

Involving the public in priority setting: a case study using discrete choice experiments

Verity Watson¹, Andrew Carnon², Mandy Ryan¹, Derek Cox²

¹Health Economics Research Unit, Institute of Applied Health Sciences, University of Aberdeen, Polwarth Building, Aberdeen AB25 2ZD UK

²NHS Dumfries and Galloway, Crichton Hall, Dumfries DG1 4TG, UK

Address correspondence to Verity Watson, E-mail: v.watson@abdn.ac.uk

ABSTRACT

Background Health-care organizations need to prioritize their resource use and should incorporate the public's preferences into their priority setting process.

Methods We apply a discrete choice experiment (DCE) to obtain weights, from the public, for use in a priority setting exercise. Ten attributes were chosen: location of care, public consultation, use of technology, service availability, patient involvement, management of care, evidence of effectiveness, health gain, risk avoidance and priority area. From the DCE responses, weighted benefit scores were calculated and used to rank development bids from across a health-care organization.

Results Sixty-eight members of the public completed the DCE. All attributes except risk avoidance were significant. The most important attribute levels were a large health gain to many people: care being provided in teams, using latest or cutting-edge technology and 24 h service availability. Local priorities were valued higher than national priorities. Ninety-five bids were ranked in order of overall score. The ranked list of development bids provided a useful tool to inform prioritization decisions.

Conclusions DCEs can offer a theoretically valid and practical means of incorporating the views of the public in an accessible, transparent and streamlined decision-making process when health-care organizations are prioritizing their resources.

Keywords economics, health services, methods

Introduction

Limited funding constrains the resources that health-care organizations have to spend on health-care provision. This implies organizations must set priorities and choose what to fund and what not to fund. This choice necessitates the use of a priority setting process to identify optimal/efficient resource shifts whereby some services are expanded and others contracted to maximize population health (or another defined objective). However, health-care organizations' objectives are complex and multidimensional. For instance, service provision should achieve local and national priorities, be acceptable to the public and allow patients involvement in their care.

Public involvement in priority setting is advocated for several reasons, including individuals' right to participate in the process; the public bring different knowledge to the

process and providers should be accountable to their communities.^{1,2} Public involvement takes many forms, varying in the consequentiality of involvement: for example consultation about final decisions; representation on decision-making panels or using public preferences to estimate service benefits. To date, public involvement in health-care priority setting has been informal³ and information about how it has influenced the organization's choices has been opaque.⁴

Verity Watson, Research Fellow

Andrew Carnon, Consultant in Public Health

Mandy Ryan, Professor

Derek Cox, Director of Public Health

This paper reports on the process and results of a priority setting exercise in a Scottish health-care organization: National Health Service (NHS) Dumfries and Galloway. This study involves the public centrally in NHS decision-making and thus advances priority setting.

Methods

Priority setting exercises compare the costs and benefits of service options for expansion/contraction. Many criteria contribute to the decision to introduce or change a service and measures of benefit must summarize these criteria into a single composite measure.

The weighted benefit score is a composite measure that both scores a project against pre-defined criteria and assigns each criterion a weight. Visual analogue and Likert-type scales ranging from 1 to 10 or 1 to 100 have been used to score health-care services. Visual analogue and Likert-type scales are problematic because many services obtain similar scores.⁵ The weights assigned to each criterion are value judgements about the relative importance of a criterion to the overall service benefit. Some studies have not assigned weights⁶ implicitly assuming all criteria are equally important, others have used existing evidence from the literature and/or local expert opinion to assign weights.⁷ These methods of assigning weights do not involve the public and can lead to decisions which lack transparency and accountability.

Studies have suggested using discrete choice experiments (DCEs) as part of the priority setting process for two reasons. First, DCEs can elicit weighted benefit scores.^{3,8} Second, DCEs can include public preferences in priority setting exercise.⁹ DCEs assume the value of a service to an individual can be defined by a set of service attributes.¹⁰ DCEs can determine the relative importance of different service attributes and produce reliable results when used to elicit public or patients' values for health-care services.¹¹ Two studies have applied DCEs to elicit weighted benefit scores from health professionals.^{12,13} Several studies have applied DCEs to elicit public preferences for priority setting using quality adjusted life year maximization, but these studies did not consider other criteria relevant to priority setting.^{14–19}

We chose 10 attributes based on the principles of care in 'Delivering for Health'²⁰ and attributes used in previous NHS Dumfries and Galloway prioritization exercises. Table 1 lists the attributes and their levels. Based on these, 64 pairs of service descriptions were created. In DCEs, individuals are presented with pairs of services and asked to choose which service they would prefer. Figure 1 presents

an example of one pair included in this study. For a detailed description of how the DCE was designed, see Supplementary data, Appendix S1.

Dumfries and Galloway is a region in the south-west of Scotland, which has a small population (~150 000) within a large geographical area (2400 square miles). A random sample of 100 residents of Dumfries and Galloway were invited by letter to attend a half-day event hosted by NHS Dumfries and Galloway. Residents were informed that the event's purpose was to involve them in the region's health service decision-making.

The DCE

On arrival at the event, attendees completed a short questionnaire about their socioeconomic characteristics and assembled in a meeting room where one of the authors (D.C.) welcomed them, introduced the event's purpose, described the attributes and levels and administered the DCE. The detailed introduction and description of the attributes took ~45 min. Health board decision-making and how the results of the DCE would be used was explained. Following this, each attribute and its associated levels were displayed in turn on a screen and explained by D.C. The amount of explanation varied across the attributes. Some attributes such as service availability are easily understood; others are more complicated and were explained in more detail. For example, in the use of technology attribute, attendees were told a service NOT USING THE LATEST TECHNOLOGY would still be a good service, the LATEST technology is the best proven technology in wide use and CUTTING EDGE technology uses the latest technological advances and is world leading. Attendees were given the opportunity to ask questions during and after the description of each attribute.

The DCE was administered to all attendees simultaneously using an electronic voting system. Before completing the DCE, attendees completed a practice question to familiarize them with the handset and ensure all handsets were working. Furthermore, an example DCE question was presented. Each DCE question was projected on to a screen at the front of the room; respondents had time to read the choice and to choose the service they preferred. Respondents made their choice by pressing either button A or B on a handset and this choice was electronically collected in a central computer. We moved on to the next choice after all respondents had voted.

In each choice respondents stated a preference for service A or B. This gave a binary dependent variable, which equals 1 when A is chosen and 0 otherwise. We used a random effects probit model in STATA v. 10.0 to estimate the probability an individual would choose one service over the

Table 1 Attributes and levels included in DCE and regression results

<i>Attribute</i>	<i>Levels</i>	<i>Coefficient/weight</i>
Location of care	At GP's office (GP)	0.2523549***
	At local health partnership (LHP)	0.1182278
	At Dumfries and Galloway Royal Infirmary (D&GRI)	0.3395357***
	Outside Dumfries and Galloway (OutD&G)	−0.5770746***
	At home	Comparator
Public involvement in decision-making	Consultation at the final stage (FINAL)	0.1165849*
	Consultation at some but not all stages (SOME)	0.2253108***
	Consultation at all stages (all)	0.4921577***
	No consultation	Comparator
Use of technology	Uses the latest technology (LATEST)	0.7056297***
	Uses cutting edge technology (CUTTINGEDGE)	0.7087127***
	Does not use the latest technology	Comparator
Service availability	Office hours only	Comparator
	Office hours and outside office hours (OOH)	0.5708215***
Patient involvement in own care	Decision made by health professional	Comparator
	Patient shares in decision (SHARE)	0.474334***
Management of care	By a individual health professional (INDv)	0.1576166***
	By a group of health professionals working as a team (TEAM)	0.7264206***
	By a group of health professionals NOT working as a team	Comparator
Evidence of clinical effectiveness	A number of clinical studies (CLIN)	−0.0117717
	At least 1 RCT (1RCT)	0.0667422
	At least 3 RCT (3RCT)	0.4146794***
	No evidence	Comparator
Health gain	Small gain to a large number or large gain to a small (Sm2L)	0.4328322***
	Large gain to a large number (L2L)	0.9661512***
Risk avoidance	Small gain to a small number	Comparator
	Medium risk reducing to a low risk (RA2)	0.1112207
	Medium risk reducing to lower than low risk (RA3)	0.2056392**
	High risk reducing to a medium risk (RA4)	0.0775806
	High risk reducing to a low risk (RA5)	0.1491032
	High risk reducing to lower than low risk (RA6)	0.1032418
Priority area	Low risk reducing to lower than low risk	Comparator
	Local priority (LOCAL)	0.2644803***
	National priority (NAT)	0.0711403
	Local and national priority (LOCAL&NAT)	0.1950561***
Constant	No priority	Comparator
Log-likelihood	−2150.430	−0.0379495
Adjusted R^2	0.215	
Number of observations	4023	

***, **, * denote that a coefficient is significant at the 1%, 5%, and 10% significance levels, respectively.

other, based on the assumption that individuals choose the service with the highest benefit (or utility) for them. The benefit that an individual received from a service is assumed to depend on the attribute and levels in Table 1. For a detail description of the data analysis, see Supplementary data, Appendix S2.

From the estimated model, the statistical significance of an attribute level indicates whether or not it influenced respondents' choices. The magnitude of the coefficient shows the relative importance of the attribute levels or the weights attached to a move from the comparator to a given attribute level.

	A	B
Location of care	Dumfries and Galloway Royal Infirmary	Outside Dumfries and Galloway
Public consultation in decision making	No consultation	Public and patients were consulted at the final stage
Use of latest technology	Not using the latest technology	Using the latest technology
Service availability	Office hours only	Office hours and out-with office hours
Patient's involvement in own care decision	No opportunity	Has the opportunity
Management of care	Care is managed by a single individual	A group of professionals working as a team
Evidence of clinical effectiveness	Clinical studies	At least 1 RCT
Health gain	Large gain to a small number Small gain to a large number	Large gain to a large number
Risk avoidance	Reduction from a high risk to a low risk	Reduction from a medium risk to a low risk
Priority area	National priority	Local and national priorities
	Service A	Service B
Which service do you prefer?	<input type="checkbox"/>	<input type="checkbox"/>

Fig. 1 Example of a choice presented to DCE respondents.

Use of the weighted benefit scores

Potential service developments in Dumfries and Galloway were identified using a two-stage process. First, services in NHS Dumfries and Galloway were grouped into 12 areas: acute services, cancer, cardiac heart disease/stroke/diabetes, child health, corporate, health-care-acquired infection, learning disabilities, community/primary care, long-term conditions, mental health, older people and public health. Second, a programme leader for each service area was responsible for identifying and submitting development bids in that area. Each submission included a description of the proposed service change, the benefits arising from and the costs associated with the change. Submissions also identified factors that might help or hinder the change.

For each bid, weighted benefit scores were calculated by summing the weights, obtained from the DCE responses, for the relevant attribute levels, dividing by the number of attributes scored and multiplying by 100. If an attribute did not apply to a bid, then it was omitted from both numerator and denominator in the calculation. Programme leaders scored each bid they submitted and the accuracy of this was checked by a panel. This ensured that bids were completed appropriately and consistently between programmes. The panel removed a small number of duplicate bids and added any missing data.

Using the weighted benefit scores, a ranking of all the submitted bids was produced. To aid with their decision-

making, the corporate management team was presented with the full ranking of all bids. Furthermore, the 20 highest scoring bids were presented in additional detail.

Results

Sixty-eight people attended the event and completed the DCE. All attendees completed 64 choices. Table 2 presents attendees' socioeconomic characteristics: individuals between 51 and 65 years and individuals living in accessible rather than remote areas are over-represented.

Results of the DCE

Table 1 shows the DCE results. The relative weights for attribute levels are intuitive and indicate the model has face validity. Higher levels of public involvement have significantly larger weights and 'public consultation at ALL stages' has the highest weight. The use of technology has significant weights for both LATEST and CUTTING EDGE technology compared with not the latest technology. These weights are not significantly different, implying that respondents did not distinguish between latest and cutting edge technology. Risk avoidance is not statistically significant (with the exception of 'a reduction of a medium risk to a lower than low risk'). Respondents either did not consider this attribute or did not distinguish

Table 2 Characteristics of respondents

		Sample (%)	Dumfries and Galloway population (%)
Age (years)	18–35	13.6	21
	36–50	24.2	27.7
	51–65	37.9	27.1
	66+	21.2	24.2
	Missing	3	
Rurality ^a	Large urban	0	0
	Other urban	27.1	28.4
	Accessible small town	22.9	15.4
	Remote small town	2.9	7.2
	Accessible rural	34.3	26.4
	Remote rural	12.9	22.6
Scottish index of multiple deprivation 2006 quintile ^b	1 (least deprived)	8.5	7
	2	32.8	22.9
	3	31.4	40
	4	22.8	22
	5 (most deprived)	4.3	8.1

^aCalculated from respondents' postcode and based on the Scottish Executive urban rural classification: large urban = settlements of over 125 000 people; other urban = 10 000–125 000 people; accessible small town = 3 000–10 000 people within 30 min drive of a settlement of 10 000 or more; remote small town = 3 000–10 000 people with a drive time of over 30 min to a settlement of 10 000 or more; accessible rural = less than 3 000 people and within 30 min drive of a settlement of 10 000 or more; remote rural = less than 3 000 people and with a drive time of over 30 min to a settlement of 10 000 or more.

^bThe Scottish Index of Multiple Deprivation identifies small area concentrations of multiple deprivation, see <http://www.scotland.gov.uk/Topics/Statistics/SIMD>.

between its levels when making their choices. This attribute was therefore excluded from the weighted benefit scores.

Results of priority setting exercise

Ninety-five development bids were submitted from across the 12 services areas in Dumfries and Galloway. Of these service areas, acute services and child health provided the largest number of bids. The weighted benefit scores calculated from the DCE results ranged from 57 to 17. Figure 2

shows the distribution of the bids' weighted benefit scores. The spread of benefit scores indicates that the attributes chosen discriminated between the bids received. Acute service area bids tend to rank higher than community service or long-term condition bids. For instance, of the top 25 bids, 11 were from acute services, 8 were from child health and 6 from other programmes.

Detailed information on the top 20 bids was presented to the corporate management team alongside a ranking of all bids. The Dumfries and Galloway corporate management team used the weighted benefits scores alongside other criteria when deciding which bids to fund. While risk did not influence DCE respondents' choices, the corporate management team had to take into account the risk associated with not funding a particular bid. Furthermore, Scottish Government policy also influenced the corporate management team's decision-making. Consideration of the weighted benefit scores was not a one-off event. Over the course of the subsequent year, NHS Dumfries and Galloway funded the 10 projects with the highest weighted benefit scores.

Discussion

Main findings of this study

There has been limited debate about the methods to calculate weighted benefits scores for priority setting. This study used a DCE to obtain weights from the general public. Our application demonstrates the feasibility of the method. The general public were capable of making tradeoffs between service attributes. This concurs with other studies, which found respondents to be 'highly engaged'¹⁵ and 'willing and able to contribute to the debate'.²¹

Acute service bids received higher scores, on average, than community care or long-term condition bids. Studies asking the general public to directly prioritize services found acute services receive high priority.^{22–24} The DCE asked respondents to trade off service attributes and not to directly prioritize specified services. Consequently, our results add robustness to the findings of others.

What is already known on this topic

When the public are asked about the role their preferences should have in health-care decision-making different studies report different results.^{2,22,23,25} Wiseman *et al.*² found that 74–78% of respondents think public preferences should inform health-care priorities, Bowling *et al.*²³ found that 58% of respondents think priority setting should be left to the doctors. The variability of these results is attributed to responsibility implied by the questions. The public want

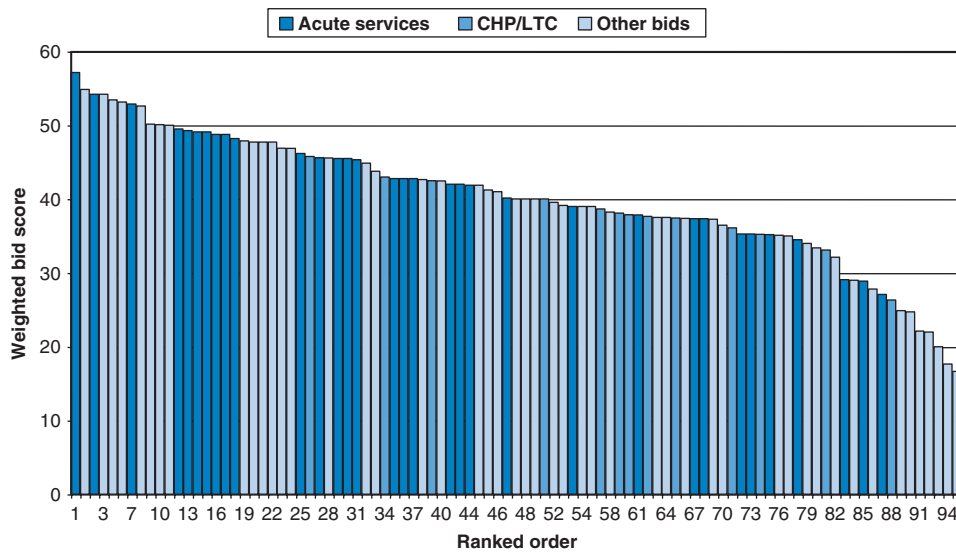


Fig. 2 Ranking of weighted benefit scores.

'accountable consultation', whereby they are involved in the decision but are not responsible for making the decision.²⁵ Variability is also related to the priority setting level; the public are comfortable being involved at the organization level but want doctors to make decisions at the patient level. We sought public involvement at the organization level, to ensure the priority setting process reflected the values of the Dumfries and Galloway population, but the responsibility for the decision remained with the organization (as is required by legislation).

The concepts involved in priority setting processes are complex. We spent 45 min, before respondents were asked to make choices, explaining what each attributes meant and how the results would be used. We did this to ensure that respondents understood the task and gave a similar meaning to attributes. This information was presented in a matter-of-fact manner to avoid influencing or leading respondents. We did this to try and overcome the concern that the public may not be able to provide informed preferences about health-care services. However, after providing respondents with time for discussion and deliberation among themselves, Dolan *et al.*²⁶ found respondents' views on priority setting were systematically different. They interpret their result as casting doubt on 'surveys, which do not allow respondents the time or opportunity to reflect on their preferences'. The citizen's jury, which Leneghan²⁷ used to involve the public in the priority setting process, is a promising approach that can be combined with surveys, such as DCEs, to give respondents time to reflect upon their preferences.

Cost-value ratios obtained when benefits scores are divided by cost assume cardinality. One criticism of visual analogue or Likert scales is that they constrain scores to be within a 0–10 or 0–100 range and do not have ratio scale properties and thus are not cardinal numbers,⁵ however neither are the benefit scores obtained from a DCE. Consequently, the weighted benefits scores should not be combined with cost to obtain an efficiency measure. Scott and Lees⁷ average the benefit rank and cost rank of all bids and calculate a prioritization score index. Future studies should include service cost as a DCE attribute and calculate willingness to pay for different services¹¹ and then use this within a cost–benefit analysis to assess service expansion or contraction efficiency.

Acceptance of any priority setting process is affected by organizational barriers and requires 'high level buy in', sufficient financing and a structure that supports change.²⁸ Our results are not fixed. The attributes' importance and relevance will change over time, due to changes in the population, government policy and the NHS. An NHS organization could consider the attributes every year and decide if they meet their needs. If attributes are changed a new questionnaire can be administered and a new weighted benefit score estimated. We identify two barriers to the regular revision of weights. First, the process can be expensive: applying DCEs needs specialist skills that are not present in all organizations and a new study requires a new sample and questionnaire. Second, when weights change some services will gain and other will lose. Acceptance of change will depend on the organization's ethos. In this

study, the weighted benefits scores were derived using an accessible, transparent and streamlined decision-making process that reflected the values of the general public in Dumfries and Galloway.

What this study adds

When asked in priority setting exercises to rate each criterion's importance some respondents (managers, professionals, patients or the public) state that all are important. DCEs prevent this because they require respondents to make tradeoffs between the attributes presented.²⁹ DCEs explicitly ask respondents to make value judgements by choosing which service they would prefer and these choices reflect how real decisions are made.

A previous study applying a DCE to elicit weighted benefit scores found many bids received the same score.¹² Farrar *et al.* calculate weights for each attribute and assume a linear relationship between attribute levels. In contrast, we calculated weights for each attribute level and thus do not assume a linear increase in benefit within an attribute. Our results which distinguish between many services demonstrate the advantage of our approach.

Often priority setting is undertaken at the disease level.³⁰ A wider perspective, which considers resource allocation across modalities or the whole organization, has been advocated.^{30,31} We take a wide perspective by considering priority setting at the local NHS organization level and by defining benefits in terms of a broad range of attributes including health outcomes and benefits such as access to services and national priorities. This allows us to compare bids across many clinical and non-clinical areas.

Limitations of this study

This study has two limitations. First, this study included 10 attributes: DCEs typically include 4–6.¹¹ While we found that the results had face validity and conclude that, on average, respondents understood the task, the implications of the task's complexity for respondents warrant consideration. Studies have found that DCE task complexity increases with the number of attributes.^{32–34} A consequence of having a larger number of attributes is that respondents completed 64 choices: DCEs typically include between 8 and 32 choices.³⁵ More choices may increase the task complexity and increase inconsistent responses or cause respondents to adopt strategies to simplify the task.^{35,36} Studies report mixed evidence of the impact of the number of choices on responses to postal or online questionnaires.^{35–37}

Second, the attributes included were based on policy documents and previous priority setting exercises. We do

not know if the public in Dumfries and Galloway would choose these attributes for priority setting in their area. One possible explanation for risk avoidance being insignificant is that respondents used information-processing strategies that ignored this criterion. However, this criterion refers to organizational risk, and it is possible that residents of Dumfries and Galloway do not consider this to be important. Future research should include qualitative research to identify the public's choice of attributes.^{19,38}

Supplementary data

Supplementary data are available at the *Journal of Public Health* online.

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