Whether the results of these studies could be more effectively made available to decision makers in the NHS should also be assessed. This would include recommendations for how NICE and NIHR research and guidance could be more helpfully presented and disseminated to inform resource reallocation decisions.

Indicative timing of this work could be within 6 months.

5.2. STRENGTHENING ESTIMATES OF THE NHS COST-EFFECTIVENESS THRESHOLD

Estimates of the NHS cost-effectiveness threshold are central to all analyses informing reallocation decisions. This is clearly true of undirected investment and disinvestment where the threshold will give an indication of the health implications of (marginal) reductions or increases in the NHS budget. It is also true of analyses supporting directed investment and disinvestment, given the importance of benchmarking these decisions against the best estimates of the threshold nationally and locally. Claxton *et al.*'s work on the NHS cost-effectiveness threshold for NICE decisions provides the first empirical estimate,[9] and this offers a key element of the evidence needed to inform reallocation decisions. It is, however, important to update this estimate over time as new expenditure and outcomes data are made available. This research can also exploit better data by ICD code on age, gender distribution, and disease incidence and duration.

The move from PCTs to CCGs provides more observations in cross section for econometric modelling. However, one of the aims of additional research would be to develop panel (longitudinal) econometric models, so mapping PCTs to CCGs would be important in order to incorporate as many waves of data as possible. Using panel data methods would facilitate estimation of time lags between expenditure and outcomes. Future work could seek to provide more secure estimates of the marginal productivity of individual PBCs, by including interactions between the expenditure and

outcomes in different PBCs. There would also be value in seeking to estimate thresholds for particular sub-groups of CCGs (e.g. those above vs. those below their target financial allocation; or inner-London vs. other CCGs). This would provide more appropriate estimates for benchmarking in local decision making. There would also be value in maintaining an overview of developments in the routine collection of patient-reported outcome measures in the NHS as a basis for estimating the 'pure HRQoL impact' of NHS expenditure.

Indicative timing of this research would probably 12 to 18 months, with ongoing activity after that.

5.3. PROVIDE ESTIMATES OF COST-EFFECTIVENESS THRESHOLDS RELATING TO OTHER BUDGETS

Research is urgently required to estimate the cost-effectiveness threshold for other budgets. There is currently no work being undertaken on the threshold relating to local authorities' ring-fenced public health budgets. A starting approach to this may be to use pre-2013 data where the equivalent public health expenditure was included in particular NHS PBCs. Due to the limited number of observations, it would not be possible to model all the interactions between the various PBCs to come up with a threshold estimate for those mainly relating to public health. However, assuming the same expenditure and outcome elasticities and ignoring interactions between PBCs and the likely longer time lags with public health expenditure, alternative weighted averaged thresholds between public health and non-public health expenditure could be estimated. This approach could be strengthened by adding expenditure relating to public health in the NHS (e.g. as part of the GMS PBC) as a covariate to outcomes equations for other PBCs. The estimated coefficient would provide a means of estimating a NHS public health threshold. This would, however, need careful handling of endogeneity and time lags.

It may possible also to generate an estimate of a public health threshold using more recent data on public health expenditure by local authorities. Again, endogeneity and time lags would need to be handled, but the approach could involve including local authority public health expenditure in the models explaining variation in the outcomes relating to particular PBCs. The estimated coefficients on local authority expenditure could provide the basis of estimates of cost-effectiveness threshold for public health budgets.

There is ongoing work relating to the estimation of the marginal productivity of social care expenditure (see Section 3.2.3). Collaboration between researchers working in this area and those active in updating and developing estimates of the NHS and public health thresholds would be important.

Indicative timing of this research activity depends on how it is specified. Initial work could be undertaken in 6 to 9 months but more extensive work to refine estimates could be warranted over 1-3 years.

5.4. CHANGES IN THE VALUE OF COST-EFFECTIVENESS THRESHOLDS OVER TIME

As discussed in Section 2.4.4, changes in cost-effectiveness thresholds over time may be an important determinant of the relative impact on population health of medical, care and prevention interventions. This could be an even stronger factor if growth in the value of health over time, which is reflected in the value of the discount rate on health benefits, is considered to be reflected in changes in thresholds. How thresholds may change will be a function of a complex interaction of factors such as real terms growth in budgets, productivity of services funded by the budgets and interactions between the health produced within different budgets and between that generated outside the budget-constrained sectors. Given this complexity, a reliable predictive model which estimates future values of k is unlikely to be possible. It is important, however, to know how the value of alternative reallocation strategies might vary according to changes in k over time, to assess what can be established about past changes in k as a function of the types of factors described above and to consider what this might imply about the future trajectory of k .

As well as changes in k over time being likely to influence the differential impact on population health of treatment, prevention and care, the level of the discount rate will also be important. A suitable means of deriving a discount rate which reflects the opportunity cost of capital and normative judgments about whether the value of health will increase with time, independently of changes in k , is an important area of future research.

Indicative timing of this research would be 6-9 months.

5.5. OUTCOME MEASURES USED IN HEALTH AND SOCIAL CARE

The challenge of extending a comparable measure of outcome between medical services and prevention (where a common view of health outcome seems reasonable) and care is described in Section 2.4.1 and Appendix A. There are a number of research projects that would help take the work forward. The first would be to test the appropriateness of current TTO values for EQ-5D and ASCOT. This would require the valuation of a sample of states from each measure using a generic version of the TTO, with best imaginable state as the upper anchor. It could be based on an interview survey of around 200 members of the public. A second study could derive a well-being-adjusted life year (WELBY) from existing well-being items. This approach is already being piloted in a project being undertaken by EPRU for DH. This involves the development of a well-being scale and then using TTO in a general population sample to generate values on the zero to one scale. A third project could seek to estimate the relationship between EQ-5D and ASCOT and various well-being measures. This is also planned as part of the EPRU project for EQ-5D. To extend it to ASCOT requires the collection of ASCOT alongside the well-being measure and this is planned in study 5 below. The indicative timing of these various 'short-term' projects would be < 6 months.

A fourth study would be to estimate exchange rates between EQ-5D, ASCOT and other outcomes using a generic TTO. Where significant differences are found between existing values sets and the generic TTO values, then the first study noted above could be extended to value sufficient states to estimate an exchange rate between instruments. This would require a valuation survey in a general population sample of around 150-200 members of the general public. A fifth study could test the psychometric properties of well-being scales. The main concern to be tested would be whether well-being measures are less sensitive to differences between patient or social care groups (validity)

and to changes over time (responsiveness) compared to EQ-5D and ASCOT. Existing work planned using the South Yorkshire Cohort funded by Yorkshire and Humber CLAHRC and Euroqol group will examine this in a general population. The indicative timing of these various 'medium-term' projects would be 6-18 months.

Two longer term projects could involve, sixthly, the use of well-being measures more widely in relevant populations and evaluations. The seventh study could be to extend the general population sample defined in the fifth study above to other populations, including patients and social care users to test the measures further and to estimate exchange rates between measures. The indicative timing of these two 'longer-term' projects would be over 18 months.

6. CONCLUSIONS AND SUMMARY

Decision makers responsible for allocating resources to health enhancing activities are constantly seeking to identify ways of improving population health from available resources. Given that budgets are constrained, this will often involve disinvesting in some existing activities to release resources to invest in new or additional services. Decision makers will need to assess whether the positive health effects generated by new activities outweigh the health forgone by placing additional costs on the budget which necessitates disinvestment from other activities. As the funding of activities relating treatment, prevention and care is now divided between different budgets in the NHS and local authorities, the net impact of reallocation between budgets needs to be assessed.

CEA provides a set of analytic tools to inform these assessments. This can be used in the context the DH directing local decision makers to initiate particular investments and disinvestments, as well as when the DH makes more general budget reallocations and leave local decision makers to establish the most suitable interventions for investment and disinvestment.

There are nuances to the general analytical framework offered by CEA. These include the importance of including an assessment of the sufficiency of evidence associated with the costs and benefits of different activities, and using that to improve reallocation decisions. There is also a need to use estimates of the cost-effectiveness threshold relating to different budgets to benchmark all forms of investment and disinvestment. Given the likely differences between treatment and prevention in the distribution of costs and benefits over time, the direction of changes in cost-effectiveness thresholds over time will be important to consider. When the costs and effects of interventions funded by NHS, prevention and care budgets fall on other areas of the public sector or on consumption, there are challenges to assessing the overall 'societal' value of resource reallocation. It may be reasonable to consider a common measure of outcome associated with treatment and prevention relating to changes in HRQoL and in survival duration. Changes in care outcomes may need an alternative measure but the relationship between health- and care-related quality of life will need to be understood. Similarly, it will also be important to understand the relationship between health and other non-health benefits of activities both funded and displaced.

There is evidence to drive the analytical framework offered by CEA to support decision making. In particular, the last 20 to 30 years has seen an increase in the availability of estimates of the costs and benefits of medical interventions. The work of NICE and the NIHR in the UK provides an ongoing source of such evidence. NICE's public health programme generates evidence on the costs and effects of a range of prevention activities. Recent research on the cost-effectiveness threshold for the NHS offers the first empirical estimate of the marginal productivity of NHS expenditure. However, there is very little evidence on the cost-effectiveness of social care, and the proportion of treatment, prevention and care interventions that are routinely offered in the UK for which there is formal evidence on cost and effects is likely to be very small. There are also no estimates of the cost-effectiveness thresholds in public health budgets held by local authorities.

An extensive programme of further research could, therefore, be initiated to feed into future analysis supporting reallocation decisions. Much of this would cover the generation of evidence relating to the costs and effects of specific interventions, and making this accessible to decision

makers. Improving and extending estimates of relevant cost-effectiveness thresholds would also be a priority.

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APPENDIX A: THE CHALLENGES OF COMPARING OUTCOME MEASURES ACROSS SECTORSⁱⁱⁱ

Introduction

A problem in comparing the cost-effectiveness of interventions across sectors is the use of different outcome measures. In the health care for example, the EQ-5D has become the most widely used generic measure of patient reported outcome, while in social care there has been the recent development and use of the Adult Social Care Outcome Tool (ASCOT). These instruments are useful for examining cost-effectiveness within their sectors, providing a measure of 'quality of life' within a measure of benefit such as a quality-adjusted life year (QALY). However, there is a policy need to: 1) aggregate benefits across sectors in order to understand overall benefits; 2) compare benefits across sectors to assess their relative value for money. The problem addressed in this section is how different measures, like EQ-5D and ASCOT, can be used to make comparisons across sectors. The issues raised would apply to other instruments such as the ICECAP measure of capability (Al-Janabi et al, 2013) that is used across a number of sectors and the WEMWBS measure of psychological well-being (Tennant et al, 2007) used in a number of surveys and to be administered in health care evaluations.

EQ-5D and ASCOT compared

EQ-5D is designed to measure an individual's health status (or health-related quality of life) across five dimensions: personal functioning (mobility and self-care), activities (usual activities), pain or discomfort, and anxiety or depression[49] (Table 4). The original EQ-5D contains three levels for each dimension (no problem, some problem and severe problem). A 5 level version is also now in used (no problem, mild problem, moderate problem, severe problem and extreme problem). In both versions, no problem is 'level 1', so no problems in any dimension are expressed as 11111.

The EQ-5D is converted to a preference-weighted index using a value set obtained from a large survey of the general public. Values were elicited using Time Trade-Off (TTO)[49] where respondents indicate the number of years in full health they consider equivalent to specified number of years in a particular chronic health state. For example, if they are indifferent between living for 6 years in full health or 10 years in state 21112, this implies a 'utility' or preference value for state 21112 of 0.6 for that individual. The TTO values were analysed econometrically, and tariff values for EQ-5D states were then derived from an additive function of each attribute and level, with an additional interaction term for health states that experience severe on any level (N3 term). The tariff allows all EQ-5D profiles to be converted to health state utilities on a zero to one scale, where zero is for health state as bad as being dead and one represents full health.

ASCOT is a measure of social-care quality of life that is designed to assess the extent to which an individual's needs and wants are being met.[50] It has eight dimensions: accommodation, cleanliness and comfort, safety, food and drink, personal care, control over daily life, social participation and involvement and dignity. Each is assessed across 4 levels: high unmet needs, some unmet needs, no unmet needs and ideal level achieved – state 11111111 denotes the best state. There are two methods of scoring the instrument. One is to use scores developed from a general population survey

ⁱⁱⁱ This appendix was authored by John Brazier (SchARR, University of Sheffield)

using Best-Worst Scaling (BWS), but these values are not anchored on the QALY scale. A sample of ASCOT states were valued by TTO in order to estimate a mapping function between BWS and TTO so that all states can be valued on a zero to one scale where zero represents an equivalent state to 'dead' and one represents the 'ideal' social-care related quality of life.

Conceptual comparison of measures

These measures can be compared in terms of their descriptive systems and methods of valuation. Starting with the descriptive systems it can be seen that there is little or no conceptual overlap between the dimensions of these measures. Below is a brief review for the 5 dimensions of EQ-5D:

- Mobility and self-care in EQ-5D – these reflect what a person can do on their own rather than the extent to which they are able to meet their needs and wants, such as for food and drink, personal care and control over daily life. While problems in mobility and self-care will contribute to a person's ability to meet their needs and wants, the level achieved in these ASCOT dimensions will also depend on the respondent's environment, and the provision and quality of the social care they receive. ASCOT is concerned with the outcome of social care and not simply their health status.
- Usual activities in EQ-5D – this is often thought to include dimensions such as social participation and occupation, so there is some conceptual overlap with the ASCOT items on occupation and employment, and social participation and involvement. The differences in wording may be important, since usual activities may change over time, but then so can a person's occupation or social activities in response to circumstances.
- Pain or discomfort – these are not covered directly by ASCOT. However, they may contribute indirectly to the dimensions of ASCOT, for example pain will impact on a person's ability to spend time doing the things they value or enjoy (occupation in ASCOT).
- Anxiety and depression – these are included in EQ-5D as a key symptom of mental health and a consequence of many physical conditions. They are also linked to the ill end of well-being. ASCOT does not explicitly cover depression and anxiety, except in as much as a person is not able to find enjoyable activities and feelings of control.

At the same time, most of the ASCOT dimensions may, at best, be indirectly reflected in the EQ-5D or would appear to be entirely absent (e.g. dignity, safety and control over daily life).

These instruments are trying to measure different conceptualisations of life. EQ-5D is about the key 5 aspects of a person's health, whereas ASCOT is concerned with the way a person's health, combined with their socio-economic status, home circumstances (including availability of informal care) and the social care services they receive impact on their overall quality of life defined in terms of the extent to which their needs and wants are being met. Poor health according to EQ-5D, for example, can impact on a person's ASCOT score in different ways depending on the availability and quality of informal and formal care provision. At the same time, the provision of good social care may result in different levels of health achieving the same ASCOT score. The descriptive systems are simply not measuring the same thing.

The measures have both been scored and anchored on the scale with zero dead and one for full health using similar versions of TTO. From a theoretical perspective choice based methods like time trade-off (TTO) and standard gamble (SG) imply that the 'quality' adjustment is equivalent to a well-

being adjustment and everything of value to an individual will be incorporated into it. In a TTO exercise if the individual is indifferent between health state z for 10 years and full health for 20, each year in this health state is valued at 0.5. The change in health from state z to full health is being valued in terms of everything which is important about being alive, as it is not just the 10 years of health which is traded off, but 10 years of life. (Similarly, in SG individuals sacrifice risk of death against health improvements, hence they sacrifice not just years of health but also years of happiness and fulfilments).

Whilst at an abstract level TTO and SG can be argued to capture well-being and so provide a way to compare the measures, the two TTO tasks differed in a crucial way – the upper anchor in the TTO for EQ-5D was EQ-5D state 11111 (no health problems) and for ASCOT was ASCOT state 11111111 (meeting social care related needs and wants). These upper anchors are not the same and so this may result in important differences in the scales. However, as will be discussed below there are solutions to this problem.

Possible approaches to achieving comparability between the measures

There are numerous methods for enhancing the comparability of these two measures and here are 5 approaches that can be taken:

1. Statistical mapping between the measures
2. Bolting-on additional dimensions to one or other of the instruments
3. Using preferences to value the measures on a common scale: a) non-monetary, b) monetary
4. Using well-being to value the measures on a common scale: a) non-monetary, b) monetary by willingness to pay, c) monetary by DCE with cost
5. Developing a new cross sector measure based on meta concepts such as well-being or capability (e.g. well-being adjusted life years)

1. Statistical mapping

Mapping is one option recommended by NICE[16] to estimate EQ-5D utility data when EQ-5D data are unavailable in the study dataset. It could be used to map in both directions and means that one measure can be used to estimate a value for the other.

To develop a mapping function, EQ-5D and ASCOT would need to be collected in a dataset. It is then possible to see how the two measures relate to each other. A mapping function could be estimated by regression which would enable any ASCOT value to be linked to an estimated value for the EQ-5D (or vice versa). There are a variety of specifications that can be fitted to the data and different statistical techniques for dealing with the distributions of the variables involved.[51-53] This would mean that if an evaluation of a social care intervention collected only the ASCOT measure, then these values could be used to estimate EQ-5D values. However, the mapping function relies on statistical association and this is unlikely to be strong given the low conceptual overlap between ASCOT measure and EQ-5D. If EQ-5D is what is required, then it would be preferable simply to include this in the initial study.

2. Bolting on dimensions

An alternative approach is to expand a measure by including 'bolt-on' dimensions to cover those missing from a measure. This could involve either adding bolt-ons to the ASCOT to include those domains from the EQ-5D which are not covered at all within the existing 8 questions (pain/discomfort, depression/anxiety), or adding bolt-ons to the EQ-5D such as whether day-to-day needs (food, cleanliness, self-care) are met and social contact.

This method has started to be explored in health for EQ-5D in health.[54] Bolt-on dimensions have been developed for cognition, sleep, energy, vision, and hearing and, of most relevance here, dignity. There are technical challenges to incorporating the bolt-ons into the EQ-5D value set since the impact of the extra dimension on health state values may not be additive. An assumption other than the dimension being additive may require a complete revaluation of the new measure, though this may be worth doing in order to make the EQ-5D more relevant for social care. Once done it could replace ASCOT or provide a better basis for mapping from one to the other.

However, this solution has more fundamental problems since the issue is not simply the absence of one or two dimensions. As indicated above, there is little conceptual similarity between the measures and so there might have to be a large number of bolt-ons. This would be unwieldy and would make little sense since the format and conceptual basis of the measures is so different. There is also a limit to the number of attributes that a descriptive system can have for it to be amenable to health state valuation exercises.

3. Using preferences to value the measures on a common scale

3a) Non-monetary

Another method would be to use preferences (say from the general population) to value the different measures on a common scale. As explained above, this has been partly achieved since EQ-5D and ASCOT have both been valued using TTO, but they used an instrument-specific upper anchor and so, in principle, are not comparable. However, one solution to this would be to use a common yardstick. Exploratory research funded by the MRC examined the use of a generic Visual Analogies Scale (VAS) (best imaginable to worst imaginable life) and ranking methods to value a number of measures including EQ-5D, an earlier version of ASCOT, ICECAP, and an asthma-specific measure .[53, 55] This enabled the estimation of 'exchange rates' between these measures. This approach could be extended to a choice-based valuation technique such as TTO where the best state is not instrument-specific, but described in more general terms such as best imagine state. In a more explicit way respondents are being asked to value states defined by EQ-5D and ASCOT in terms of how many years of best imaginable life they would be willing to sacrifice. Once a sample of states from the 2 instruments have been valued in this way it would be possible to map between them using the common scale.

However concerns remain. When valuing EQ-5D, for example, a respondent's attention is focused on the particular aspects of health and they are typically not encouraged to think more broadly about their life. It is not clear what they imagine will happen to other aspects of their life like job, income, relationships, well-being and so forth. The valuation techniques also assume that individuals are able to predict the likely impact of the health state being described on their lives in the future,

but this has been shown not to be the case in health and other contexts.[56] General population respondents to health valuation surveys imagining health states, for example, tend not to take into account the extent of any adaptation they may make over time. So their preferences will provide a poor indicator of the actual impact on their well-being. For ASCOT this may be less of a problem since the dimensions already contain a significant degree of evaluation rather than simply description, but again the respondent is left to imagine the likely impact on other aspects of their life like well-being. This is one of the reasons for some economists advocating the use of more direct measurement of well-being in those experiencing the health states through measures of subjective well-being.[56]

3b) Monetary

A more traditional approach to valuation in economics has been to use the amount a person is willing to pay for a given change in their circumstances. This is typically used to value goods and services, or specific intangibles such as environmental improvements. There have been some applications to valuing health in the context of trying to obtain a value of a QALY to elicit monetary values to avoid some duration or risk of a health state[57] and how much they would be willing to pay for medication to avoid living in an EQ-5D health state. This method has not been used across entire descriptive systems.[58] There are concerns with using willingness to pay in this way in a system where individuals do not pay for health care at the point of consumption. There will also be distributional consequences though these can be obviated by using a representative sample or weighting responses to achieve a representative set of mean values. More generally there is evidence from applications of willingness to pay of insensitivity to scale, though this has not been examined in this context.

Monetary values can be obtained for health states using a discrete choice experiment where cost is included as an attribute. This provides an alternative way to elicit monetary values for health states or different attributes of states by estimating marginal rates of substitution between health and cost. Again there is little experience of applying this approach in the context of health or social care state valuation.

4. Using subjective well-being (or quality of life) to value the measures on a common scale

There are established measures of affect or life satisfaction that can be interpreted as cardinal measures of utility.[56] There are a number of tools used, including simple self-reported items on happiness and life satisfaction, a well-being VAS or multi-item measures such as WEMWBS.[59] These well-being measures can provide the dependent variable in an equation estimating the impact of EQ-5D and/or ASCOT on well-being. There have been studies undertaken to estimate weights for EQ-5D and SF-6D in this way using happiness and life satisfaction items.[60, 61] This approach is using well-being as the common metric. The limitation with this approach is that the resultant scores are not anchored on the zero to one scale required to calculate QALYs or a similar measure to reflect the impact of interventions which impact on survival duration. A further serious difficulty associated with this approach is the interpersonal comparison of the subjective well-being measures.

A related approach that overcomes these problems is to estimate a well-being equation that contains all the variables thought to impact on well-being including health and a measure that can provide a numeraire like income. This enables the estimation of marginal rates of substitution between the EQ-5D or ASCOT and income. This approach has been used in the context of health,[62], but not social care, and there may be problems with the fact that social care provision tends to be linked strongly to age; and this in turn is inversely related to income. More generally there are concerns that well-being is prone to adaptation, low expectations and even denial effects that may not reflect societal values. Furthermore, monetary equivalent values change depending on the well-being measure used.[63]

5. Develop a new cross sector measure using well-being (e.g. a WELBY) or capability

This approach would go a step further than 4) and, rather than using well-being as a common scale to re-value existing measures, it would be used to develop a new measure suitable for use in different sectors. There are many potential candidates.

There are numerous measures of well-being that could be used including those mentioned above or a measure of capability. Sen advocates capability sets rather than functionings in response to concerns about an over reliance on utilities. Capability is concerned with what you can do or be, rather than what you actually choose (or happen) to do or be. It is about opportunity sets and sees value in opportunities even if they are not taken. This is a significant departure from conventional consequentialist measures like EQ-5D. Although Sen remains reluctant to set out a definitive list of capabilities, Nussbaum's[64] high-level 10 item list is widely applied and attempts have been made to adapt her list of capabilities into a list of functionings and apply this to conventional questionnaires.[65] There are also measures that claim to assess capabilities developed from interviews with the general public valued using stated preference valuation methods (like ICECAP). The problem is that it is doubtful whether capability sets can be measured using questionnaires.[66]

A well-being measure could be used to estimate a new QALY anchored at best imaginable state and death. [It is doubtful whether developers of capability measures would be willing to submit their measures to a QALY approach (QOL x duration)]. A well-being classification system could be formed from measures like the ONS-4 or WEMWBS and valued using a recognized valuation technique to generate values on the zero to one scale, where one is for best imaginable life. This approach is being piloted in a project at EEPRU for DH. A well-being adjusted life-year or WELBY could be used to measure benefits across sectors and to permit comparisons of efficiency across sectors and could be used within the framework of economic evaluation. The disadvantage is that a general well-being measure is less specific to any single sector and so may have less sensitivity than more sector specific measures such as EQ-5D and ASCOT. EEPRU is currently undertaking a study comparing well-being measures to EQ-5D across a number of data sets in order to examine the extent of this attenuation.

Going forward

In summary, the approaches of mapping or bolting-on dimensions to EQ-5D do not offer viable solutions to the problem of making it comparable to ASCOT. This leaves three potential solutions –

one is to use the preferences of the general public value them on a common metric using TTO (or another elicitation method); second, to estimate the MRS between each measure using a well-being equation; and thirdly to develop a new well-being-based measure on the zero to one scale required for use in economic evaluation. Using TTO with the same upper anchor would come closest to current methods used by NICE since it uses a choice-based non-monetary valuation technique. The use of monetary-based methods to valuing health states on a common scale is not well tested. The use of well-being to describe the benefits of health or social care would need further testing to understand whether it is sensitive to differences and changes in health and/or social care quality of life, though could better meet the requirements of the Green book (along with willingness to pay).

Table 4: EQ-5D

Dimension	Level	Description
Mobility	1	No problems walking about
	2	Some problems walking about
	3	Confined to bed
Self-Care	1	No problems with self-care
	2	Some problems washing or dressing self
	3	Unable to wash or dress self
Usual activities	1	No problems with performing usual activities (e.g. work, study, housework, family or leisure activities)
	2	Some problems with performing usual activities
	3	Unable to perform usual activities
Pain/Discomfort	1	No pain or discomfort
	2	Moderate pain or discomfort
	3	Extreme pain or discomfort
Anxiety/depression	1	Not anxious or depressed
	2	Moderately anxious or depressed
	3	Extremely anxious or depressed

Table 5: ASCOT

Domain level
<i>Accommodation cleanliness and comfort</i>
1. My home is as clean and comfortable as I want
2. My home is adequately clean and comfortable
3. My home is not quite clean or comfortable enough
4. My home is not at all clean or comfortable

<i>Safety</i>
1. I feel as safe as I want
2. Generally I feel adequately safe, but not as safe as I would like
3. I feel less than adequately safe
4. I don't feel at all safe

<i>Food and drink</i>
1. I get all the food and drink I like when I want
2. I get adequate food and drink at OK times
3. I don't always get adequate or timely food and drink
4. I don't always get adequate or timely food and drink, and I think there is a risk to my health

<i>Personal care</i>
1. I feel clean and am able to present myself the way I like
2. I feel adequately clean and presentable
3. I feel less than adequately clean or presentable
4. I don't feel at all clean or presentable

<i>Control over daily life</i>
1. I have as much control over my daily life as I want
2. I have adequate control over my daily life
3. I have some control over my daily life, but not enough

Domain level

4. I have no control over my daily life

Social participation and involvement

1. I have as much social contact as I want with people I like
 2. I have adequate social contact with people
 3. I have some social contact with people, but not enough
 4. I have little social contact with people and feel socially isolated
-

Dignity

1. The way I'm helped and treated makes me think and feel better about myself
 2. The way I'm helped and treated does not affect the way I think or feel about myself
 3. The way I'm helped and treated sometimes undermines the way I think and feel about myself
 4. The way I'm helped and treated completely undermines the way I think and feel about myself
-

Occupation and employment

1. I'm able to spend my time as I want, doing things I value or enjoy
 2. I'm able to do enough of the things I value or enjoy with my time
 3. I do some of the things I value or enjoy with my time, but not enough
 4. I don't do anything I value or enjoy with my time
-

APPENDIX B: MULTI-SECTORIAL COST IMPLICATIONS OF NICE'S PUBLIC HEALTH INTERVENTIONS ADVISORY COMMITTEE'S GUIDANCE

It is important to understand not only what the costs of a public health intervention are but also where they fall. Possible bearers of these costs can be classified into five types:

- Type 1: Costs fall on the NHS
- Type 2: Costs fall on the local authority public health spend (categories 361-385 in the LA Total Spend data, see **Appendix ###** for total spend categories)
- Type 3: Costs fall on the local authority but to categories outside of public health spend (e.g. highways and transport services). All costs that fall in this type should be assignable to one (or more) local authority total spend category outlined in **Appendix ###**
- Type 4: Costs fall on some other public sector (e.g. school based interventions not provided under LA education services spend)
- Type 5: Costs fall outside of the public sector (e.g. mental well-being in the workplace)

Table 6 below applies this structure to the full range of public health guidance issued. The categorisation is made by considering the recommendations made by the guidance rather than any estimates of cost given in the guidance document or related economic modelling, as considered by Owens et al.[33] In many cases it is unclear (given limited detail of the guidance) where the costs fall on the public sector, for example whether the costs fall on NHS or local authority health spend, or local authority education spend or the department for education, in such cases all possible areas of cost are indicated.

Table 6: Categorisation of the cost burden of PHIAAC guidance

PHIAAC guidance	Where do the direct costs fall?				
	Type 1 (NHS)	Type 2 (LA PH spend)	Type 3 (LA non-PH spend)	Type 4 (wider public sector)	Type 5 (outside public sector)
PH1: brief intervention and referral for smoking cessation	X				
PH2: four commonly used methods to increase physical activity	X	X			
PH3: prevention of sexually transmitted infections and under 18 conceptions	X	X	X	X	
PH4: interventions to reduce substance misuse among vulnerable people			X	X	
PH5: workplace interventions to promote smoking cessation		X			X
PH6: behaviour change: the principles for effective interventions	N/A				
PH7: school based interventions on alcohol		X	X	X	
PH8: physical activity and the		X	X	X	

environment					
PH9: community engagement	N/A				
PH10: smoking cessation services	X	X	X		
PH11: maternal and child nutrition	X	X	X		
PH12: social and emotional well-being in primary education			X		
PH13: promoting physical activity in the workplace	X	X	X	X	X
PH14: preventing the uptake of smoking by children and young people		X		X	X
PH15: identifying and supporting people most at risk of dying prematurely	X	X			
PH16: occupational therapy and physical activity interventions to promote the mental well-being of older people in primary care and residential care	X	X	X		
PH17: promoting physical activity for children and young people	X	X	X	X	
PH18: needle and syringe programmes	X	X			
PH19: managing long-term sickness and incapacity for work				X	X
PH20: social and emotional well-being in secondary education			X	X	
PH21: reducing difference in the uptake of immunisations	X	X	X		
PH22: promoting well-being at work					X
PH23: school-based interventions to prevent smoking			X	X	
PH24: alcohol-use disorders, preventing harmful drinking	X	X		X	
PH25: prevention of cardiovascular disease	X			X	
PH26: quitting smoking in pregnancy and following childbirth	X	X			
PH27: weight management before, during and after pregnancy	X	X	X		
PH28: looked-after children and young people			X	X	
PH29: strategies to prevent unintentional injuries among under-15s	X		X	X	
PH30: preventing unintentional injuries among the under-15s in the home		X	X		
PH31: preventing unintentional road injuries among under-15s: road design			X		

PH32: skin cancer prevention: information, resourced and environmental changes	X	X	X		X
PH33: increasing the uptake of HIV testing among black Africans in England	X	X			
PH34: increasing the uptake of HIV testing among men who have sex with men	X	X			
PH35: preventing type 2 diabetes: population and community interventions	X	X	X	X	
PH36: prevention and control of healthcare: associated infections, quality improvement guide	N/A				
PH37: identifying and managing tuberculosis among hard to reach groups	X	X		X	
PH38: preventing type 2 diabetes: risk identification and interventions for individuals at high risk	X	X			
PH39: smokeless tobacco cessation: South Asian communities	X	X			
PH40: social and emotional well-being: early years	X		X		
PH41: walking and cycling: local measures to promote walking and cycling as forms of travel or recreation		X		X	
PH42: obesity: working with local communities	X	X			
PH43: hepatitis B and C: ways to promote and offer testing to people at increased risk of infection	X	X		X	
PH44: physical activity: brief advice for adults in primary care	X				
PH45: tobacco: harm reduction approaches to smoking	X	X		X	
PH46: assessing BMI and waist circumference thresholds for intervening to prevent ill health and premature death among adults from black, Asian and other minorities	X	X			
PH47: managing overweight and obesity among children and young people: lifestyle weight management services	X	X		X	
PH48: smoking cessation in secondary care: acute, maternity and mental health services	X	X	X		

PH49: behaviour changes: individual approaches			X	X	
PH50: domestic violence and abuse: how health services, social care and the organisations they work with can respond effectively	X		X	X	

Table 6 shows that the majority of PHIAC guidance resulted in a cost burden falling on the NHS (66% of guidance) and local authority public health spend (66%), with fewer on non-public health local authority spend (48%), the wider public sector (44%) or the private sector (12%). The table also shows the complexity of the task of characterising where the costs fall as few of the PHIAC guidance are expected to only imply a cost burden to a stakeholder type.

APPENDIX C: DETAILS OF CATEGORIES OF DATA COLLECTED AS PART OF THE SPENDING AND OUTCOME TOOL (SPOT)

Spend data

The local authority SPOT will consider costs across all local authorities categorised by Department for Communities and Local Government defined categories and sub-categories. The full costs data the SPOT will use is freely available online (<https://www.gov.uk/government/collections/local-authority-revenue-expenditure-and-financing>). The major categories are:

- Education services
- Highways and transport services
- Children's social care
- Adult social care
- Public health
- Housing services
- Cultural and related services
- Environmental and regulatory services
- Planning and development services
- Police services
- Fire and rescue services
- Central services
- Other services

In addition all of these categories (excluding police and fire and rescue) are sub-categorised, for public health the spend sub-categories are:

- Sexual health services - STI testing and treatment (prescribed functions)
- Sexual health services - Contraception (prescribed functions)
- Sexual health services - Advice, prevention and promotion (non-prescribed functions)
- NHS health check programme (prescribed functions)
- Health protection - Local authority role in health protection (prescribed functions)
- National child measurement programme (prescribed functions)
- Public health advice (prescribed functions)
- Obesity - adults
- Obesity - children
- Physical activity - adults
- Physical activity - children
- Substance misuse - Drug misuse - adults
- Substance misuse - Alcohol misuse - adults
- Substance misuse - (drugs and alcohol) - youth services
- Smoking and tobacco - Stop smoking services and interventions
- Smoking and tobacco - Wider tobacco control
- Children 5–19 public health programmes
- Miscellaneous public health services

Outcome data

As of the March 2014 pre-release version of the tool 282 outcome measures were included, but this list is expected to change and be extended before final release. The full list of outcomes is available.

APPENDIX D: WORKSHOP

This appendix sets out the participant list for the workshop, the table allocations, the questions asked and the notes from the table discussions.

Workshop table allocation

Topic 1: Evidence around public health

Table 1

1. Brian Ferguson, Public Health England – **table chair**
2. Rebecca Molyneux, Public Health England – **table note-taker**
3. Jim Chillcot, SchARR, University of Sheffield
4. John Henderson, Department of Health
5. Tim Marsh, UK Health Forum
6. Anita Charlesworth, Health Foundation
7. Mark Petticrew, LSHTM
8. Anthony Morgan, NICE

Table 2

1. Mike Batley, Department of Health – **table chair**
2. Jack Edwards, Department of Health – **table note-taker**
3. Anna Dixon, Department of Health
4. Julia Fox-Rusby, Brunel University
5. Michael Chaplin, NHS England
6. Christine McGuire, Department of Health
7. Laura Webber, UK Health Forum
8. Lesley Owen, NICE

Topic 2: Evidence around social care

Table 3

1. John Brazier, SchARR, University of Sheffield – **table chair**
2. Helen Weatherly, CHE, University of York – **table note-taker**
3. Julien Forder, PSSRU, LSE
4. Sarah Horne, Department of Health
5. Bernard van den Berg, CHE, University of York
6. Jose-Luis Fernandez, PSSRU, LSE
7. Barbara Barrett, KCL
8. Jonathan White, Department of Health

Topic 3: Analytical framework

Table 4

1. Mark Sculpher, CHE, University of York – **table chair**
2. Simon Walker, CHE, University of York – **table note-taker**
3. Gavin Roberts, Department of Health
4. Emmi Poteliakhoff, Number 10
5. Andrew Passey, Department of Health
6. Peter Smith, Imperial
7. Andrea Lee, Department of Health

Table 5

1. Karl Claxton, CHE, University of York – **table chair**
2. Alistair Rose, Department of Health – **table chair/note-taker**
3. Hugh Gravelle, CHE, University of York
4. Alan Glanz, Department of Health
5. David Parkin, KCL
6. Keith Derbyshire, Department of Health
7. Claire Cormie, Department of Health

Professor Klim McPherson attended the presentations but was unfortunately unable to stay for the table discussion. He provided written comments instead.

Questions for tables:

Questions for Public Health focused table(s):

Please consider the following questions in your discussion:

Analytical Framework questions:

General	<ul style="list-style-type: none"> • What are your views of the proposed framework, with particular reference to: <ul style="list-style-type: none"> ○ Resource allocation between the NHS and local authorities for prevention when we are solely interested in health as an outcome?
Directed versus undirected	<ul style="list-style-type: none"> • What are the relative merits of considering directed versus undirected <u>investment</u>? Please give specific consideration to prevention activities and social care activities.
	<ul style="list-style-type: none"> • What are the relative merits of considering directed versus undirected <u>dis-investment</u>? Please give specific consideration to NHS treatment activities.
Similar approaches	<ul style="list-style-type: none"> • Has any similar analytical work, considering the efficient allocation of resources between public sector budgets, been conducted in other areas of government or internationally?

Evidence around public health

Missed anything?	<ul style="list-style-type: none"> • Are there any resources detailing the costs (and/or outcomes) of public health/preventative initiatives in the UK beyond those discussed in the presentations? These might include local authority resources, third-party datasets, or those collected through research.
	<ul style="list-style-type: none"> • Are there any resources that detail what public health/preventive programmes/interventions are currently being funded, either by local authorities or other funders in the UK, which have not been discussed previously?
Generalisability of evidence	<ul style="list-style-type: none"> • How generalisable is the evidence in this area? What could be the role of non-UK evidence?
Outcome measures	<ul style="list-style-type: none"> • What are the desired outcomes of public health expenditure? How do these differ from, for example, expenditure on NHS treatments?

Threshold	<ul style="list-style-type: none"> • What evidence exists for informing undirected (dis)investment in public health by local authorities, i.e. estimating the marginal productivity of the sector, the ‘threshold’? What research could help inform this?
Disinvestment	<ul style="list-style-type: none"> • Are any activities currently being undertaken to identify the most appropriate areas of disinvestment in the UK within the NHS or public health?
Gaps and priorities	<ul style="list-style-type: none"> • What are the research priorities in this area? Give particular consideration to both applied and methods research priorities.
	<ul style="list-style-type: none"> • How could research capacity in this area best be increased and used most efficiently?

Questions for Social Care focused table:

Please consider the following questions in your discussion:

Analytical Framework questions:

General	<ul style="list-style-type: none"> • What are your views of the proposed framework, with particular reference to: <ul style="list-style-type: none"> ○ Resource allocation between the NHS and local authorities for health and social care where the outcomes are wider than health?
Directed versus undirected	<ul style="list-style-type: none"> • What are the relative merits of considering directed versus undirected <u>investment</u>? Please give specific consideration to prevention activities and social care activities.
	<ul style="list-style-type: none"> • What are the relative merits of considering directed versus undirected <u>dis-investment</u>? Please give specific consideration to NHS treatment activities.
Similar approaches	<ul style="list-style-type: none"> • Has any similar analytical work, considering the efficient allocation of resources between public sector budgets, been conducted in other areas of government or internationally?

Evidence around social care

Missed anything?	<ul style="list-style-type: none"> • Are there any resources detailing the costs (and/or outcomes) of social care programmes beyond those discussed in
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	<p>the presentations? These might include local authority resources, third-party datasets, or those collected through research.</p> <ul style="list-style-type: none"> • Are there any resources that detail what social care programmes are currently being funded, either by local authorities or other funders in the UK, which have not been discussed previously?
Generalisability of evidence	<ul style="list-style-type: none"> • How generalisable is the evidence in this area? What could be the role of non-UK evidence?
Outcome measures	<ul style="list-style-type: none"> • What is the most appropriate measure of outcomes in social care, for example EQ5D, ASCOT and ICECAP? What further work is needed to use these more widely in social care economic evaluation? How does the most appropriate measure relate to measures of outcome in other areas such as NHS treatment and prevention activities?
Threshold	<ul style="list-style-type: none"> • What evidence exists for informing undirected (dis)investment in social care, i.e. estimating the marginal productivity of the sector, the 'threshold'? What research could help inform this?
Disinvestment	<ul style="list-style-type: none"> • Are any activities currently being undertaken to identify the most appropriate areas of disinvestment in social care?
Gaps and priorities	<ul style="list-style-type: none"> • What are the research priorities in this area? Give particular consideration to both applied and methods research priorities. • How could research capacity in this area best be increased and used most efficiently?

Questions for Analytical Framework focused table(s):

Please consider the following questions in your discussion:

Analytical Framework questions:

General	<ul style="list-style-type: none"> • What are your views of the proposed framework, with particular reference to: <ul style="list-style-type: none"> ○ Resource allocation between the NHS and local authorities for prevention when we are solely interested in health as an outcome? ○ Resource allocation between the NHS and local authorities for health and social care where the outcomes are wider than health?
Directed versus undirected	<ul style="list-style-type: none"> • What are the relative merits of considering directed versus undirected <u>investment</u>? Please give specific consideration to prevention activities and social care activities.

	<ul style="list-style-type: none"> • What are the relative merits of considering directed versus undirected <u>dis-investment</u>? Please give specific consideration to NHS treatment activities.
Similar approaches	<ul style="list-style-type: none"> • Has any similar analytical work, considering the efficient allocation of resources between public sector budgets, been conducted in other areas of government or internationally?
Gaps and priorities	<ul style="list-style-type: none"> • What are the research priorities in this area? Give particular consideration to both applied and methods research priorities. Consider the likely duration of this research: short- (6-12 months), medium- (12-24 months) and long-term (more than 24 months).

Notes from each table

Table 1: public health focus

Brian Ferguson (chairing) said that there were really 4 blocks of questions which we needed to consider:

1. What evidence and resources might be missing?
2. What outcomes might be relevant for public health?
3. Are there other activities already taking place around investment or disinvestment which we could focus on?
4. What should our research activities be?

Starting with **question 1**, the table felt that there was an issue of whether the proposed framework captured the full range of inputs to public health outcomes. In particular, the voluntary and informal sector play an important role in generating public health activities and outcomes in broad terms. If you just look at formal services, you will miss a lot of inputs.

Local authorities have a wider conception of what constitutes public health activities, which the proposed framework does not reflect. The framework also doesn't cover the full costs of interventions, potentially including the value of the time of the person being treated.

There are complex funding routes within public health.

Social capital is an important variable for public health outcomes and this varies significantly by area. The citizenship survey measures this in some form. Are CCGs and local authorities mapping the informal or voluntary services which are available in each area.

Public Health and social care have much more of a mixed model with self and community provision, compared with the healthcare sector which is very much state controlled.

The outsourcing of public health services to voluntary sector provision is increasing, and it would be good to evaluate this work.

The group felt that the OECD work on obesity and alcohol was very relevant to this work.

There are issues around how you include the changes in tax revenue from health changes. E.g. if a public health intervention is effective at causing people to stop smoking, tax revenue from cigarettes will decrease, and taxes might then have to rise for other taxpayers. One would also need to account for a fall in consumer income surplus if, for example, alcohol prices were raised.

Turning to **question 2**, the group felt that the significant externalities from public health interventions could not be excluded from the framework. The decision-maker (ie local authorities for many public health interventions), will often care as much about the externalities (e.g. improved educational attainment) as the public health benefit of any intervention. The externalities might also have public health effects themselves over the longer term.

The framework and underpinning analysis will need to speak to local authorities – QALYs is too restrictive for them. For example, the Sheffield alcohol work models significant employment effects which local authorities will also care about. We need to understand the factors which people take into account when they are making decisions. Local authorities have constrained budgets, yet they also have a ring-fenced public health grant. Therefore they are actively looking for ways to invest their public health budget in a way which also delivers their other aims.

The group moved onto a discussion of **QALY thresholds**. They agreed that a lower cost-per-QALY limit from NICE would help public health interventions which tend to be more cost-effective.

We need to distinguish between the marginal intervention (the new interventions are the ones which are generally subject to NICE analysis) and the more standard business-as-usual interventions which are not generally evaluated in this way. It may be that we have already carried out most of the cost-effective interventions.

We don't have the granularity of information about the marginal cost-effectiveness of some interventions. E.g. smoking cessation generally is very cost-effective, but it may cost a lot more to target entrenched, older smokers or people with mental health problems, thus affecting the cost effectiveness.

We also need to consider the global and knock-on effects of interventions.

The group remarked on the general lack of **equity considerations** in the Framework and felt this was a gap. At the moment, the only equity assumption the framework makes is that all QALYs are equal.

But should we focus on improving the average health, or the distribution of health. From a purely allocative point of view, you would concentrate efforts on shirring the average, but that ignores equity.

Table 2: Public Health focus

Health Inequalities

This is an important issue. The secretary of state has a statutory duty regarding health inequalities.

The distribution of spending between social care, CCGs etc will have implications for health inequality, in part due to different services' difference in clients.

Social care for instance caters predominantly to over 65s.

DH has a choice to make about whether it want to raise average health or prioritise removal of health inequality, possibly taking away resources from the healthiest to reallocate to those with the lowest health.

What control do we have over investment/disinvestment

Given local authorities greater control over public health budgets and that aspects of social care budget are not directable, it seems that significant aspects of resource allocation would have to be undirected.

Public Health England can give guidelines on how money might be spent but cannot mandate its use.

Consideration needs to be given as to the role of Health and Wellbeing Boards and how Directors of Public Health etc in how decisions are actually made on the ground.

Benefits and costs falling outside the health sector

This is important as many health investment decisions may impact on other sectors and others sectors spending can impact on health. It is hard to know for example how much those who control the education budget are willing to spend on a policy where the main output is improving health outcomes.

Educational attainment for instance has been found to affect the age at which women become pregnant.

Cross sectoral studies could be useful to help make a decision.

NICE have a committee looking at the emotional and physical well-being of children.

Is a single measure appropriate for measuring outcomes

This leads into the question about how we express the contribution of health more widely. Even a broad measure such as well-being will not capture everything that might be desirable about a policy.

A question for the project is whether we should aim for a single measure for outcomes or take an approach where we accept a subjective decision has to be made to weigh up how we prioritise different health and care spending

A question was raised as to where the monetary savings of a reallocation of spending are considered in the model.

If for instance money is taken from treatment budget and spent on primary care. Is this just a loss of money to the treatment budget or is consideration given to how this will save on treatment costs in future.

UK Health Forum sound like they are looking at this question in their risk factor work

How are future versus current benefits compared? How is discounting done?

Epidemiological life cycles may not be that stable

Cohort effects will likely mean that the cost effectiveness of interventions vary a lot. For instance oral health policies will have very different effects on older people who grew up before fluoride was added to drinking water.

Welfare benefit changes may also have a cohort effect.

There is likely to be a significant difference in the evidence around disinvestment as opposed to investment.

Table 3: Social Care focus

Issues around outcomes need to be addressed. There was discussions around the use of ASCOT and other alternative measure in social care (such as ICE CAP). It will be important to consider outcomes other than the QALY when considering interventions beyond health care.

Work is currently being undertaken which examines the marginal productivity in the different sectors. However, there are challenges in attributing any difference in reported outcomes to the interventions individuals received.

Much more work is needed to examine the cost-effectiveness of social care interventions. There is currently a dearth of evidence in this area.

There is a key role of evidence to inform choice not just of local decision makers, but of individuals. This is particularly the case with social care where we may have individual budgets or co-funding of care. Issues around self-funding in social care need to be considered in detail as they impose costs on individuals rather than public sector budgets.

Table 4: Framework focus

Importance of identifying the threshold/marginal product

- Key is marginal product of every programme, money should be focused to those with the highest marginal benefit.

Outcomes

- Need for a common unit of outcome, or in place of a common unit of outcome will need a measure of exchange so that we can convert things into a common numeraire

Linking to impact on growth and GDP

- So far ignored, but given government priorities it is important to consider the impact on growth and GDP.
- A key aspect of social care is the releasing of human capital (namely carers) for other purposes.
- Prevention is trading short term health for long term health, impact on GDP could be similar (short term loss for long term again)
- Issues around supply side impact of spending: Is spending on pharmaceuticals better than social care? Spending on drugs vs. non drugs? Need knowledge of the multipliers involved.
- Difficult to measure impact of health on GDP- e.g. people live longer but are non productive, estimates of impact on GDP per capita are uncertain.
- GR has researched this issue, linking health to wider social benefits
- Another key aspect of social care is the releasing of human capital for other uses

Directed versus undirected investment

- Issues around localism versus centralism
- If directed investment, there is a concern around the ring fencing of budgets (ring fencing can increase the risks on other budgets, as we are no longer able to spread financial risk across all budgets).
- With localism, role of centre is to provide evidence and monitor what the local decision makers do.

- With upfront investment, role of centre to help allow for investment (e.g. by providing funds or relaxing rules)

Co-funding

- Need to consider multiple sectors contributing to public health interventions
- With social care there is the further issue of copayments and financial needs assessments (Copayment could prevent use of activities which have benefit)

Issues with data and evidence

Local authority data

- Difficult to know what local authorities currently spend money on and how much they spend
- There are concerns around the quality of the evidence around local health budgets and issues about “blurring” of budgets.
- Local authorities might report net spending, not gross spending, as they are able to collect fees for services

Pharmaceutical data

- Good data on primary drug spends, however, currently difficult to access data on hospital spends (although GR states it is available)

Evidence

- Would be useful for the centre to provide more evidence for local interventions rather than just to prescribe what the local authorities should do (provide them with a menu based on good quality evidence)
- Gives the local decision makers guidance and supports the decisions they make
- Need more evidence around disinvestment

Thresholds

- Need estimates of thresholds in NHS, Public Health and Social Care

Northern Ireland

- Northern Ireland have had integrated funding for years and may be useful to examine.

Police

- Police service have looked at multiple outcomes

Table 5: Framework focus

As one starts to consider re-allocating resources from treatment to prevention and social care, rather than simply transferring resources within these categories of spend, two important distributional issues come into play: inter-generational and inter-temporal.

Linked to the first of these, it was pointed out that the objective of state-funding of social care is more than just meeting a need, it seems to be also about financial protection and preserving an individual’s assets so that they can be passed on to subsequent generations. However, in response

to this point, a member of the group questioned whether this was any different than the objective of NHS care – i.e. this is also partly about protecting people’s assets.

One member of the group then asserted that there is not currently sufficient evidence to do directed investment or disinvestment. This, he went on to argue, meant that in the short term we should focus our efforts on improving our estimates of the threshold for the main categories of spend. It was suggested that a fairly quick win would be to include local authority spend in the NHS threshold estimation equation. This would still take health (i.e. mortality and morbidity) as the measure of outcome (dependent variable) but estimate the marginal impact of LA spending on prevention, social care and other LA services on health outcomes. (This assumes that LA spending can be successfully mapped to CCG areas. The group felt that this should be possible without too many problems).

As a next step, it was suggested that it may be possible to use information from individuals reporting both EQ-5D and ASCOT scores to impute ASCOT outcomes for each CCG area (in the same way that mortality and morbidity effects are imputed for some areas of CCG spending).

An important pre-requisite for this wider threshold analysis is that ONS continue to collect mortality data at CCG-level and that PBC data is also continued to be collected.

(For the purposes of the next PPRS negotiation, it was also suggested that branded drug spend mapped to CCGs should also be separately identified in the PBC data).

To counter the assertion that there is insufficient data to inform directed investment or disinvestment, one member of the group wondered if in fact there was evidence from the World bank or others on the health services and interventions considered to be ‘essential’. When combined with what is known about health interventions that have been shown to be ineffective, this information could be used to effectively reduce the size of the undirected pot of resources. So, rather than a black-and-white distinction between directed and undirected re-allocation, an intermediate option might involve providing some direction to commissioners in terms of the share of their spending (or types of services) considered to be ‘essential’ and that which should never be undertaken (i.e. a bit like a ‘banned list’), leaving behind a (hopefully) small proportion of spending assumed to be undirected, for which commissioners would be held accountable for ensuring that any new investments demonstrate cost-effectiveness below the estimated threshold.

This ties in with feedback from one of the other tables, which was about whether there is a grey area between directed and undirected investment/disinvestment, which is expenditure which is not necessarily directed but is ‘influenced’ by the centre, making it different from purely undirected spending.

