



Examining the attitudes and preferences of health care decision-makers in relation to access, equity and cost-effectiveness: A discrete choice experiment

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ABSTRACT

Objectives: To describe the views of health care decision-makers and providers operating in the UK National Health Service (NHS) concerning the concepts of cost-effectiveness, equity and access through a series of attitudinal questions; to evaluate the preferences of health care providers in relation to each of these concepts using a discrete choice experiment (DCE); to assess the impact of prior completion of an attitude questionnaire on preferences elicited through a DCE.

Method: Three versions of a DCE questionnaire were developed with and without a series of attitudinal questions and randomly distributed to 1456 health care decision-makers and providers. The questionnaire sought to elicit their preferences between the competing objectives of cost-effectiveness, equity and access within the context of different hypothetical, specialist treatment programmes for cardiovascular disease.

Results: The response rate was 26%. Female respondents exhibited a stronger preference than males for reducing health inequalities by targeting the worst off (Wald test, $P < 0.001$). Primary Care Trusts (PCTs), Strategic Health Authorities (SHA) or Department of Health (DoH) staff were also more likely than hospital managers to favour programmes that targeted the worst off (Wald test, $P < 0.001$ in each case). Those who were clinically trained and currently in a clinical post had a stronger preference for programmes with shorter waiting times compared to those in a managerial or non-clinical posts, who exhibited stronger preferences for equity. Completion of a series of attitudinal questions prior to completing the DCE task resulted in a lower proportion of dominant responses and an increased willingness to make trade-offs between attributes.

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1. Introduction

The UK National Health Service (NHS) aims to promote access to services, reduce inequalities in health, and promote cost-effectiveness in the use of its resources [1,2]. The

pursuit of these objectives may suggest conflicting courses of action and priority setting then requires a choice or trade-off between these competing aims. There is very little information available concerning the relative importance given to access, equity and cost-effectiveness by decision-makers at any level of the NHS or the health care systems of other countries and the trade-offs that are inevitably made between these competing objectives.

There were three main elements to this study; the first two elements being empirical and the third element being of methodological interest. Firstly, to describe the views of

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health care decision-makers and providers operating in the UK NHS about the concepts of cost-effectiveness, equity and access using a series of attitudinal questions. Secondly, to evaluate their preferences in relation to each of these concepts using a discrete choice experiment (DCE). Thirdly, to assess the impact of prior completion of an attitude questionnaire on preferences elicited through a DCE.

In a DCE, individuals are typically faced with pairwise choices between hypothetical scenarios designed to reflect the factors considered within real world decisions. Individuals are asked to choose their preferred scenario from each pair and inferences are drawn about their values based upon the trade-offs made between attributes. DCE studies are increasingly being used to elicit patient and/or general population preferences for alternative health service configurations [3,4]. The technique has also been more rarely but successfully used with health care decision-makers in priority setting for clinical service developments [5] and in the choice of hospital reimbursement scheme [6].

Economists typically assume that respondents engage in compensatory decision-making when engaging in DCE type choice tasks. Choice decisions can then be modeled statistically using a form of compensatory objective function [7]. However, alternative types of reasoning, e.g. take the best may also be employed whereby the option best satisfying the most preferred objective is selected [8,9]. This type of reasoning leads to the exhibiting of dominance in DCE studies where the scenario with the higher level of a given attribute is always chosen, irrespective of the levels of the remaining attributes [9]. In a study to examine politicians and hospital managers trade-offs in the choice of hospital reimbursement scheme Bech found that 27% of respondents exhibited dominant preferences for one of the attributes presented [6]. Other studies have reported much higher proportions of dominant respondents, e.g. Ryan et al. found that 70% of respondents exhibited dominant preferences [10]. Preferences may also be affected by a variety of factors including an individual's own experiences and may also be dependent upon the type of elicitation technique employed [11–13].

There is evidence to suggest that some simple interventions can be included within a choice task to encourage individuals to adopt a more systematic approach to the evaluation of information [14,15]. This may lead to the formation of more stable preferences which are essentially closer to the underlying compensatory preferences assumed by economists in the analysis of DCE data. This study sought to facilitate more stable preferences from respondents by integrating a DCE with a series of attitudinal questions. A 25-item standard attitude questionnaire to assess views towards issues of access, cost-effectiveness and equity was administered prior to the employment of the DCE. This aimed to encourage respondents to consider their own attitudes and views about the concepts of cost-effectiveness, equity and access within the context of priority setting within the NHS.

Specifically the study aimed: (A) to describe health care providers (HCPs) (NHS managers, clinicians and nurses) views about concepts of cost-effectiveness, equity and access via a series of attitudinal questions, (B) to evaluate the preferences of HCPs for different hypothetical, special-

ist treatment programmes for cardiovascular disease using a DCE and (C) to assess the impact of completing an attitude questionnaire on preferences elicited through a DCE.

2. Methods

2.1. Sample selection

HCPs were drawn from the macro-, meso- and micro-levels of health care decision-making in the UK. At the macro-level, senior officials in the Department of Health (DoH), NICE directors, senior officials from the Welsh Assembly, National Service Framework directors, and senior Directors of Public Health were all sampled ($n=68$). At the meso-level, all 28 Chief Executives in Strategic Health Authorities (SHA), 298 chief executives in Primary Care Trusts (PCTs) in England and 23 individuals who had titles such as head of resources or director of commissioning within PCTs were sampled. The micro-level was represented by all 1039 clinicians active in the UK in the specialties of cardiac disease, cardiovascular surgery, vascular surgery and respiratory medicine. This gave a total possible sample of 1456 individuals, a comprehensive sample covering all levels of decision-making within the NHS.

2.2. Materials

Three versions of the questionnaire were produced. The main questionnaire (Version 1) comprised the attitudinal questions, the DCE questions, background characteristics, and a question asking whether the respondent was interested in taking part in a follow-up interview. This questionnaire was administered a larger sample of individuals than Versions 2 and 3 because this was our preferred study design. Versions 2 and 3 were developed more specifically to test methodological questions ($n=340$ for each version). Version 2 did not contain the attitudinal questions but the remainder of the questionnaire was identical to Version 1. Version 3 was identical to Version 1, except that the order of presentation of the DCE attributes was reversed, i.e. total distribution of QALYs was the first item and distance travelled was now the last item. This design enabled checking for a possible ordering effect in the presentation of the attributes within the pairwise choices. The questionnaires were distributed randomly throughout the sample using random number allocations in Excel. The development of the attitudinal statements and DCE questions are discussed in more detail below.

2.3. Attitudinal items

A multi-item attitude questionnaire was developed in the context of a Service Delivery and Organisation (SDO) funded study considering trade-offs between cost-effectiveness, equity and access [16]. With reference to guidelines on questionnaire development and attitude measurement [17], 58 items were identified from 3 sources. Firstly, the results of a qualitative survey of the public's views about the relative importance attached to different factors when setting priorities in health care [18]. Secondly, definitions and conceptual descriptions of equity, access

and cost-effectiveness identified in a structured review of policy documents and statements made during qualitative interviews of HCPs to explore providers views of cost-effectiveness, equity and access [16]. Finally, the (14) co-authors of the SDO study rated each of the items on a Likert scale (0–6; strongly disagree–strongly agree) and made comments about items in terms of comprehension and social desirability of response. From this process, 25 statements were selected for use in the final attitudinal questionnaire to assess professional' views towards cost-effectiveness, equity and access (Appendix A).

2.4. DCE attributes and levels

The attributes and the levels for the DCE were informed by working definitions of each of the key concepts resulting from prior qualitative interviews: cost-effectiveness, as the maximisation of health benefits; equity, as reducing inequities in health; access as (1) the distance that people have to travel to utilise services (geographical access) and (2) how long they have to wait to use those services (temporal access). In order to simplify the cost-effectiveness attribute for inclusion in the DCE, equally costly programmes were assumed and effectiveness was allowed to vary between programmes. Effectiveness was expressed in terms of quality adjusted life years (QALYs), which is presently the most common metric for expressing the benefits from health care programmes in the context of informing resource allocation decisions [19]. The equity attribute was defined according to the share of health benefits received by the highest and lowest population income quintiles. Access was defined firstly in terms of the time spent waiting for treatment and secondly in terms of the distance travelled to receive treatment (geographical access).

The DCE approach requires that the chosen attribute levels should be realistic and credible to respondents and, crucially, that respondents are capable of making trade-offs between them [9]. Total health benefit from each programme (QALYs) had levels 20, 30 and 40; the share of health benefits (SHARE) was either 20% to both highest and lowest quintiles (SHARE = 0), or 30% to the worst off quintile and 10% to the best off quintile (SHARE = 1). The three middle quintiles always received 20%. The average waiting time to receive specialist treatment (WAIT) was either 2 months or 8 months and the average distance travelled to hospital to receive treatment (DISTANCE) was either 5 or 30 miles. All variables but SHARE were entered as continuous variables. SHARE is a categorical variable but has an identical effect to including two variables for the upper and lower group shares and restricting that their coefficients

have equal magnitude and opposite sign. The attributes and their levels are defined in Table 1.

Computer-based software allowed the creation of a set of 8 choice sets from which a linear additive model was estimated [20]. The properties of orthogonality, level balance and minimum overlap were considered within the DCE design. For each pair of scenarios respondents were asked to indicate which they would choose when asked to consider different ways of providing specialist treatment for a cardiovascular disease (see Appendix B for an example of a pairwise choice included within the DCE).

2.4.1. Demographic characteristics

The following items were used to elicit data about the characteristics of HCPs participating in the survey: age; sex; training; job description; location in the UK and private insurance scheme cover. These data were collected to provide proxy measures of differences in experience with which to categorise staff for sub-group analysis.

2.4.2. Pilot study

In order to check completion rates and respondents' understanding of all items in the questionnaire, a pilot study was undertaken in advance of the main study involving a convenience sample of nine clinicians and an administrator from a local Hospital Trust who completed the questionnaire and commented on the items included. A number of small changes were made to the layout and content of the survey instrument as a consequence of the pilot study.

2.4.2.1. Data analysis. Three sets of data analyses were carried out to meet the aims of the study:

2.4.2.1.1. Attitudinal questions. A factor analysis using a varimax rotation was applied to the attitudinal data to reduce the number of items in further analysis. As all items achieved a correlation of above 0.3 within the component matrix, all items were included within the final equation. Ten factors were extracted accounting for 63% of the variance in the equation (Table 2) (Eigenvalues > 1). As this is the first study to describe HCPs' views towards equity, access and cost-effectiveness, the frequency for responses to each item are recorded for descriptive purposes. Factor scores were calculated by summing all item scores within a factor and dividing the sum by the number of items in the factor to give a single score rated from 0 to 6. Analysis of variance was used to explore differences in attitudes by demographic variables age, sex and job type with a 0.05 significance level.

2.4.2.1.2. Discrete choice experiment. The DCE data were analysed using a random effects probit model that

Table 1
Attributes and levels included in the study.

Attribute	Label	Description	Level/Coding
Total health benefit from each programme	QALYs	Continuous	20, 30, 40
The share of total health benefits	SHARE	Categorical	20% for both groups = 0; 30% for worst off group = 1
The waiting time to receive specialist treatment	WAIT	Continuous	2 and 8 months
The distance travelled to hospital to receive treatment	DISTANCE	Continuous	5 and 30 miles

Table 2
Characteristics of respondents ($n = 380$).

Characteristics	<i>n</i>	%
Age		
<40	40	(11)
40–54	270	(71)
55+	61	(16)
Missing	9	(2)
Gender		
Male	265	(70)
Female	98	(26)
Missing	17	(5)
Type of post		
Clinically trained, clinical post	230	(61)
Clinically trained, managerial post	70	(18)
Non-clinically trained, non-clinical post	58	(15)
None of the above	5	(1)
Missing	17	(5)
Current post		
Hospital clinician	239	(63)
PCT	102	(27)
SHA/DoH	23	(6)
None of the above	5	(1)
Missing	11	(3)
Private health insurance		
Yes	58	(15)
No	312	(82)
Missing	10	(3)
Geographical location		
England	325	(86)
Northern Ireland	14	(4)
Scotland	17	(5)
Wales	15	(4)
Missing	9	(2)

takes account of the repeated measurement aspect of the data, whereby multiple responses are obtained from the same individual [21]. The function to be estimated was of the following form:

$$V = \beta_1 \text{QALY} + \beta_2 \text{SHARE} + \beta_3 \text{WAIT} + \beta_4 \text{DISTANCE} + e + u$$

where V is the utility or satisfaction associated with each programme, β_1 – β_4 are the parameter estimates of the model and e and u are the unobservable error terms, where e is due to differences amongst observations and u is the error term due to differences amongst respondents. The estimated coefficients and their statistical significance (or otherwise) indicate the relevant importance of the different attributes on individual preferences. A positive sign on a coefficient indicates that as the level of the attribute increases the utility derived increases (and conversely for a negative sign). The marginal rate of substitution (MRS) provides an indication of the extent to which respondents are, on average, prepared to trade an improvement in one attribute for a detriment in another attribute. The MRS between a pair of attributes can be estimated by the ratio of the relevant parameter estimates.

To ascertain the extent to which preferences vary across respondent subgroups, the data were segmented according to: age group (39 or younger, 40–54, 55 or older); gender; clinically trained and in clinical post versus non-clinically trained and/or in non-clinical post; and hospital clinician versus PCT or SHA/DoH. This was provided that

the subgroups had more than 30 observations, which is the minimum number recommended for analysis [7]. Dummy variable interaction terms were then created between all of the attributes and a dummy variable for each characteristic. Where there were more than two levels for a particular characteristic, one level was used as a base case and all subsequent levels were compared to the base case. The Wald statistic was used to test for statistically significant differences on the coefficients across sub-groups. For each respondent, tests were also carried out to determine if any of the attributes were dominant; that is, whether the scenario with the higher level of a given attribute is always chosen, irrespective of the levels of the remaining attributes [9].

2.4.2.1.3. *Attitudinal questions impact on DCE responses.* Chi-squared tests were used to examine any differences in the DCE choices made and/or use of a dominant processing strategy were employed, according to whether or not participants received attitude questions.

3. Results

A total of 380 questionnaires were returned after one reminder, representing a 26% response rate which is broadly comparable to the response rates for postal surveys in the general population [22,23]. The incorporation of attitudinal questions did not adversely affect response rates; there were no significant differences in response rates across the three versions of the questionnaire, with response rates of 27, 26 and 24%, respectively. Respondent characteristics are shown in Table 2. The majority of respondents were male (70%) and aged between 40 and 54 years (71%). Hospital clinicians made up nearly two-thirds of the sample, and most respondents were working in England.

3.1. Attitudinal questions

There were 288 useable responses to the attitude questionnaires (Table 3). The findings suggest that respondents view current policies as necessary to maintain an efficient health service (factor 1; factor 3; factor 6; factor 8; factor 10) but are sceptical of how the policies are implemented and understood by both patients and professionals (factor 2; factor 5, factor 7; factor 9). Additionally, they are unsure of their usefulness in long-term service provision (factor 4). The distribution of responses by individual items suggests: variation in views by HCPs; more homogeneity in views around conceptual issues, for example the role of the NHS, than about turning policy into practice. There were differences in HCPs responses by sex and job type: both men and clinicians in clinical positions were less supportive of current policies and more sceptical of their implementation (Table 4).

3.2. Discrete choice experiment

The results of the random effects probit model for the total sample (excluding 10 respondents with missing data) and for those with non-dominant preferences are shown in Tables 5a and 5b. For the total sample (Table 5a), all the regression coefficients have the expected signs and are sta-

Table 3
Attitudinal responses–frequency of responses to items by factor (n = 288).

Factor/item and number	Frequency (%)		
	Disagree	Neutral	Agree
	0–2	3	4–6
(1) Usefulness of targets (6 items; 12% variance)			
Targets help health professionals focus on what care is important to patients [2]	58	18	24
Cost-effectiveness calculations are essential when allocating current service resources [4]	12	13	75
It is essential that NHS services are targeted to the needs of the local population [5]	4	8	88
Equity should be measured by assessing the impact of service provision on disease rates [6]	25	25	50
Information gained from equity, access and cost-effectiveness exercises help decision-makers to manage the NHS better [21]	16	17	67
A service cannot be cost-effective if it does not meet patient needs [25]	22	12	68
(2) Limitations of policy implementation (5 items; 9% variance)			
Service managers do not know how to interpret the information elicited by current target initiatives [7]	17	24	59
Using waiting lists to measure access is meaningless [8]	26	9	65
Health professionals feel their work is compromised by meeting policy targets [13]	6	9	85
The different values across society make it difficult to reach a consensus on NHS service priorities [14]	21	11	69
A lot of NHS resources are wasted by 'old style' management practices [24]	21	23	56
(3) Prioritising spending (3 items; 7% variance)			
Patients living in deprived areas should have access to more services than those living in affluent areas [3]	39	15	45
People will not pay more taxes to support changes to NHS services [16]	61	15	24
Research should not be a part of routine health care delivery [23]	84	7	9
(4) Impact on service planning (2 items; 6% variance)			
Cost-effectiveness calculations are not useful for long-term service planning [17]	67	10	24
It is important that patients see the health professional they want to see [20]	32	22	46
(5) Uncertainty about policy prioritising (1 item; 5% variance)			
Issues of equity are morally more important than issues of access [18]	21	37	42
(6) Measurement of access (2 items; 5% variance)			
Access should be measured by matching the actual service provision with patient's preference for services [12]	47	24	29
Access should be measured by whether or not patients received an effective health intervention [15]	19	12	69
(7) Patients' lack of awareness about the impact of service use (2 items; 5% variance)			
Patients are not aware of how resource limitations affect NHS service planning [1]	17	12	71
People who use the health service more often than average should pay more [9]	85	7	9
(8) Purpose of NHS (1 item; 4% variance)			
It is the role of the NHS to ensure patients have access to services when they need them [22]	4	4	92
(9) Awareness of policy decisions in practice (2 items; 4% variance)			
Most health professionals do not differentiate between equity, access and cost-effectiveness when delivering health services [11]	13	15	72
Greater transparency about NHS policy decisions will help patients understand changes in service provision [19]	13	13	74
(10) Importance of time targets (1 item; 4% variance)			
It is important that patients can see a GP within 48 h [10]	13	11	77

Table 4
Attitudinal differences by respondent characteristics.

Age (n = 282)	<39 years (n = 28)		40–54 (n = 202)		55+ (n = 52)		Significance	
	Mean	CI	Mean	CI	Mean	CI	f	Sig
Factor 1: usefulness of targets	4.0	2.8–5.2	3.6	3.4–3.7	3.9	3.6–4.1	2.0	0.14
Factor 2: limitations of policy implementation	4.6	2.8–6.3	4.1	3.9–4.3	4.2	3.8–4.5	0.6	0.53
Factor 3: prioritising spending	2.8	1.7–3.8	2.4	2.2–2.6	2.2	1.8–2.6	5.4	0.58
Gender (n = 275)	Male (n = 196)		Female (n = 79)		Significance			
	Mean	CI	Mean	CI	f	Sig		
Factor 1: usefulness of targets	3.6	3.4–3.7	3.9	3.6–4.3	4.6	0.03		
Factor 2: limitations of policy implementation	4.2	4.0–4.4	4.0	3.7–4.3	1.4	0.24		
Factor 3: prioritising spending	2.3	2.9–2.5	2.7	2.4–2.9	4.2	0.04		
Job type (n = 275)	Clinician in clinical post (n = 173)		Clinician in management (n = 53)		Non-clinician (n = 49)		Significance	
	Mean	CI	Mean	CI	Mean	CI	f	Sig
Factor 1: usefulness of targets	3.4	3.2–3.6	4.3	4.0–4.5	4.2	3.8–4.5	10.6	<0.001
Factor 2: limitations of policy implementation	4.3	4.2–4.5	3.6	3.4–3.9	3.7	3.3–4.2	7.0	<0.001
Factor 3: prioritising spending	2.3	2.1–2.5	2.3	2.0–2.6	2.8	2.1–3.4	1.6	0.20

Table 5a

Random effects probit model results: Full sample (370 respondents, 2937 observations).

Attribute	Coefficient	P	95% CI
QALY ^a	0.0630	<0.001	0.0586–0.0674
SHARE ^a	0.1646	<0.001	0.1040–0.2252
WAIT ^a	–0.0825	<0.001	–0.0925 to –0.0725
DISTANCE ^a	–0.0099	<0.001	–0.0123 to –0.0075
CONSTANT	0.0326	0.362	–0.0375 to 0.1028

^a Indicates $P < 0.05$.**Table 5b**

Random effects probit model results: non-dominant respondents (221 respondents, 1737 observations).

Attribute	Coefficient	P	95% CI
QALY ^a	0.0514	<0.001	0.0461–0.0567
SHARE ^a	0.1241	0.001	0.0507–0.1975
WAIT ^a	–0.0755	<0.001	–0.0874 to –0.0636
DISTANCE ^a	–0.0088	<0.001	–0.01117 to –0.0059
CONSTANT	–0.0950	0.025	–0.1778 to –0.0122

^a Indicates $P < 0.05$.

tistically significant, indicating that in general respondents prefer health care programmes: that bring about greater benefits, reduce inequalities, have shorter waiting times and shorter distances to travel for treatment. The results when those with dominant preferences are excluded are presented in Table 5b and are broadly similar in terms of coefficient size and direction for each attribute indicating that, for this study, the policy implications are the same regardless of whether dominant preferences are excluded or included within the data analysis.

Consider a programme providing the middle level of total health benefit (30 QALYs) that increases the health of all groups equally (SHARE=0). Here, the five quintiles receive six additional QALYs each. For the non-dominant respondents, the size of the coefficients for SHARE (0.1241) and QALY (0.0514) suggest that targeting the worst off (SHARE=1) is preferred to providing an additional QALY in total health benefit. In order to have the same effect as improving equity, a programme increasing total health ben-

efit would have to provide 2.41 (0.1241/0.0514) additional QALYs on top of the original benefit of 30 QALYs. Fig. 1 illustrates the benefits to the top, bottom and middle quintiles in equivalent equity- and health-improving programmes from a baseline programme providing 30 QALYs.

In relation to waiting time, a 1-month reduction in waiting time (coefficient 0.0755) in a programme is valued more highly than a one QALY improvement in health benefits (0.0514). In order to have the same effect as a 1-month reduction in waiting time, the total health benefit of the programme would have to increase by 1.47 QALYs (0.0755/0.0514). In a similar way, a one QALY improvement in total health benefits has the same effect as a reduction of 5.84 miles in the average distance to a hospital (0.0514/0.0088).

The results from the segmentation of respondents according to background characteristics (Table 6) indicated that there were no statistically significant differences in preferences across age groups. However, female respondents exhibited a stronger preference than males for targeting the worse off (Wald test, $P < 0.001$). Those who were clinically trained and currently in a clinical post had a stronger preference for programmes with shorter waiting times compared to those in a managerial or non-clinical posts, who tended to favour equity more. Hospital clinicians were less likely than PCT, SHA or DoH staff to favour programmes that target the worst off (Wald test, $P < 0.001$ in each case).

3.3. Attitudinal questions impact on DCE responses

Chi-squared analyses were carried out to assess the impact of completing the attitude items on the DCE preference responses. There were no differences in the eight programmes chosen by whether or not the participants had completed the attitudinal questions. However, it was noted that 39% of respondents exhibited dominant preferences for one of the attributes when making their DCE choice; 28% were in relation to total health benefit and 10% were in relation to waiting time. It was found that a lower proportion

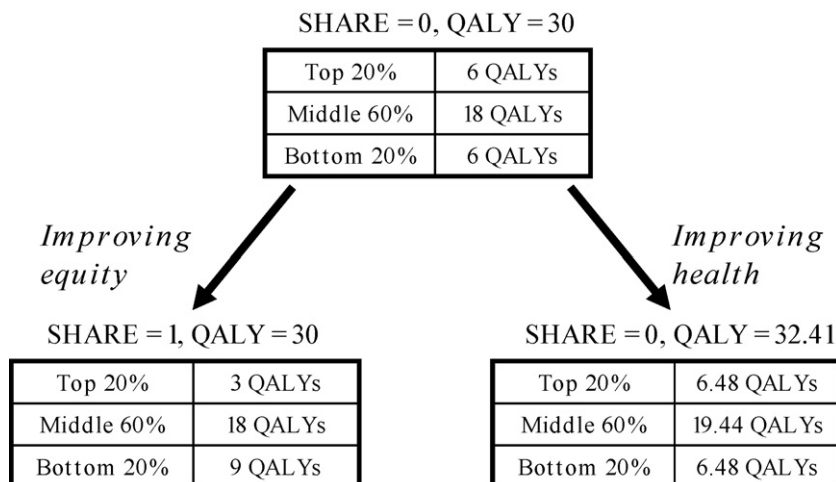
**Fig. 1.** Equivalent improvements in equity and total health benefit.

Table 6
Results of data segmentation—Model 1 = age; Model 2 = gender; Model 3 = level; Model 4 = post.

Model 1: age		
Attributes	Coefficient	95% CI
(1a) 55+ QALY*	0.0650	0.0544–0.0756
(2a) 55+ SHARE*	0.2092	0.0722–0.3462
(3a) 55+ WAIT*	–0.0618	–0.0851 to –0.0385
(4a) 55+ DISTANCE*	–0.0079	–0.0133 to –0.0024
(1b) 40–54 QALY*	0.0646	0.0594–0.0697
(2b) 40–54 SHARE*	0.1299	0.6501–0.1947
(3b) 40–54 WAIT*	–0.0843	–0.0956 to –0.0729
(4b) 40–54 DISTANCE*	–0.0099	–0.0126 to –0.0073
(1c) <40 QALY (base)	1.000	
(2c) <40 SHARE (base)	1.000	
(3c) <40 WAIT (base)	1.000	
(4c) <40 DISTANCE (base)	1.000	
CONSTANT	0.0009	–0.0647 to 0.0665
Wald tests for differences between attribute coefficients		
Null hypothesis	Wald	P
(1c)–(1b)=0	0.01	0.937
(2c)–(2b)=0	1.05	0.305
(3c)–(3b)=0	2.89	0.089
(4c)–(4b)=0	0.45	0.501
N (data)	2907	
N (groups)	365	
χ^2	787.03	
P	<0.001	
Model 2: gender		
Attributes	Coefficient	95% CI
(1a) MALEQALY*	0.0626	0.0572–0.0678
(2a) MALESHARE*	0.0820	0.0119–0.1521
(3a) MALEWAIT*	–0.0849	–0.0965 to –0.0732
(4a) MALEDISTANCE*	–0.0105	–0.0133 to –0.0077
(1b) FEMALEQALY*	0.0664	0.2555–0.4865
(2b) FEMALESHARE*	0.3710	–0.0997 to –0.0610
(3b) FEMALEWAIT*	–0.0803	–0.0127 to –0.0037
(4b) FEMALEDISTANCE*	–0.0082	–0.0471 to 0.0961
CONSTANT	0.0245	–0.0471 to 0.0961
Wald tests for differences between attribute coefficients		
Null hypothesis	Wald	P
(1a)–(1b)=0	0.52	0.472
(2a)–(2b)=0	19.06	<0.001
(3a)–(3b)=0	0.18	0.675
(4a)–(4b)=0	0.84	0.360
N (data)	2844	
N (groups)	357	
χ^2	851.26	
P	<0.001	
Model 3: Level		
Attributes	Coefficient	95% CI
(1a) CLINQALY*	0.0466	0.04505–0.0526
(1b) CLINSHARE	0.0010	–0.0767 to 0.0787
(1c) CLINWAIT*	–0.0178	–0.0246 to –0.0111
(1d) CLINDISTANCE*	–0.0079	–0.0113 to –0.0045
(2a) NONCLINQALY*	0.0527	0.0458–0.0560

Table 6 (Continued)

Model 3: Level		
Attributes	Coefficient	95% CI
(2b) NONCLINSHARE*	–0.0378	–0.0681 to –0.0074
(2c) NONCLINWAIT*	0.0196	0.0096–0.0296
(2d) NONCLINDISTANCE*	–0.0110	–0.0154 to –0.0067
CONSTANT*	–0.0772	–0.1300 to –0.0244
Wald tests for differences between attribute coefficients		
Null hypothesis	Wald	P
(1a)–(1b)=0	1.74	0.187
(2a)–(2b)=0	0.82	0.364
(3a)–(3b)=0	37.60	<0.001
(4a)–(4b)=0	1.23	0.268
N (data)	2852	
N (groups)	358	
χ^2	484.38	
P	<0.001	
Model 4: Post		
Attributes	Coefficient	95% CI
(1a) HOCLINQALY*	0.0504	0.0438–0.0568
(1b) HOCLINSHARE	–0.0551	–0.1440 to 0.0339
(1c) HOCLINWAIT*	–0.0737	–0.0882 to –0.0592
(1d) HOCLINDISTANCE*	–0.0078	–0.0113 to –0.004
(2a) NOHOCLINQALY*	0.0582	0.0480–0.0684
(2b) NOHOCLINSHARE*	0.4817	0.3483–0.6152
(2c) NOHOCLINWAIT*	–0.0882	–0.1104 to –0.0661
(2d) NOHOCLINDISTANCE*	–0.0120	–0.0172 to –0.0068
CONSTANT*	–0.0957	–0.01812 to –0.0103
Wald tests for differences between attribute coefficients		
Null hypothesis	Wald	P
(1a)–(1b)=0	1.66	0.198
(2a)–(2b)=0	46.08	<0.001
(3a)–(3b)=0	1.19	0.276
(4a)–(4b)=0	1.83	0.176
N (data)	1707	
N (groups)	216	
χ^2	455.32	
P	<0.001	

* Indicates statistical significance at 5% level or $P < 0.05$.

of respondents who completed the attitudinal questions exhibited a dominance strategy, a difference that trends towards statistical significance ($\chi^2 = 2.1$; d.f. = 1; $P = 0.09$) (Table 7).

4. Discussion

This is the first study to investigate HCPs' views towards equity, access and cost-effectiveness in allocating health care resources. It is also the first occasion to our knowledge where attitudinal questions and DCE questions have been used together in the same survey instrument. From the attitude responses, it is clear that HCPs see the value of policy to target resources (e.g. factors 1 and 3) and support the broad axioms of current policy (e.g. factors 3 and

Table 7
Proportion of respondents exhibiting dominant preferences by version.

Attributes	N	Proportion with dominant variable				
		QALY (%)	SHARE (%)	WAIT (%)	DISTANCE (%)	ANY (%)
Version 1: attitudinal questions plus DCE	210	28	0.5	10	0.5	39
Version 2: DCE, no attitudinal questions	89	35	2	12	0	49
Version 3: attitudinal questions plus reordered DCE	71	21	1	9	1	32
Average		28	1	10	1	40

8) but perceive there to be inadequacies in the way policy is delivered (e.g. factor 2).

The DCE results confirmed that many respondents were prepared to trade between attributes relating to cost-effectiveness, equity and access. There is some suggestion of differences across levels of decision-making with clinicians at the individual level being more concerned about access and less concerned about equity than decision-makers at higher (meso and macro) levels. However, a more striking finding is that over one-quarter of respondents exhibited dominant preferences for the total health benefit attribute. This finding is in broad agreement with the findings from the attitude questions, whereby 75% of respondents indicated that they agreed with the statement that ‘cost-effectiveness calculations are essential when allocating current service resources’ and 66% disagreed with the statement that ‘cost-effectiveness calculations are not useful for long-term service planning’. It is possible that the pattern observed of a fairly large percentage of respondents displaying dominant choices for the total health benefit attribute within the DCE is a consequence of the choices presented. Alternative levels for some or all of the attributes may have encouraged these respondents to trade-off the health benefit attribute. However, it is important to ensure that the levels chosen appear plausible to respondents and the attribute levels included within this exercise were carefully chosen to reflect realistic levels for cost-effectiveness, access and equity indicators within the UK NHS.

The concepts of equity, access and cost-effectiveness were defined by drawing heavily upon a prior qualitative study which investigated the definitions adopted by decision-makers for each of these concepts. We deliberately chose to keep the attribute descriptions simple in order to avoid the possibilities for misunderstanding or difficulties in interpreting and completing the exercise. In addition, individuals were asked to consider the DCE questions in terms of the overall delivery of a cardiovascular disease treatment programme within one hospital operating with a total budget of one million pounds per annum. The number of individuals receiving treatment within each programme was not specified directly. However, alternative question contexts, e.g. defined in terms of the number of people receiving treatment and/or the inclusion of richer definitions of, e.g. equity or cost-effectiveness may generate different responses to the DCE questions than those reported here. It is important for future research to consider the possibility of including alternative question contexts and richer definitions of these concepts within a DCE and to assess their impact upon responses in terms of completion rates and comprehension.

It is encouraging for future research that respondents completing the attitude statements prior to the DCE exhibited fewer instances of dominant preferences relative to those respondents who were not asked to consider the attitude statements. It appears likely that encouraging respondents to attend explicitly to views about cost-effectiveness, equity and access was associated with the employment of more systematic strategies when making the service choice which resulted in an increased willingness to make trade-offs between attributes.

The DCE technique is arguably more robust with a reduction in “non-trading” behaviour. Non-trading behaviour significantly complicates the interpretation of results within DCEs, since this may indicate either compensatory or non-compensatory choice. Whilst both forms of choice can be analysed with DCEs, non-compensatory choices will lead to misleading results since it assumes that an underlying compensatory objective function is used to determine choice in those for whom no such function exists. Likewise, analysing only those exhibiting non-dominant choices (“traders”) will potentially exclude some whose choices are compensatory. Neither option is entirely satisfactory. Further, since both compensatory and non-compensatory modes of choices are available to all individuals it is unclear which truly reflects “underlying” preferences, if they exist. By reducing the number of non-traders the impact of this methodological uncertainty is reduced.

The impact of including attitude statements prior to the DCE is consistent with other findings in the decision aid literature [14], and suggests that choices made following systematic evaluations might be more robust over time than those made using simpler processing strategies such as dominance of attributes [24]. It is recommended that further research is conducted to assess the potential importance of attitudinal statements in encouraging respondents within DCE’s to employ systematic information processing strategies when making trade-offs between attribute levels.

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Appendix A. Attitude questions

Health professionals have a range of views about organisation of health service resources. Please read each

statement below and circle a response to indicate how much you agree or disagree with these varied views. There are no right or wrong answers; it is your opinion we are interested in

		strongly disagree	strongly agree
1	Patients are not aware of how resource limitations affect NHS service planning.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
2	Targets help health professionals focus on what care is important to patients.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
3	Patients living in deprived areas should have access to more services than those living in affluent areas.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
4	Cost-effectiveness calculations are essential when allocating current service resources.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
5	It is essential that NHS services are targeted to the needs of the local population.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
6	Equity should be measured by assessing the impact of service provision on disease rates.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
7	Service managers do not know how to interpret the information elicited by current target initiatives.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
8	Using waiting lists to measure access is meaningless.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
9	People who use the health service more often than average should pay more.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
10	It is important that patients can see a GP within 48 hours.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
11	Most health professionals do not differentiate between equity, access and cost effectiveness when delivering health services.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
12	Access should be measured by matching the actual service provision with patient's preference for services.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
13	Health professionals feel their work is compromised by meeting policy targets.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
14	The different values across society make it difficult to reach a consensus on NHS service priorities.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
15	Access should be measured by whether or not patients received an effective health intervention.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
16	People will not pay more taxes to support changes to NHS services.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
17	Cost-effectiveness calculations are not useful for long-term service planning.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
18	Issues of equity are morally more important than issues of access.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
19	Greater transparency about NHS policy decisions will help patients understand changes in service provision.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
20	It is important that patients see the health professional they want to see.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
21	Information gained from equity, access and cost-effectiveness exercises help decision makers to manage the NHS better.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
22	It is the role of the NHS to ensure patients have access to services when they need them.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
23	Research should not be a part of routine health care delivery.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
24	A lot of NHS resources are wasted by 'old style' management practices.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	
25	A service cannot be cost-effective if it does not meet patient needs.	0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6	

Appendix B

CHOICE 1

	Programme A	OR	Programme B
Waiting time	2 months		8 months
Distance travelled	5 miles		30 miles
Total health benefit	40 QALYs		20 QALYs
Share of health benefits	<i>For best off group: 20%</i> <i>For worst off group: 20%</i>		<i>For best off group: 10%</i> <i>For worst off group: 30%</i>

Which programme would you give priority to: (please tick one)

Programme A

Programme B

CHOICE 2

	Programme A	OR	Programme B
Waiting time	2 months		8 months
Distance travelled	5 miles		30 miles
Total health benefit	20 QALYs		40 QALYs
Share of health benefits	<i>For best off group: 10%</i> <i>For worst off group: 30%</i>		<i>For best off group: 20%</i> <i>For worst off group: 20%</i>

Which programme would you give priority to: (please tick one)

Programme A

Programme B

CHOICE 3

	Programme A	OR	Programme B
Waiting time	2 months		8 months
Distance travelled	30 miles		5 miles
Total health benefit	40 QALYs		20 QALYs
Share of health benefits	<i>For best off group: 10%</i> <i>For worst off group: 30%</i>		<i>For best off group: 20%</i> <i>For worst off group: 20%</i>

Which programme would you give priority to: (please tick one)

Programme A

Programme B

Appendix B (Continued)

CHOICE 4

	Programme A	OR	Programme B
Waiting time	8 months		2 months
Distance travelled	5 miles		30 miles
Total health benefit	20 QALYs		30 QALYs
Share of health benefits	<i>For best off group: 10%</i> <i>For worst off group: 30%</i>		<i>For best off group: 20%</i> <i>For worst off group: 20%</i>

Which programme would you give priority to: (please tick one)

Programme A

Programme B

CHOICE 5

	Programme A	OR	Programme B
Waiting time	8 months		2 months
Distance travelled	30 miles		5 miles
Total health benefit	30 QALYs		40 QALYs
Share of health benefits	<i>For best off group: 20%</i> <i>For worst off group: 20%</i>		<i>For best off group: 10%</i> <i>For worst off group: 30%</i>

Which programme would you give priority to: (please tick one)

Programme A

Programme B

CHOICE 6

	Programme A	OR	Programme B
Waiting time	8 months		2 months
Distance travelled	5 miles		30 miles
Total health benefit	30 QALYs		20 QALYs
Share of health benefits	<i>For best off group: 10%</i> <i>For worst off group: 30%</i>		<i>For best off group: 20%</i> <i>For worst off group: 20%</i>

Which programme would you give priority to: (please tick one)

Programme A

Programme B

Appendix B (Continued)

CHOICE 7

	Programme A	OR	Programme B
Waiting time	2 months		8 months
Distance travelled	30 miles		5 miles
Total health benefit	30 QALYs		40 QALYs
Share of health benefits	<i>For best off group: 10%</i> <i>For worst off group: 30%</i>		<i>For best off group: 20%</i> <i>For worst off group: 20%</i>

(please tick one)

Which programme would you give priority to:

Programme A

Programme B

CHOICE 8

	Programme A	OR	Programme B
Waiting time	2 months		8 months
Distance travelled	5 miles		30 miles
Total health benefit	30 QALYs		40 QALYs
Share of health benefits	<i>For best off group: 20%</i> <i>For worst off group: 20%</i>		<i>For best off group: 10%</i> <i>For worst off group: 30%</i>

(please tick one)

Which programme would you give priority to:

Programme A

Programme B

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