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## Local health care expenditure plans and their opportunity costs

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### ABSTRACT

**Background:** In the UK, approval decisions by Health Technology Assessment bodies are made using a cost per quality-adjusted life year (QALY) threshold, the value of which is based on little empirical evidence. We test the feasibility of estimating the “true” value of the threshold in NHS Scotland using information on marginal services (those planned to receive significant (dis)investment). We also explore how the NHS makes spending decisions and the role of cost per QALY evidence in this process.

**Data and methods:** We identify marginal services using NHS Board-level responses to the 2012/13 Budget Scrutiny issued by the Scottish Government, supplemented with information on prioritisation processes derived from interviews with Finance Directors. We search the literature for cost-effectiveness evidence relating to marginal services.

**Results:** The cost-effectiveness estimates of marginal services vary hugely and thus it was not possible to obtain a reliable estimate of the threshold. This is unsurprising given the finding that cost-effectiveness evidence is rarely used to justify expenditure plans, which are driven by a range of other factors.

**Discussion and conclusions:** Our results highlight the differences in objectives between HTA bodies and local health service decision makers. We also demonstrate that, even if it were desirable, the use of cost-effectiveness evidence at local level would be highly challenging without extensive investment in health economics resources.

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### 1. Introduction

Health technology assessment (HTA) is becoming more widespread as an approach to determining the health services that are reimbursed in health care systems. Some HTA bodies focus on the incremental cost-effectiveness measured in terms of incremental cost per quality-adjusted life year (QALY) gained, most explicitly so in the UK.

In the UK, decisions to approve or reject new health care technologies for reimbursement by the tax-funded

National Health Service (NHS) are made by the National Institute for Health and Care Excellence (NICE), the Scottish Medicines Consortium (SMC) and the All Wales Medicines Strategy Group (AWMSG). These HTA bodies compare the incremental cost-effectiveness ratios (ICERs) of new technologies against a “threshold range” of £20,000–30,000 per QALY [1].

Central to the use of the cost per QALY threshold is the notion of opportunity cost: the approval of any new technology which increases costs will have an opportunity cost of the QALYs that might have been obtained by alternative use of those resources. NICE assumes that if it was to approve a technology with a cost per QALY greater than the chosen threshold, this would cause more QALYs to be

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lost than gained [1]. Although HTA organisations use other criteria to inform recommendation decisions, the ICER is the most important factor [2,3]. The value of the cost per QALY threshold in the UK remains a matter of controversy, stemming from the absence of key data and the many strong assumptions that consequently have to be made to facilitate empirical estimation [4,5].

One approach to approximating the threshold involves attempting to establish the relationship, on average, between different levels of spending and different levels of health outcomes (e.g., premature mortality as a proxy for the QALYs “produced”) across the health system. A detailed example of this type of work is Claxton et al. [6]: an econometric analysis of data from the NHS in England in 2008/09 on variations across the 151 local areas into which NHS England was divided at that time in their spending on 23 programme budget categories and associated mortality outcomes. The Claxton et al. analysis is controversial as a result of the assumptions it relies on in the absence of key data, not least the absence of data on the numbers of QALYs produced by NHS services. The numerical results are sensitive to changes in those assumptions. The interested reader is referred to Raftery [7] who provides a concise summary of the Claxton et al. method and of the controversy around it.

We test an alternative approach. Culyer et al. [8] present a model in which they show that, assuming that the health service seeks to maximise health gain measured by QALYs, the threshold is equal to the inverse of the marginal health gain of the last technology funded, the “marginal” technology. Following this, Appleby et al. [9] present a stylised decision-making model where they show that – supposing it was possible to identify the cost per QALY of every service – one could create a “cost-effectiveness league table” of all technologies. One could then identify the marginal services as the least cost-effective service currently provided and most cost-effective service not yet provided, and estimate the value of the threshold as lying between these lower and upper bounds. The authors note that in practice, there will be a series of (dis)investment decisions at the margin but that observing these decisions should at least identify a region within which the threshold is located.

Appleby et al. piloted this approach by studying decisions about service (dis)investment in England. The authors were readily able to identify services that were the focus of these decisions but concluded that they could not identify the implied cost per QALY threshold from them, because in many cases the services were not “truly marginal” (or threshold revealing)—for example, disinvestments from “dominated” services (ones for which alternative services are both more effective and less expensive); and decisions driven by considerations other than cost per QALY. They suggest that definitive findings about the consistency or otherwise of NICE and NHS cost-effectiveness thresholds would require many decisions to be observed, combined with a detailed understanding of local decision-making processes.

The key aims of the current paper are twofold. The first is to build on the Appleby et al. work by demonstrating whether it is possible to identify the cost per QALY of marginal services in NHS Scotland, where there exists

a unique additional source of spending information: the Budget Scrutiny, an annual survey of spending plans performed by the Health and Sport Committee of the Scottish Parliament [10]. As part of this survey, all 14 territorial NHS Boards are required to supply information on services that are planned to receive a significant level of (dis)investment in the upcoming financial year and thus could potentially be described as “marginal”. The data are in the public domain but have not previously been analysed for what they reveal about marginal opportunity costs. We supplement these data with information on marginal services collected in interviews with decision-makers. We then perform a literature search for each marginal service to obtain an estimate for its incremental cost per QALY.

The second aim of this paper is to explore how the NHS makes spending decisions at the margin and the extent to which cost per QALY evidence informs the decision-making process. This information is derived from a series of semi-structured interviews with Directors of Finance of the local NHS Boards in Scotland.

## 2. Data

### 2.1. The budget scrutiny

The starting point for this research is the 2012/13 budget scrutiny, which was undertaken in March 2012, immediately before the start of the 2012/13 financial year [10]. The questions from the budget scrutiny used for our work are those related to marginal spending decisions, namely questions:

- 4(b): “Please identify the three main areas in which . . . savings will be made . . . in 2012–13”.
- 5(a): “Please give three examples of service developments that you have been able to fund in 2012–13”.
- 5(b): “Please give three examples of service developments that you would consider priorities, but have been unable to fund in 2012–13”.

If NHS Boards wished to prioritise investment in services by cost per QALY, they would be expected to disinvest from the existing services with the *highest* cost per QALY if faced with tightening constraints on their budgets. Hence, in theory, the responses to question 4(b), which asks for areas of planned disinvestment, can be used to find an upper bound to the threshold by identifying services at the margin. Question 5(b) identifies the services which are deemed just too costly relative to their benefits to be invested in and can thus also be used to explore the upper bound of the opportunity cost threshold.

Question 5(a) asks for examples of positive investment. If NHS Boards wish to prioritise the lowest cost QALYs first, these questions may identify services whose cost per QALY is *just low enough* to warrant investment. Therefore, the costs per QALY of these services can be used to identify a lower bound of the threshold.

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