

Supplemental File 1: Preferences of non-attending young women for the characteristics of interventions to increase cervical cancer screening uptake – a discrete choice experiment

Experimental Design

A D-optimal approach to design attempts to elicit maximum information for preference estimation.¹⁻³ Values of D-optimality can be computed for DCE designs that use different numbers of choice tasks, with higher values of the statistic being preferable. Our calculations showed that D-optimality was maximised with a design using 16 choice tasks (the D-optimality statistics was 97.21%) however with 12 choice tasks the level of D-optimality was still high at 90.86%. Given the challenges encountered when engaging these women with the prior qualitative interviews, we opted for 12 tasks to reduce as much as possible, the respondent burden.

Sample Size

Following the approach suggested by Rose and Bliemer, we utilised data from the pilot study to estimate prior coefficients for each attribute (using a conditional logit model without a constant), and combined these with the asymptotic variance-covariance matrix from the experimental design, specifying a significance level of 5% and a t-ratio of 1.96.⁴ The resulting output suggested that with sample sizes >150, it would be possible to estimate significant coefficients for the action, nurse, and cost attributes, but that the location attribute would require a sample size of 1151.

Statistical Analysis

As noted in the main paper, because researchers cannot observe an individual's utility, but do have information on the characteristics / attributes of the alternatives being considered and of the decision makers per se, it is possible to model the statistical relationship between these observed factors and the decision maker's choices. Of course, there are also factors affecting an individual's utility, which are not observable to the researcher. Utility can therefore be thought of as having two components as shown below:

$$U_{ni} = V_{ni} + \varepsilon_{ni} \quad (1)$$

Where U_{ni} is the utility of the n^{th} individual for alternative i , V_{ni} is often called the explainable or observable component of utility and is the part of utility determined by observed attributes or participant characteristics, and ε_{ni} is the unobservable component of utility, thus encompassing other factors affecting utility but not included in V_{ni} .⁵ ε_{ni} can also be thought of as an error term, being the difference between true utility U_{ni} and the part of utility captured by the modelling of V_{ni} . As ε_{ni} for each i is unknown, when modelling, these terms are treated as random, with different models making different assumptions about their distributional form.⁵ As detailed in the main paper, the representative utility (V) of the n^{th} individual for alternative screening intervention (i) was estimated to be a linear and additive function of each intervention's attributes and levels as follows:

$$V_{ni} = \alpha + \beta_1 Action_{yes} + \beta_2 Location_{GPSurg/clinic} + \beta_3 Nurse_{yes} + \beta_4 Cost \quad (2)$$

As specified, equation 2 assumes that the incremental impact of an attribute on utility is fixed or the same for all women, indicating homogeneity of preferences in the study sample. Early discrete choice models included observed heterogeneity by allowing the parameters in equation 2 to vary with participant characteristics (e.g. age, gender, health status or income).⁵ However, preference heterogeneity is expected even in people with the same observed characteristics, and it is important that such unobserved preference heterogeneity is captured in the modelling of discrete choice responses. Besides heterogeneity in the preference parameters, equation 2 is also subject to heterogeneity in the overall variance of the error term.⁶ The variance of the error term includes a scale parameter that can be greater for some participants than for others. This translates into random choice behaviour when participants complete discrete choice tasks. Ignoring these two sources of heterogeneity can lead to potential biases in the estimated parameters and problems with model specification.⁷ It is not possible to estimate separately preference and scale heterogeneity but both sources of heterogeneity can be estimated simultaneously.^{8,9} In this study we estimated a random correlated parameter mixed logit model that has been shown to simultaneously account for the main types of heterogeneity.


We compared the goodness of fit of two models estimated using different sets of parameters as starting values for the random correlated parameter mixed logit model; the first used coefficient values

estimated by a conditional multinomial logit model on the same data, and the second used coefficient values from an uncorrelated random parameter mixed logit. Models were estimated using 5000 Halton draws and results compared using the log-likelihood, and Akaike's Information Criterion divided by the number of observations included in the model (AIC/n). Smaller values on each statistic were taken to indicate a better 'goodness of fit'.¹⁰ The best fitting model was the one using parameter estimates from a conditional multinomial logit as starting values and this is the random correlated parameter mixed logit model reported in the main paper (further details are available from the authors upon request).

References:


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Figure A1 Final version of the DCE Questionnaire




A survey about your views on features of the Cervical Screening Process

Participant code XXXX



This survey is part of the STRATEGIC project, which is funded by the National Institute for Health Research's HTA Programme.



FOR OFFICE USE ONLY:

Version 1.4

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February 10th 2015

Doctors and researchers in Manchester, Oxford, York and Aberdeen are carrying out research into changes that could be made to the NHS Cervical Screening Programme to encourage more women to be screened. To help with this, we would like your views about different features of the cervical screening process (e.g. arranging a test, attending for a test). You have been sent this questionnaire because you have recently been invited for a cervical screening test and records indicate that you have not yet attended. Your participation in this research is entirely voluntary, but your views could help us make improvements to the NHS Cervical Screening Programme in the future.


Please try to answer all of the questions. There are no right or wrong answers - we are just interested in your views.

This questionnaire takes around **15-20 minutes** to complete. Please return your completed questionnaire in the pre-paid envelope provided. If you prefer you can complete this questionnaire online at:

<http://tinyurl.com/hercstrategic>

by entering the participant code on the first page of this questionnaire

You will be reimbursed for your time with a £10 high street shopping voucher. Details of how to claim this are included on the final page of this questionnaire.



IF YOU HAVE ANY QUESTIONS OR COMPLAINTS ABOUT THIS QUESTIONNAIRE, PLEASE CONTACT:

Carly Moseley
Trial Coordinator STRATEGIC study; The University of Manchester
Telephone: 0161 276 6772
Email: STRATEGIC@cmft.nhs.uk

For more information about this study visit: <http://www.herc.ox.ac.uk/research/strategic>

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HOW TO COMPLETE THIS QUESTIONNAIRE

The NHS Cervical Screening Programme offers regular screening tests to all women aged between 25 and 64 in England and Wales, and between 20 and 60 in Scotland. Not all women attend when they are first invited. Cervical screening is one of the best ways of reducing the risk of developing cervical cancer so our research is trying to find ways of increasing attendance rates. Currently, women who do not respond to their first invitation for a screening test are sent a reminder letter asking them to contact their GP surgery to make an appointment. In the future other choices might be possible. For example:

- To be sent a test kit through the post, giving women the choice of carrying out the test at home and posting the sample to the laboratory.
- To offer women a nurse to talk to about screening and help arrange a test, either at the GP surgery or at home.

Of course, having these choices would also cost the NHS money, so it is important to find out whether they would work in practice. That is where we need your help. We would like you to look at some different choices and tell us which you prefer. Each choice can have different parts to it called features. By getting you to select between different choices with different features, we can build up a picture of what you like and don't like.

Here are the 4 features we want to ask you about:

- Whether you personally need to take action to arrange a test
- Whether your test is done at a GP Surgery/Clinic or at home by yourself
- The availability of a nurse for you to talk to about anything related to screening
- The cost of your test to the NHS

Each feature is described on the following page. Please read the descriptions carefully. This will help you to answer the questions that follow.

FEATURES

- Is action required by you personally to arrange a test? (Yes or No)

The choice here is would you prefer to be given a set appointment time for a screening test or to contact your GP Surgery/Clinic to arrange a test yourself. It does not matter whether the test is eventually done at the surgery or by yourself at home. The choice here is whether or not you need to do something to arrange the test.

- Location of your test (GP Surgery/Clinic or at home)

The choice here is would you prefer to go to a GP Surgery/Clinic for the screening test, or be sent a kit to do a similar test yourself at home.

- Is a nurse available for discussion or help prior to appointment? (Yes or No)

The choice here is would you prefer to be able to talk to a nurse to discuss the screening process and to help arrange a test, regardless of whether the test is eventually done at the GP Surgery/Clinic or by yourself at home.

- Cost of your test to the NHS (£8, £20, £25, £40)

The choice here is how much would you prefer the NHS to pay for the test. Of course, women will not have to pay for any NHS service, but spending more on cervical screening may mean the NHS spending less on other services, or tax payers paying more for the NHS.

Section 1: How important are the features to you?

Please think about all 4 of the features we have just described and rank these in order of importance to you in the blue boxes.

Rank the feature that is most important to you with a 1. Then rank the second most important feature with a 2. Do the same for the third and fourth most important features. Rank the feature that is least important to you with a 4.

Feature	Rank
Action required by you personally to arrange the test	
Location of your test	
Nurse available for discussion or help prior to appointment	
Cost of your test to the NHS	

CHOOSING BETWEEN THE FEATURES

We are now going to give you a series of imaginary situations (Questions 1 to 12). In each situation, two choices are described using the 4 features above.

For each question we would like you to tell us whether you prefer Choice 1 or Choice 2.

Please read through the EXAMPLE QUESTION on the next page. Reading this will help you to answer the questions that follow.

Section 2: Example question

Think about the features of Choice 1 and Choice 2. Please indicate with a cross (x) which choice you prefer.

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	No	Yes
Location of your test	GP Surgery/Clinic	Home
Nurse available for discussion or help prior to appointment	Yes	No
Cost of your test to the NHS	£8	£20

Which choice do you prefer? Choice 1 ☒ Choice 2 ☐

In this example Choice 1 has been selected. The person answering the question thought about the features of both choices and decided they preferred the choice where:

- they did not have to do anything to arrange a screening test,
- their test was done at a clinic or GP surgery,
- they had access to a nurse if they wanted to discuss anything related to screening, and
- the cost to the NHS for each woman screened was £8

Please try to answer all of the following questions. Remember there are no right or wrong answers – we are just interested in what you think. All information will be kept strictly anonymous (you will not be identifiable from your responses) and only seen by the research team.

Thank you for your help.
Your views really are important to us.

Think about the features of Choice 1 and Choice 2 in the following questions. Please indicate with a cross (x) which choice you prefer.

2.1

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	No	Yes
Location of your test	Home	GP Surgery/Clinic
Nurse available for discussion or help prior to appointment	No	Yes
Cost of your test to the NHS	£40	£8

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.2

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	Yes	No
Location of your test	GP Surgery/Clinic	Home
Nurse available for discussion or help prior to appointment	Yes	No
Cost of your test to the NHS	£20	£25

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.3

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	No	Yes
Location of your test	GP Surgery/Clinic	Home
Nurse available for discussion or help prior to appointment	No	Yes
Cost of your test to the NHS	£8	£20

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.4

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	No	Yes
Location of your test	Home	GP Surgery/Clinic
Nurse available for discussion or help prior to appointment	Yes	No
Cost of your test to the NHS	£20	£25

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.5

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	No	Yes
Location of your test	Home	GP Surgery/Clinic
Nurse available for discussion or help prior to appointment	Yes	No
Cost of your test to the NHS	£25	£40

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.6

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	Yes	No
Location of your test	Home	GP Surgery/Clinic
Nurse available for discussion or help prior to appointment	Yes	No
Cost of your test to the NHS	£25	£40

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.7

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	No	Yes
Location of your test	GP Surgery/Clinic	Home
Nurse available for discussion or help prior to appointment	No	Yes
Cost of your test to the NHS	£40	£8

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.8

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	Yes	No
Location of your test	Home	GP Surgery/Clinic
Nurse available for discussion or help prior to appointment	No	Yes
Cost of your test to the NHS	£8	£20
Which choice do you prefer?	Choice 1	Choice 2

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.9

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	Yes	No
Location of your test	GP Surgery/Clinic	Home
Nurse available for discussion or help prior to appointment	No	Yes
Cost of your test to the NHS	£25	£40

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.10

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	No	Yes
Location of your test	GP Surgery/Clinic	Home
Nurse available for discussion or help prior to appointment	Yes	No
Cost of your test to the NHS	£8	£20

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.11

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	Yes	No
Location of your test	Home	GP Surgery/Clinic
Nurse available for discussion or help prior to appointment	No	Yes
Cost of your test to the NHS	£20	£25

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

2.12

Feature	Choice 1	Choice 2
Action required by you personally to arrange a test	Yes	No
Location of your test	GP Surgery/Clinic	Home
Nurse available for discussion or help prior to appointment	Yes	No
Cost of your test to the NHS	£40	£8

Which choice do you prefer? Choice 1 ☐ Choice 2 ☐

Section 3: The questions were easy to understand

We would like now to know what you think about the questions that you have just answered. Please tick the box that best describes what you think.

3.1 The questions were easy to understand

Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree ☐

3.2 The difference between the choices on each question was clear

Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree ☐

3.3 It was easy to make a choice on each question

Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree ☐

We would like now to know what you think about cervical screening.

3.4 Screening for cervical cancer is important. Please tick the box that best describes what you think

Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree ☐ Strongly disagree ☐

Section 4: About yourself

Finally, we would like to ask you a few questions about yourself. Nobody will be able to identify you from the answers you give.

- 4.1 Your age in years ☐ ☐
- 4.2 Country in which you live
 England ☐ Scotland ☐ Wales ☐ Northern Ireland ☐ I'd rather not say ☐
- 4.3 Your ethnicity
- | | | | |
|----------------------------------|--------------------------|----------------------------------|--------------------------|
| English / Welsh / Scottish / | <input type="checkbox"/> | Pakistani | <input type="checkbox"/> |
| Northern Irish / British | <input type="checkbox"/> | Bangladeshi | <input type="checkbox"/> |
| Irish | <input type="checkbox"/> | Chinese | <input type="checkbox"/> |
| Gypsy or Irish Traveller | <input type="checkbox"/> | Any other Asian background | <input type="checkbox"/> |
| Any other White background | <input type="checkbox"/> | African | <input type="checkbox"/> |
| White and Black Caribbean | <input type="checkbox"/> | Caribbean | <input type="checkbox"/> |
| White and Black African | <input type="checkbox"/> | Any other Black / African / | <input type="checkbox"/> |
| White and Asian | <input type="checkbox"/> | Caribbean background | <input type="checkbox"/> |
| Any other Mixed / | <input type="checkbox"/> | Any other ethnic | Please describe |
| Multiple ethnic background | <input type="checkbox"/> | | |
| Arab | <input type="checkbox"/> | I'd rather not say | <input type="checkbox"/> |
| Indian | <input type="checkbox"/> | | |
- 4.4 Please tell us about your education. Tick one box which best describes your highest level of education.
- | | |
|--|--------------------------|
| School leaver at age 16 | <input type="checkbox"/> |
| Further education to age 18 (e.g. A-level or Scottish Highers) | <input type="checkbox"/> |
| Vocational qualifications (e.g. NVQ) | <input type="checkbox"/> |
| University (e.g. Degree) | <input type="checkbox"/> |
| I'd rather not say | <input type="checkbox"/> |
- 4.5 Which of the following describes your main activity? Tick one box which best describes your current situation.
- | | |
|--|--------------------------|
| Employed | <input type="checkbox"/> |
| Unemployed and seeking work | <input type="checkbox"/> |
| Student carrying out full or part time education or training | <input type="checkbox"/> |
| Long-term sick or disabled | <input type="checkbox"/> |
| Homemaker looking after the family | <input type="checkbox"/> |
| Not receiving benefits or actively seeking work | <input type="checkbox"/> |
| Unpaid voluntary work | <input type="checkbox"/> |
| I'd rather not say | <input type="checkbox"/> |

Please write any comments you would like to make about this questionnaire

END OF QUESTIONNAIRE

Thank you for taking the time to complete this questionnaire.
 Your answers will help us determine how to provide better cervical screening to young women in the future.

Please return your completed questionnaire
 in the pre-paid envelope.

If you wish to be sent a summary of the results when
 the study has been completed please let us know when
 you claim your £10 voucher in the online form at

<http://tinyurl.com/MHSstrategic>



Figure A2 Patient Information Leaflet

What will happen when the survey is finished?

When the survey has been completed we will use the findings to help us to complete the STRATEGIC study. We may present the findings at conferences and in scientific journals. If you wish to be sent a summary of the results when the study has been completed please provide your email in the space provided at the end of the survey.

What do I do now?

If you wish to take part please complete either the enclosed questionnaire or the online version of the survey. You can access the online survey at [www.weblink TBA.com](http://www.weblink.TBA.com) online by entering the following participation code XXXX

Where can I get more information about the survey?

If you do not understand anything on this information sheet, would like more details or if you are unhappy with any aspect of this study please contact:

Carly Moseley
(trial coordinator)

Telephone: 0161 276 6772

Email: STRATEGIC@cmft.nhs.uk

If the trial coordinator is unable to resolve your concern or you wish to make a complaint regarding the study, please contact a University Research Practice and Governance Co-ordinator on 0161 275 7583 or 0161 275 8093 or by email to: research.complaints@manchester.ac.uk

If you would like advice on whether to take part or not, advice may be available from the Central Manchester University Hospitals Trust Patient Advice and Liaison Service (PALS), who can be contacted on 0161 276 8686 or via email: pals@cmft.nhs.uk

Thank you for taking the time to read this leaflet.

This study is funded by the NHS NIHR Health Technology Assessment Programme

(Ref 09/164/01)

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NHS
National Institute for Health Research

Patient Information Sheet

Survey linked to the STRATEGIC Study

Strategies to Increase Cervical Screening Uptake at First Invitation



Version 1.2
April 16th 2014

We would like to invite you to take part in a survey of around 400 women which is being carried out as part of a study looking at ways to increase the number of young women accepting their first invitation for a cervical screening test (smear test). The study is called STRATEGIC. Before you decide whether to take part, it is important for you to understand what it will involve. Please take time to read this information sheet carefully and if you have any questions, or you would like more information, our contact details are given at the end of this leaflet.

What is the purpose of the survey?

We would like to understand more about how women feel about cervical screening in general, and women's preferences for different options that could be used by the NHS to encourage young women to accept their invitation for their first cervical screening test.

Why have I been approached?

You have been approached because you have recently been invited for a cervical screening test and records indicate that you have not yet attended. If you have now attended for your cervical screening test then please ignore this invitation and accept our apologies for having contacted you. You need take no further action.

We want to learn more about what you think about cervical screening and to get your views about alternative ways that could potentially be used to arrange a

cervical screen. We can assure you that we are not questioning your decision not to have a cervical screening test; we only seek to understand any potential barriers that may have influenced your decision.

If you are happy to take part in the survey please either complete the attached questionnaire and return in the postage-paid envelope or visit www.weblinkTBA.com and complete the survey online by entering the following participation code XXXX.

The survey will simply ask you about your views on cervical screening in general, and will present you with a number of different choices. These choices will be presented to you in pairs and you will be asked to indicate which you prefer. You will also be asked some questions about yourself.

Do I have to take part?

Your participation is entirely voluntary. Even if you initially decide to take part and complete the survey, you can still change your mind at a later point. Whatever your decision it will not affect the standard of any care that you may receive from the NHS.

What are the possible benefits of taking part?

If you do take part, you will be contributing to our knowledge about women's preferences for cervical screening and what they find acceptable and not acceptable. Our hope is that we can use this knowledge to help increase women's willingness to attend for cervical screening in the future, which could reduce the numbers of women who develop cervical cancer.

What are the possible disadvantages and risks of taking part?

Completing the survey will take up roughly 15-20 minutes of your time. As compensation for your time and to say thank you for your help, we will send you a £10 shopping voucher in the post when we have received your completed survey.

Will my taking part be kept confidential?

Your responses will be anonymised and therefore nothing that identifies you personally will be shared outside of the individuals in the research team. You will only be contacted again as part of this research if you complete the survey, and this will only be so that we can send you the £10 shopping voucher.

Will my GP be informed?

Whether you choose to complete the survey or not, your GP will not be informed.

Who has reviewed the study?

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect your safety, rights, wellbeing and dignity. This research has been reviewed and approved by Greater Manchester North West Research Ethics Committee.