ELSEVIER

Elimination and selection by aspects in health choice experiments: Prioritising health service innovations☆

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ARTICLE INFO

ABSTRACT

Priorities for public health innovations are typically not considered equally by all members of the public. When faced with a choice between various innovation options, it is, therefore, possible that some respondents eliminate and/or select innovations based on certain characteristics. This paper proposes a flexible method for exploring and accommodating situations where respondents exhibit such behaviours, whilst addressing preference heterogeneity. We present an empirical case study on the public's preferences for health service innovations. We show that allowing for elimination-by-aspects and/or selection-by-aspects behavioural rules leads to substantial improvements in model fit and, importantly, has implications for willingness to pay estimates and scenario analysis.

1. Introduction

Prioritisation of health service innovations in a health care system where the number of new practices, services and technologies outstrips scarce resources is inevitable. Policy-makers and other decision-makers in the health care system use various methods to inform decisions about which innovation(s) to invest in. Alongside the use of economic criteria, including cost-effectiveness and cost-utility, other factors (e.g., ease of implementation, severity and burden of disease, age of target group) are used in the prioritisation of health service innovations (Boote et al., 2010; The King's Fund, 2010; Barber et al., 2011). Recently, national agencies have sought

to incorporate public preferences in priority setting and investment decisions (e.g., UK House of Commons, 2012; Health Canada, 2005).

Both moral and political arguments can be advanced in support of public involvement (Thompson et al., 2009; Boote et al., 2010). Where healthcare is funded though taxation (e.g., as in the case of UK) the public effectively become "part-owner" and so the system has a tacit moral duty to involve them in decisions that impact on their health status (Dyer, 2004; O'Donnell and Entwistle, 2004). Politically, public involvement provides a voice for disadvantaged social groups (Beresford, 2005; Boote et al., 2010) as well as a more democratic decision-making process with greater accountability (Florin and Dixon, 2004). Furthermore, public involvement can increase the relevance, appropriateness and quality of health and social care research (Cotterell, 2007; Cashman et al., 2008).

There are various methods used for the prioritisation of health service innovations, such as cost-effectiveness, cost-utility, cost–benefit. Despite the appeal of these methods, they are often unable to uncover priorities from a societal perspective (Mirelman et al., 2012). Discrete choice experiments (DCEs), which is a preference elicitation method, are particularly well suited for identifying the health service innovations that are deemed preferable from the

public's point of view. They have been used widely to elicit public and patient preferences in health economics research (see for a review (de Bekker-Grob et al., 2012)). In addition, the choice experiments have also been used by the UK NICE Decision Support Unit (?), as well as other policy relevant researches funded by the UK government bodies (Torbica et al., 2014; Gerard et al., 2012; Ryan et al., 2001; Cairns and Van der Pol, 2000).

Unlike decision-making techniques based on a single criterion (e.g., cost–benefit analysis), DCEs utilise a multi-criteria approach to inform prioritisation decisions from a broader context. It involves decomposing health service innovations into their characteristics (or decision criteria), such as their cost, how long they take to implement, and their potential impact on public health. Viewing innovations as 'bundles' of their characteristics (or attributes) allows us to study a wide range of innovations sharing the same characteristics (e.g., cost), but at different levels (e.g., £ 10, £ 20). The DCE then involves asking individuals to choose those innovations they would most like to see their healthcare system invest in from the comparisons offered to them. In this way, individuals 'trade-off' the various attributes of health service innovations. This generates outputs to weigh and compare competing innovation scenarios, importances and acceptability of decision criteria used in prioritisation from the public's perspective.

Notwithstanding the appeal of DCEs, and its use in various fields, including health economics (e.g., see for recent applications Green and Gerard, 2009; Guo et al., 2011; de Bekker-Grob et al., 2012), there are some issues raised in the literature that might be important. For example, in DCE studies, the typical assumption that individuals consider and trade-off between all attributes within the choice sets is often questioned. Indeed, a number of studies (e.g., Hensher, 2006; Carlsson et al., 2010; Campbell et al., 2011; Hensher et al., 2012; Scarpa et al., 2013) show that many respondents exhibit signs of adopting a range of simplifying mental processing rules, which are referred to as decision-making heuristics (Gigerenzer and Gaissmaier, 2011). For example, a large body of research (e.g., see Hensher et al., 2005; Campbell et al., 2008, 2011; Ryan et al., 2009; Hole et al., 2013; Lagarde, 2012; Scarpa et al., 2013; Erdem et al., 2014) has shown that many respondents simplify their choice by ignoring (or not considering) some attributes of the DCE (i.e.,'attribute non-attendance'), or make their decision based on certain criteria, such as the cost thresholds (e.g., Campbell et al., 2012, 2014). Other processing strategies may consist of respondents eliminating or selecting some alternatives based on some decision criteria. Respectively, these are referred to as 'elimination-by-aspects' (EBA) and 'selection-by-aspects' (SBA). A number of factors may contribute to these behaviours, including: a genuine disinterest or interest in the attribute; the context and survey design related issues, such as complexity, controversy and sensitivity of the survey topic, irrelevance or relevance of the attribute to respondents, cognitive demand required to complete choice tasks; respondents' different capabilities and motivations (Hensher et al., 2005); or strategic behaviour respondents may exhibit, especially in public policy choices, such as innovation prioritisation in a publicly funded healthcare system.

Despite the increased attention on decision-making heuristics within the stated preference literature, with the exception of a few studies (e.g., Batley and Daly, 2006; Hess and Stathopoulos, 2012; Campbell et al., 2014), EBA and SBA behaviours have largely been overlooked. This paper furthers this line of enquiry and explores EBA and SBA behaviours in the context of public preferences for health service innovations. To do this we use empirical data obtained from a DCE survey administered in the UK exploring public preferences relating to health service innovation investment decisions. Accounting for EBA and SBA behaviours may be particularly important in such a context since priorities for public health investment may not be considered equally by all members of the public. For example, within the UK the clinical guidelines for obesity, which is one of the health problems receiving increased attention, recommend that "managers and health professionals in all primary care settings should ensure that preventing and managing obesity is a priority, at both strategic and delivery levels, and dedicated resources should be allocated for action" (NICE, 2006, p.7). This policy priority is not always given the same weight by the public. Indeed, some members of the public consider obesity as being "self-inflicted" and dislike spending on treatments targeting people with obesity (e.g., Lund et al., 2011), whereas others recognise that obesity is not necessarily merely a lifestyle choice and there should be equal health care access for those who are struggling with it (e.g., Chambers and Traill, 2011; Sikorski et al., 2012). In contrast, there may be situations where the public may want to prioritise innovations targeting patients with a certain illness (e.g., cancer patients), and thus, they may choose innovation investment options targeting these people (e.g., O'Shea et al., 2008).

Due to the range in views and priorities, at least in principle, one may postulate the hypothesis that there is likely to be a subset of respondents who systematically restricted their actual choice set to only include alternatives that ensured certain population groups would be targeted. In fact, it is possible that some respondents selected their preferred innovation alternatives based solely on a specific target group. This may then imply that individuals eliminated or selected alternatives successively, on the basis of their failure to possess certain attributes. Failing to account for this type of processing strategy is likely to be suboptimal.

In this paper, we investigate respondents' decision-making strategies based on who the health service innovations are mostly intended for. Specifically, we propose a flexible modelling approach that is capable of addressing EBA- and SBA-like choice behaviours, whilst addressing preference heterogeneity. We use the approach to investigate the extent to which respondents eliminated alternatives targeting certain populations or limited their choice to those alternatives that targeted a certain population. The approach used in the paper is intuitive as it provides probabilistic estimates of the proportion of the sample who are associated with each type of behaviour. We first analyse the data assuming the homogeneity of preferences and the use of the conventional random utility maximisation (RUM) individual behavioural rule. We then build on this by separately accommodating EBA- and SBA-like behaviours and subsequently for both type of behaviours concurrently. Finally, we estimate the same models, but where the heterogeneity in respondents' preferences is accounted for. Overall, our approach is clearly shown to help build a richer insight into respondent's behaviour as well as raise a number of concerns about the appropriateness of assuming the deterministic choice set, as generated by the experimental design. The empirical application of our modelling approach shows that it has important implications for model fit, welfare analysis and prediction.

This paper adds to the literature in a number of ways. It highlights the importance of and need for identifying decision-making heuristics respondents may adopt in choice experiments, along with preference heterogeneity. The method outlined in the paper provides a step forward on how to accommodate EBA- and SBA-like behaviours concurrently, along with preference heterogeneity, in choice experiments using flexible probabilistic choice models. In addition to this methodological contribution, the research presents a unique conceptual approach to exploring public's preferences for health service innovations, which allows policy-makers to compare numerous competing health service innovations.

The structure of this paper is as follows: Section 2 describes our modelling approach, Section 3 explains the survey design and