Resolving the “Cost-Effective but Unaffordable” Paradox: Estimating the Health Opportunity Costs of Nonmarginal Budget Impacts

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ABSTRACT

Considering whether or not a proposed investment (an intervention, technology, or program of care) is affordable is really asking whether the benefits it offers are greater than its opportunity cost. To say that an investment is cost-effective but not affordable must mean that the (implicit or explicit) “threshold” used to judge cost-effectiveness does not reflect the scale and value of the opportunity costs. Existing empirical estimates of health opportunity costs are based on cross-sectional variation in expenditure and mortality outcomes by program budget categories (PBCs) and do not reflect the likely effect of nonmarginal budget impacts on health opportunity costs.

The UK Department of Health regularly updates the needs-based target allocation of resources to local areas of the National Health Service (NHS), creating two subgroups of local areas (those under target allocation and those over). These data provide the opportunity to explore how the effects of changes in health care expenditure differ with available resources. We use 2008–2009 data to evaluate two econometric approaches to estimation and explore a range of criteria for accepting subgroup specific effects for differences in expenditure and outcome elasticities across the 23 PBCs.

Our results indicate that health opportunity costs arising from an investment imposing net increases in expenditure are underestimated unless account is taken of likely nonmarginal effects. They also indicate the benefits (reduced health opportunity costs or increased value-based price of a technology) of being able to “smooth” these nonmarginal budget impacts by health care systems borrowing against future budgets or from manufacturers offering “mortgage” type arrangements.

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Introduction

Policy Context

In 2015, the National Institute for Health and Care Excellence (NICE) completed appraisals of a number of new drugs for treating hepatitis C [1–3]. Although these drugs were approved as cost-effective by NICE for many patients,1 NHS England (NHSE) raised serious concerns about the affordability of such a commitment, given the projected budget impact based on estimates of hepatitis C prevalence in the United Kingdom and the prices charged by the manufacturer for these drugs. As a result the implementation period of NICE guidance was extended beyond the usual timeframe [2]. Hence, there was a conflict between NICE judging these drugs to be cost-effective and NHSE regarding them unaffordable. Subsequently, NICE and NHSE have changed to the process of technology assessment to explicitly consider budget impact [5,6]. Now, new technologies judged to be “cost-effective” by NICE but with a budget impact of over £20 million will not immediately be required to be funded by the NHS and, instead, will be subject to additional negotiation between NHSE and the manufacturer. Immediate funding will be reserved for new technologies that are more cost-effective (less than £10,000 per QALY) and with a lower budget impact. Different approaches have been taken by other institutions in other health care systems. For example, the US-based Institute for Clinical and Economic Review evaluates budget impact as a separate attribute in addition to cost-effectiveness. This is justified on the basis that short-term affordability is the main determinant of coverage decisions by private insurers in the United States [7]. Another example is Australia’s Pharmaceutical Benefits Advisory Committee (PBAC); in Australia, the new hepatitis C drugs have been

1Cost-effectiveness was judged according to the standard “cost-effectiveness threshold” applied by NICE of £20,000 to £30,000 per quality-adjusted life-year (QALY). It is worth noting that the Pharmaceutical Benefits Advisory Committee (PBAC) made judgments requiring lower cost per QALY than usual given the large budget impact [4].

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judged by more stringent criteria (a lower cost per QALY “threshold”) because of the scale of their likely budget impact [4]. In effect, PBAC is insisting that the maximum acceptable price for the new hepatitis C drugs should be lower because of the significance of the projected budget impact.

Considering whether or not a proposed investment (an intervention, technology, or program of care) is affordable is really asking whether the benefits it offers are greater than the value of those things that are likely to be given up if the additional costs must be accommodated within existing expenditure commitments. Alternatively, if the additional costs of the investment are to be covered through increases in health care expenditure, some assessment of the benefits that could have been gained elsewhere from the alternative use of these additional resources needs to be considered. Therefore, an assessment of health opportunity cost, based on evidence of the marginal productivity of health care expenditure, is required whether or not health care is funded through fixed administrative budgets. The question of affordability is precisely the question that cost-effectiveness analysis seeks to inform, when the criteria for judging whether or not an intervention is cost-effective is based on an empirical assessment of the likely opportunity costs elsewhere in the health care system.2 To say that an alternative is cost-effective but not affordable must mean that the (implicit or explicit) “threshold” used to judge cost-effectiveness does not reflect the opportunity costs incurred given the scale of the impact on health expenditure. 

The problem of assessing the expected health opportunity costs of a proposed investment is the same as estimating the relationship between changes in health care expenditure and health outcome. This is the approach that is taken in research conducted in the United Kingdom [14–16], which uses national data on expenditure and outcomes in different disease areas (program budget categories [PBCs]) reported at a local level.3 By exploiting the variation in expenditure and mortality outcomes, the relationship between changes in spending and mortality is estimated while accounting for sources of endogeneity. With additional information about age and gender of the patient population, these mortality effects can be expressed in terms of cost per life-year (£25,214 per life-year). By using the effect of expenditure on the mortality and life-year burden of disease as a surrogate for the effects on a more complete measure of health burden (one that also includes morbidity burden), the result can be expressed in terms of cost per QALY, which reflects the likely impact of expenditure at the margin on both mortality and morbidity (£12,991 per QALY) [15].4 This empirical work provides

Empirical Work on Health Opportunity Costs of Nonmarginal Expenditures

Although the conceptual basis for expected health opportunity costs of a proposed investment varying with the level of incremental costs or budget impact is well established, see for instance McCabe et al. (2008); Paulden et al. (2017) and Culyer (2016), there has only so far been limited empirical work that attempts to quantify this relationship [21–23]. One study, by Claxton et al. [15], conducted an exploratory analysis, wherein different types of primary care trust (PCT) are found to have different productivity in terms of cost per life-year based on 2006–2007 expenditure in the NHS in the “big four” PBCs.5 The two types of PCT being considered are those that are “over target” in terms of their budget allocation and those that are “under target,” where deviations of actual budget allocations from targets occurred as a result of periodic adjustments of targets based on changes in the results of a needs-based formula. Over-target PCTs received an actual allocation that was greater than their target allocation, whereas under-target PCTs were allocated less than their target allocation. The cost per life-year estimates for the big four PBCs are £10,604 for all PCTs combined; £8,441 for those PCTs under their target allocation; and £14,083 for PCTs over their target allocation. The results stem from the larger magnitude of outcome elasticities in the big four PBCs when the regression models are estimated on the under-target PCTs only and smaller magnitude of outcome elasticities when estimated on the over-target PCTs only. This is consistent with the concept that there are diminishing marginal returns to health care expenditure where PCTs under greater financial pressure prioritize more cost-effective treatments within PBCs compared with PCTs facing less pressure. Although the results of Claxton et al. [15] for over- and under-target PCTs are intuitive and consistent with a health production function that exhibits diminishing marginal returns to health care expenditure, there are a number of limitations to the study: (1) only differences in outcome elasticities between PCT subgroups are considered when differences in how a change in resources are allocated might also be expected; (2) only the four largest PBCs were included in the analysis when differences in productivity and reallocation between all 23 PBCs is possible; (3) only cost per life-year were reported, rather than using estimated mortality effects as a surrogate for the effects of changes in expenditure on a more complete measure of health outcome (QALYs); and (4) there was no consideration of whether estimated differences between subgroups were likely to reflect systematic differences with adequate power or merely chance variations driven by noise in the data.

This paper contributes to the literature in two main ways. First, we are able to overcome the key limitations associated with the exploration undertaken in Claxton et al. [15] by: (1) allowing expenditure and outcome elasticities to differ between the over- and under-target PCTs; (2) including all PBCs in the analysis; (3) reporting the overall cost per QALY using the same methods and

(footnote continued)

the assumptions made in the paper: critical discussion [18,19], response to critique [32], and additional sensitivity analysis [20].

Large in this context should be judged relative to total expenditure and the significance of the scale of the budget impact depends on the resulting health opportunity cost.

Cancer, circulatory disease, respiratory problems, and gastrointestinal problems.
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