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# Sex and altruism: is screening good for you too?

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**Aims:** This research explores both explicit and implicit preferences for the provision of three different national screening programmes, namely, for bowel, breast and prostate cancers. Whilst the first-mentioned would be available to both women and men, the second and third would be specific to women or men only. Preferences for cancer screening are already known to be influenced by, for example, knowledge of the disease, risk perception and socio-economic characteristics. We wished to discover whether relative preferences were influenced also by considerations of personal capacity to benefit, by altruism across the sexes, or by notions of equity of receipt of care services, independent of sex.

**Methods:** A questionnaire was sent to persons aged 30 to 70 years via two general practices in Nottinghamshire. The questionnaire was spilt into three sections. The first was a "quiz", designed to find out what respondents know about cancer. The second section elicited respondents' preferences for the three screening programmes, using both explicit ranking and contingent valuation questions. Respondents were encouraged to justify their preference selection. The third section asked for socio-demographic details. Responses were anonymous.

**Results:** Preliminary analyses based on 1240 responses (57% female) from one practice showed that for women, 3 permutations of preferences covered 86% of cases, whereas, for men, 6 permutations were represented by 10% or more in each case. When required to offer a single choice, approximately 40% of both men and women chose bowel cancer. Of the remainder, however, women were around 60-times more likely to choose the screening from which they would benefit personally than were men.

**Conclusion:** Men are more likely to be convinced that screening is good for women than women are convinced that screening is good for men.

## INTRODUCTION

This research is concerned with individuals' preferences over health care interventions, when some of the interventions being considered would not benefit some of the individuals directly. We consider two types of preference elicitation, namely, explicit ranking and contingent valuation.

*Explicit ranking*

Alternative interventions or programmes are presented to respondents, who are then asked to rank these programmes in terms of a pre-specified criterion. Explicit ranking gives an ordinal ranking but fails to give information about the strength of preference for one health programme over another. (Olsen et al., 2005).

*Contingent valuation (implicit ranking)*

Contingent valuation (CV) is widely used to obtain public valuations of goods and services where market prices are absent. This is done using survey methods and via the construction of a hypothetical market (Mitchell and Carson 1989, Klose 1999, Bala 1999). As a method of determining benefits in health technology assessment, CV offers distinct advantages over measurement in the form of health state utilities, such as quality-adjusted-life-years (QALYs). CV imposes no restriction on what respondents include in their expressed value, whereas assessing benefits as QALYs limits users to preferences over health outcomes (Diener et al 1999, Smith 2003, Shiell and Rush 2003). In addition, CV values are commensurate with the costs of the technology under appraisal such that cost-benefit analysis can be employed, although few studies use values in this way (Olsen and Smith 2001, Sach et al 2007). In the past, CV studies have tended to elicit valuations for single interventions, thereby obviating the need for subjects to choose between or prioritise different services. In public health care systems, unconstrained choice is unrealistic, because no system could ever afford to meet all of the public's needs. To achieve realism in preference elicitation, therefore, we must confront subjects with choices. Thus, WTP values elicited in a CV survey can be used to compare relative preferences for different health care technologies within a fixed health care budget, these can be used to derive an implicit ranking of the programmes by the respondent. Again in practice few studies have done this (the main exception being a methodological orientated programme of work called the EuroWILL study which took place in 6 European countries to value helicopter, hearts and hips) and no study has compared the relative preferences for different cancer screening programmes (Olsen et al 2005, Protière et al 2004, Luchini et al 2003, and Olsen and Donaldson 1998, Phillips 2006). It should be noted that a number of methodological issues remain unresolved within the CV approach and these may limit the usefulness of the technique.

*Comparing implicit and explicit rankings*

In theory, one would expect consistency between the rankings found in an explicit ranking task and an implicit ranking found in a WTP task if respondents (Olsen et al 2005, Shackley and Donaldson 2002). In their study, Olsen et al group WTP responses into three categories, those with strong ranking, that is each programme is given a different WTP value, weak ranking, that is if three programmes are compared respondents give two of the programmes an equivalent WTP value and the third programme a different value, and finally no ranking, where all the programmes being compared are given the same WTP values (Olsen et al, 2005). This study concluded that the convergent validity of WTP was low, in

particular they found a large proportion giving no ranking in the WTP exercise. Shackley and Donaldson (2002) found that asking marginal WTP questions, instead of maximum WTP values for each individual programme, made no difference to the level of consistency between implicit and explicit rankings.

CV AND SCREENING

Few studies of stated preferences for cancer screening exist. A recent review (Phillips et al, 2006) found eight studies in total, half of which were about, or included, breast cancer screening, and six of which used contingent valuation methods as opposed to discrete choice analysis (1 study used both methodologies). They found no studies looking at preferences for prostate cancer (Phillips et al, 2006). Since this review study Yasunaga and colleagues have published a few contingent valuation studies on cancer screening in Japan (2006, 2007), one of which measured the Willingness to Pay (WTP) of men for prostate cancer (Yasunaga et al. 2006). In this study they compared the WTP of informed men (defined as those randomly assigned to the group given more information in the questionnaire) (Mean WTP US$18.10) to ill-informed men (mean WTP US$19.60, price year not explicitly stated) and found no statistically significant difference in mean WTP. This result is a contrast to that found in a study of cervical cancer screening (Philips et al., 2006) which found that those with accurate information provided significantly lower WTP values (mean WTP £127.6) than those making the valuation decision based on their own prior knowledge and beliefs (Mean WTP £175.5, price year not explicitly stated)($p=0.03$).

That the majority of studies have focused on preferences for breast and cervical cancer perhaps reflects that these have been the longest-running and most comprehensive cancer screening programmes in Europe and North America. Although research into women's perceptions, knowledge and preferences for cancer screening is evolving, no-one has yet thought to question men about these programmes. Men do not, of course, benefit personally and directly from routine breast (although they potentially could benefit from this type of screening men are not routinely given the opportunity to) and cervical screening although, in countries such as the UK, they do contribute to service provision via taxation. Moreover, relatively little is known about male attitudes to screening for cancers which they themselves might develop. To date, screening for bowel cancer, prevalent amongst both sexes, is the only form of screening where male preferences have been directly ascertained with the exception of the Yasunaga et al study (2006). No study has yet valued prostate cancer screening in a European context. At present, therefore, there is only a minimal understanding of men's cancer screening priorities, and of their dispositions with respect to cancer screening programmes from which they can, at best, benefit only indirectly.

ALTRUISTIC PREFERENCES

Neither explicit nor implicit (WTP) ranking predefine what can be included in the value set by the respondent. Thereby, it is potentially possible to capture the value people place on others receiving utility, whether this be through altruism (concern for others), duty or other criterion. The social value of health care has, to date, received interest in the contingent valuation context through either the valuation of community values for a health good (For example, Onwujekwe and Uzochukwu 2004, Lindholm 1997) or the values of parents/adults for children (For example, Walsh et al. 2006, Wasserfallen et al 2006, Leung and Guria 2006, Sach 2003, Liu 2000, Diez 1998). A few contingent

valuation studies have explicitly tried to measure altruism (for example, Shiell and Rush 2003, Araña and León 2002, and Johansson 1994). Sheill and Rush asked a small convenience sample of University employees how much they would be willing to pay for a vaccination programme that they would directly benefit from and then the same program for those in the poorest 10% of the population (in this case respondents were also informed that the program would have no benefits for them either direct or indirect). Their aim to explore empirically Sen's Notion of sympathetic and committed alturism, where "sympathy is concern for others that affects one directly" such that the individual's own utility is affected by the others (Shiell and Rush, 2003, p.650) and committed altruism is "a concern for others that does not affect one directly. It is driven by moral obligation and a sense of community or duty towards one's fellow beings rather than (enlightened) personal Preference)" (Shiell and Rush, 2003, p.650). WTP was higher for the scenario where the benefit was a personal one (CN$2000 $46.50) and lower ($35.60) when paying for someone else.

We elected to approach altruism in health service provision by asking each individual to select from a range of services although, owing to the nature of these services, both men and women would be ineligible to participate in all of them. We asked individuals to offer a preference ordering across the services, anticipating that the existence of altruistic preferences (if they indeed were present) would mean that ineligibility and incapacity to benefit directly would not necessarily result in individual's placing a low priority on such services. The paper firstly details the methods used and the information collected before addressing the question of whether men and women have different levels of knowledge, worry and perceptions of own risk of developing cancer. We then hypothesise that level of knowledge will influence preferences for cancer screening and set out a number of potential questions we might be able to address with our data before exploring one or two of these questions as illustrations of how this work might develop. As this is a work in progress we end in true HESG style, by discussing our preliminary findings and asking for your advice.

## METHODS

*Participants and procedures*

The first draft of the questionnaire was devised using previously used local contingent valuation studies of cancer screening (Philips et al., 2006; Whynes et al., 2004, 2003; Frew et al. 2004, 2003, 2001), and with reference to the wider literature on cancer screening and preference measurement. Study materials, comprising questionnaire, patient information sheet and recruitment letter, were submitted to two female consumer representatives from the Nottingham Primary Care Research Partnership Consumer panel for consideration. As a result, changes were made to the questionnaire. For instance, the consumers believed that many women would not know that they did not have a prostate and so wording was inserted to make it clear that the prostate is part of the male reproductive system. All study documentation was submitted to, and finally approved by, local research ethics committees. Following approval, GP members of the collaborative research network were invited to act as recruitment practices.

In total we had responses from 5 GP practices, 3 of whom did not wish to be involved. After contacting the two remaining practices, another also withdrew. The remaining practice was given 4939 pre-packed pre-paid envelopes (a pack for each registered eligible patient aged 30-70 years of age, the pack contained a recruitment letter, questionnaire, patient information sheet and pre-paid response

envelope for return of completed questionnaires via royal mail) and the same number of blank address labels. The practice created a mail merge of all registered patients aged between 30 and 70 years (excluding those with a current diagnosis of cancer or with severe learning disabilities) and posted the packs during April and May 2007. A further GP practice was recruited to participate in the study from a contact in the Division of Primary Care at the University of Nottingham. This practice sent 2000 recruitment packs to patients aged between 30 and 70 years registered with the practice. These were sent out late September 2007. The Index of Multiple Deprivation score for the postcode of the practices was 45.58 (rank 3,160) for practice one and 12.04 (rank 21,420) for practice two (where a rank of 1 is the most deprived and a rank of 32,482 is least deprived). It can be seen that these two practices are likely to serve very different populations.

Since the questionnaire was completely anonymous, that is it did not ask for identifiable data such as name, address, telephone number, such that non-response could not affect the care they received. The questionnaire was designed to take about 10-15 minutes to complete, although some participants may have chosen to spend longer on it. As responses were received they were sequentially entered into an excel database. Quantitative, closed ended questions were entered using predefined codes whilst qualitative data from open ended questions was entered verbatim for analysis at a later date.

*Questionnaire content*

The questionnaire comprised three sections. The first was intended to test participant's general knowledge of cancer. It asked them to estimate how many people are diagnosed with cancer each year in the UK, to assess which two cancers are the most common in the UK, and to identify major and minor risk factors from a list provided. There were also "true/false" questions about whether sun bathing causes skin cancer, whether more women than men get cancer, and whether more people die of heart disease than of cancer.

The second section asked participants if they had ever had screening for bowel, breast or prostate cancer, if they would consider having it in future, and whether they thought the National Health Service ought to be providing cancer screening services. Participants were then given information about three national screening programmes: Bowel, which is to be introduced in the near future, breast, which has been operating for 20 years, and prostate, which is not presently organised as a national programme. Each of these three cancers occurs with approximately the same frequency, yet participants were either eligible or ineligible for a specific national screening programme on the basis on sex. Both men and women are eligible for bowel cancer screening whilst only women are eligible for routine screening on the national breast cancer screening programme and men only would be eligible for a prostate screening programme. As observed earlier, just because women or men may be ineligible for a service does not necessarily mean they would not value the service, on the grounds, for example, of altruism or fairness. For the three screening programmes listed (bowel, breast, and prostate) participants were asked to state which one should be provided if the NHS could only afford one and which two should be provided if the NHS only had funds to provide two of the three. An open-ended question asked them to explain how they chose which should or should not be funded.

Participants were asked to state the maximum amount of money they would be willing to contribute towards each type of screening service per annum. The willingness to pay questions were elicited using the open-ended format. Although research has shown that WTP values are sensitive to

the elicitation format used (Frew et al 2003 and 2004, Whynes et al 2003 and 2004) others have suggested that the open-ended format may be more appropriate for eliciting altruistic WTP estimates as the open-ended format is most akin to how people normally donate money to charity (Onwujekwe and Uzichukwu, 2004). Given in our study that all three programmes are valued using the same elicitation format and that we are interested only in relative differences, the choice of format is relatively unimportant. After the WTP questions respondents were then asked to state what their values represent, that is how they had formulated their answers, and to place a cross on a calibration scale from 0 (very easy) to 10 (very difficult) for how difficult they found it estimating monetary values.

The final section of the questionnaire requested information on personal characteristics (age, gender, marital status, ethnicity, age on leaving full-time education, annual household income), whether they or a family member had ever experienced particular diseases (cancer, piles/haemorrhoids, stomach problems, heart disease, stroke or depression), health behaviours (cigarette smoking, body weight, number of visits to their GP and dentist in the past 12 months), perception of risk of cancer (compared to others their own age their perception of their chance of getting cancer and also how worried they are about cancer). Participants were invited to complete the EQ-5D questionnaire (Brooks, 1996).

*Statistical Analysis*

For the purpose of this paper the variables shown in table 1 were extracted from the data set. The following analyses were undertaken. Chi-square tests were undertaken to assess whether responses to the knowledge questions in section (i) of the questionnaire varied according to sex. We then hypothesise that preferences for screening will be influenced by prior beliefs about cancer and the socio-demographic characteristics of respondents. We therefore grouped respondents together, firstly, by their relationship between their screening preference when only one programme could be chosen and their eligibility for that programme. We term "altruistic" men who chose breast and women who chose prostate, on the grounds that these participants would not benefit directly were that particular screening programme to be the only one enacted. These male and female cases were combined into a single group. Men choosing prostate and women choosing breast were grouped together as "selfish", on the grounds that they would be eligible for benefit. Men and women choosing bowel were grouped together as "egalitarian", on the grounds that eligibility for benefit was not constrained by sex (see Table 3a). Secondly, we grouped respondents on the basis of their preference permutations based on both their choice when they could only choose one of the programmes and choice when they could choose two of the three programmes. So for example, a male choosing bowel when they were given one choice and bowel and breast when given two choices was placed in group 2, a female with these same choices was placed in group 1 on the basis of eligibility for the programmes selected. The groups can be seen in Table 3b.

Since the categories have no natural ordering, we undertook multinomial logistic regression analyses to explore which variables explain why people have different preferences over which of the three screening programmes they would give first priority based on eligibility. The model assumes that people select the screening programme that gives them the highest level of utility and that whilst we cannot observe their utility level (although we could if we included WTP estimated into the analysis) we observe their choice which acts as our censored dependent variable. The independent variables and their definitions are given in Table 1. We used a main effects model with the backward stepwise

method. All statistical analyses were conducted in SPSS version 14, a p-value of <0.05 was deemed significant.

## RESULTS

*Participants*

In this paper we analyse only the 1240 responses received from practice one (a 25% response rate). We received around 560 additional responses from practice two but, at the time of writing, these have yet to be entered into the database. Table 1 shows responses were fairly evenly split across the different age categories but slightly more women than men responded. Most respondents were of white ethnic origin and the majority left full-time education before 18 years of age although there was a fairly even spread across income groups.

Analysis

Our analysis focuses mainly on the quantitative data as we have not yet systematically analysed the qualitative data that we have about what factors influenced respondents preference decisions. However, in the interests of illustrating some of the quantitative points we include some of the qualitative data in *italic* text.

*What do people know about cancer?*

Table 2 displays the responses to the questions separately for women and men. It can be seen that in many cases the response patterns were not significantly different between women and men (P>0.05). However, in a few notable cases differences can be observed. Women were more likely than men to cite bowel or cervical cancer as one of the two most common cancers in the UK, whilst men were more likely to include prostate cancer in their top two compared to women. Interestingly men were less likely to rate sexually transmitted infections and family history as major risk factors for cancer than women. Evidence suggests that whilst certain sexually transmitted infections are a major risk for certain cancers (for example the HPV virus in cervical cancer), family history is less of a risk factor than the majority believe, family history and genetics are thought to be linked only to 5-10% of all cancers (Cancer research UK, 2007). Our results suggest women are more likely than men to overestimate the impact of family history on cancer. In terms of whether cancer is more common in women than men, female respondents were more likely to believe that the answer was women whilst men were much less certain about whether this was true or not. Published data show that cancer is marginally more common in women as a whole but for specific age groups or types of cancer this is not always true. If one looks at the number of deaths more men died of cancer than women in 2004, 67,300 versus 61,900 (Statistics, 2004).

Finally, although women believe they personally have a higher chance of getting cancer than men, men are more worried than women about cancer. 12% of women compared to 5% of men stated that they were not at all worried about cancer. In a supplementary analyses (not reported here) it was clear that those whom believed they had a higher chance of getting cancer or knew a relative or friend with cancer were more likely to state that they were worried about cancer. This finding offers an area that may be fruitful for further investigation in terms of whether the worry experienced by men translates into concern for women and whether because women are less worried this means they are more likely to be selfish than men in deciding their preferences for national cancer screening.

*What are people's preferences for the three national cancer screening programmes?*

Explicit ranking

Table 3a shows men and women's choice when they can choose to prioritise only one of the screening services. Whilst around 40% of both men and women gave preference to bowel cancer (many citing that this was the *"fair"* choice because both women and men would be eligible to benefit), the majority of women chose breast screening as their priority (58%) which may, in part, reflect that some of these women would already have had experience of the service. In contrast, for men bowel was the most popular choice but interestingly 35% (compared to just 1.3% of women choosing prostate cancer screening) chose breast screening despite not being eligible for routine breast screening themselves. 25.4% of men choose prostate cancer screening. The pattern of responses for women and men were statistically significantly different (Pearson's Chi-square = 181.446, p-value<0.001).

A second explicit rank question asked respondents to choose the two screening programmes they would prioritise if the Government could afford only two of the three programmes. Interestingly, some respondents did not include the same choice as that shown in Table 3a. Looking at Table 3b it is possible to see that whilst for the vast majority of respondents we would be able to determine their 1st, 2nd and 3rd choice, for 23 women and 10 men this is not possible because they switched preferences. For instance, for 21 women and 10 men, bowel was given as their priority when only one programme could be chosen. However, when given the choice of two programmes these people switched to breast and prostate. Words such as *"equal", "equality", "doesn't discriminate"* were used by these respondents to explain their choices. Two women, switched from breast to bowel and prostate, one of these was a protest type response: "*Looking at the figures on the previous page I think all cancer is serious and if screening was available it really should be for all types of cancer"*, in the other case the respondent said they chose breast because "I am female" but chose the other two because they "are probably most common".

The text in bold in Table 3b highlights those preference permutations which best describe preferences for women and men. It can be seen that just three permutations seem to describe 86.5% of women's preferences for cancer screening (with 43% preferring breast if only one programme can be provided and breast and bowel if two can be provided, both programmes being ones they themselves could benefit from). In contrast, men are more complicated with six preference permutations describing preferences for cancer screening for 93.8% of men. (Pearson's Chi-square = 352.419, p-value<0.001). Over 50% of men included prostate cancer screening in their top two choices, compared to just under 25% of women. These preferences may reflect the current system in which only women receive cancer screening as part of a national screening programme such that the choice is more complicated for men particularly given the disparity between the evidence base for each type of screening.

33 (2.7%) respondents protested against this question, where protesters are defined as those either not completing any of the questions or only partially completing the question and additionally giving verbal comments that indicated they did not agree with the line of questioning. The reasons for protest responses fell into three broad categories. Firstly some respondents stated that they "*think it is important that screening should be provided for all three types through NHS*"… "After all, they can all kill you". This was the same as saying "*I have not shown a preference in either [question] 7 or 8 as I*

*rate all 3 as the same priority"*. A second group of respondents stated that they "*cannot make this choice*" for some this was because they found the questions difficult "*How do you decide who lives and who dies, who's entitled to screening and who's not, who will suffer the pain and debilitation of cancer and who will not?*". Others couldn't make the choice because they felt "*that is a unjust and unethical question*". A third small group of respondents protested on various financial grounds, "*I believe that the NHS could afford to provide screening for all types of cancer, in a regular 'well persons check' but due to mis-management, pressure to achieve Government targets, abuse of systems/services by patients/public and a host of other reasons, it cannot*" and "*Paying my NHS bill monthly I should be entitled to any test I require*".

Contingent valuation (implicit ranking)

There are a number of ways of analysing and presenting the WTP values elicited. Using the whole sample, estimated mean WTP for Bowel Cancer screening was £ 57.07 (SD: £128.90; range £0, £1500), mean WTP for Breast Cancer Screening was £58.31 (SD: £135.08; range £0, £1500), and mean WTP for Prostate cancer screening was £50.18 (SD: £125.49; range £0, £1500). Two respondents who gave WTP values in excess of £1 million per screening programme were excluded on the grounds of implausibility. It can be seen on average that breast is preferred to bowel which is itself preferred to prostate cancer screening, however, only the differences between bowel and prostate and breast and prostate were found to be significantly different ($P<0.000$). The Spearman's coefficients between WTP values for each national cancer screening programme were high (Bowel/breast: 0.883, Bowel/prostate: 0.807, Breast/prostate: 0.710, all $p<0.000$).

Table 4 shows the number of women and men who stated WTP values exhibiting no, weak or strong ranking. It can be seen that men were more likely than women to give the same value to all three cancer screening programmes and that women were more likely to have weak or strong preferences compared to men ($\chi^2 = 10.606$, $p<0.005$). Women were also more likely not to answer the questions at all (that is they left the response space blank). 180 (14.5% of the total sample or 16.6% of those stating a WTP value) respondents, three of whom did not disclose their gender, gave zero as their WTP value for all three programmes, 54.8% of whom were male. The two main factors influencing the values given by respondents stating a zero WTP were reported as being how much they thought they could afford to pay (in this case nothing), stated by 58.6% of these respondents, and also what these respondents deemed to be reasonable or fair amounts for them to pay, stated by 26.3%.).

Table 5 shows the mean, median and range of WTP values by whether the respondent showed no, weak or strong ranking across screening programmes. It can be seen that for those giving no ranking women on average gave higher (the same) mean (median) WTP values than men. Women giving weak or strong implicit rankings (note the preferred programme in the weak ranking could vary between respondent hence no two programmes have the same WTP value), on average, preferred breast, then bowel and then prostate. In contrast men giving weak preferences, on average, preferred bowel then prostate then breast whilst men giving strong implicit rankings preferred bowel then breast and the prostate. The average whole sample WTP preferences may therefore be influenced most strongly by the preferences of women.

An alternative way of examining WTP values would be to look at the marginal difference by using the WTP for bowel as an anchor point and estimating the deviation away from this for breast and bowel. That is subtracting the WTP for Breast away from the WTP for bowel and subtracting the WTP

for prostate cancer away from the WTP for bowel. Comparing bowel and breast, men were WTP £21.30 (SD £125.99) more for Bowel than breast whilst women were WTP £7.13 (SD £78.35) less for bowel compared to breast. In contrast, men were WTP £0.89 (SD £20.00) more for bowel than prostate cancer and women were WTP £13.03 (SD £85.81) more for bowel than prostate (all comparisons $p<0.001$).

*What factors explain preferences?*

The preferences elicited in both the explicit and implicit ranking questions show greater consistency amongst women than men, in that on average women always prefer breast to bowel, and bowel to prostate. Clearly a number of factors may be explaining this including experience of cancer screening, knowledge of cancer, concern about cancer, lifestyle factors, and other socioeconomic factors. The results of the multinomial regression are shown in table 6, where the reference category is selfish. Only the significant independent variables are shown in the interests of space. Males are around 80 times more likely to be altruistic than females (OR=0.013). Respondents who were worried about getting cancer were less likely to be altruistic. It seems reasonable to expect such people to be more likely to give preference to programmes from they themselves can benefit (Odds ratios ranged from 0.545 for a bit worried to 0.248 for very worried). Respondents who believed breast cancer is one of the two most common cancers were also less likely to be altruistic (OR = 0.343). In terms of age, the oldest respondents (those aged over 60 years) were less likely to be altruistic compared to respondents aged 30 to 40 years (OR = 0.391). When comparing egalitarians to the selfish only sex and whether the respondents believed bowel or breast cancer to be one of the two most common cancers were significant independent variables. That is males were 2.5 times more likely than women to be egalitarian, those that did not believe bowel cancer was one of the two most common cancers were less likely to be egalitarian (OR = 0.385) and those not believing breast cancer is one of the two most common cancers in the UK were around 1.5 times more likely to be egalitarian than selfish. Clearly beliefs about the frequency of cancer are important in determining people's preferences over the priority that should be attached to different types of cancer screening services.

This analysis was undertaken to illustrate what might be possible with our data. We aim to undertake further analysis to explore what factors determine the preference permutations shown in table 3b and also to evaluate determinants of WTP. A recent study by Luchini et al. reported that other studies that have undertaken a CV survey of multiple programmes (also referred to as joint evaluations) have estimated the values independently of one another but they suggest that doing so ignores unobservable factors that are common to each of the WTP equations (that is the error terms may be interrelated) such that simultaneous techniques need to be employed (Luchini et al., 2003). We would welcome discussion about this in the context of how to take forward our analysis.

## DISCUSSION

This paper, using data from one of the two practices that participated, provides some preliminary exploratory data analysis to highlight some of the key questions we hope to address, some early results and areas for discussion. In setting out to do this research we wished to test a number of hypotheses including (i) whether men and women have different levels of knowledge about cancer; (ii) What priorities respondents would have for the three screening programmes using explicit ranking versus implicit ranking using WTP values derived from a CV survey and the influence of eligibility on these;

(iii) Whether preferences are influenced by level of knowledge and personal perceptions of risk and other characteristics?

It seems that men and women do give significantly different answers to some, but not all, questions about knowledge of cancer and self-perception of risk. The results indicate that men and women do have slightly different levels of knowledge but these were less divergent than one might have expected given men are not currently routinely involved in any national cancer screening programme and as such may have little incentive to be informed about cancer. When respondents could only choose one of the three national cancer screening programmes, the majority of women chose breast cancer whilst men's preferences were less concentrated with the largest group (40%) choosing Bowel. Men were more likely to choose the programme that they were ineligible for than women. We need to undertake further analysis to explore whether this reflects the fact that breast is currently provided, that prostate screening is known to be less reliable or whether this is a result of genuine altruism. When looking at respondents preference permutations, that is the pattern of response from one choice through to two choices, it was seen that the majority of women's preference were explained by just three preference permutations in contrast to men for whom six permutations emerged as describing the preferences of the majority of men. However, until we undertake further analysis we do not know what is motivating this difference, although it would appear that females have more unified preferences perhaps reflecting their higher entitlement for such services in the current system. Although it appears that women are less complex there may be sub-groups within these preference permutations reflecting the different reasons one may have for choosing it. We therefore wonder if there may be a case for undertaking cluster analysis to explore this further.

Looking at the WTP values it can be seen that the values estimated were roughly around the same level as those estimated in previous individual CV studies of bowel and breast cancer screening (Frew et al. 2001, and Clarke 2002). However, more striking is the number of respondents who choose to give the same WTP value to all three screening programmes. Around 59% of females and 70% of males WTP values exhibited no ranking, these values are slightly higher than those found in the EuroWILL WTP study where no implicit ranking ranged between 25% (Portugal) and 57% (Ireland) of the sample (Olsen et al., 2005). Women were, however, more likely to protest and not give a WTP value, although note men were around twice as likely as women to protest when asked to choose one or two programmes in the explicit ranking question. There is, therefore, an inconsistency between the explicit and implied rankings. In our study this may reflect the way in which we asked the question, since we did not ask respondents to place the three options in order of preference nor did it use a 'marginal' approach, where respondents are asked for their maximum WTP for their least preferred option and then asked for the additional or incremental amount they would be WTP for the second choice programme and the same incremental approach again for their first choice programme. Research by Shackley and Donaldons (2002) using this marginal or incremental approach in the Irish component of the EuroWILL study did not find improved consistency between explicit and implicit rankings, although the authors note that consistency was higher in the original version in Ireland and so there was less room for improvement. Despite the inconsistencies, when looking at the whole sample, not split by gender, both the explicit ranking and the implicit ranking inferred from the elicited WTP values show a majority preference for breast, then bowel and then prostate. In the context of the implicit ranking this preference reflects the fact that more females gave weak or strong rankings than men and that females in this sample had a clear preference towards breast cancer screening and against prostate cancer

screening. We believe that the qualitative data will be very insightful into explaining people's preferences and that once we have coded and analysed this data it may improve the explanatory power of our statistical analyses.

We believe that altruism may be important since we are asking respondents to potentially give up a benefit to themselves to choose a screening programme for others from which they cannot personally benefit by virtue of sex. The issue of altruism is, however, not straight forward. For example, a 35 year old woman may prioritise breast cancer screening although she cannot directly benefit from it currently because of her age. This might capture option value in that she knows she will benefit from the service in future, it may reflect that she has a mother who may be benefiting from the service (an indirect benefit) or it may reflect an altruistic payment for other women (social solidarity) because although she doesn't want the screening herself she believes women should have a choice (or a mix of these reasons). As another example, a man may choose breast cancer screening for reasons of altruism, because his wife or mother benefits or for another reason such as reliability. Some of our quantitative and qualitative data (when analysed) may be able to help us differentiate some of this noise out but there remains some question about the degree to which we are capturing altruism in this study and if capturing, the nature of the altruism.

As work in progress we would welcome discussion and comments, particularly on:

- To what extent are we actually homing in on altruism (however defined) in this paper?
- Are there more appropriate statistical techniques we could be using to get more out of our data?
- Would cluster analysis be useful?
- Should we be analysing the data on men and women separately?
- Should the work be split up and presented separately? Perhaps splitting the altruism issue from the convergent validity issue?

**REFERENCES**

1. Araña JE, León CJ. Willingness to pay for health risk reduction in the context of altruism. Health Econ. 2002 Oct;11(7):623-35.
2. Bala MV, Mauskopf JA, Wood LL. Willingness to pay as a measure of health benefits. Pharmacoeconomics 1999; 15(1): 9-18.
3. Brooks R. EuroQol: the current state of play. Health Policy 1996; 37: 53-72.
4. Cancer Research UK. How do we know? May 2005. Accessed online on 7th December 2007 at http://info.cancerresearchuk.org/healthyliving/howdoweknow/?a=5441
5. Clarke PM.Testing the convergent validity of the contingent valuation and travel cost methods in valuing the benefits of health care. Health Econ. 2002 Mar;11(2):117-27.
6. Diener A, O'Brien B, Gafni A. Health care contingent valuation studies: a review and classification of the literature. Health Econ 1998; 7(4): 313-26.
7. Diez L. Assessing the willingness of parents to pay for reducing postoperative emesis in children. Pharmacoeconomics. 1998 May;13(5 Pt 2):589-95.
8. Frew EJ, Wolstenholme JL, Whynes DK. Comparing willingness-to-pay: bidding game format versus open-ended and payment scale formats. Health Policy. 2004 Jun;68(3):289-98.
9. Frew EJ, Whynes DK, Wolstenholme JL. Eliciting willingness to pay: comparing closed-ended with open-ended and payment scale formats. Med Decis Making. 2003 Mar-Apr;23(2):150-9.
10. Frew E, Wolstenholme JL, Whynes DK. Willingness-to-pay for colorectal cancer screening. Eur J Cancer. 2001 Sep;37(14):1746-51.
11. Johansson PO. Altruism and the value of statistical life: empirical implications.J Health Econ. 1994 Mar;13(1):111-8.
12. Klose T. The contingent valuation method in health care. Health Policy 1999; 47(2): 97-123.

13. Lindholm LA, Rosén ME, Stenbeck ME.Determinants of willingness to pay taxes for a community-based prevention programme.Scand J Soc Med. 1997 Jun;25(2):126-35.
14. Liu JT, Hammitt JK, Wang JD, Liu JL. Mother's willingness to pay for her own and her child's health: a contingent valuation study in Taiwan. Health Econ. 2000 Jun;9(4):319-26.
15. Luchini S, Protière C, Moatti JP. Eliciting several willingness to pay in a single contingent valuation survey: application to health care. Health Econ. 2003 Jan;12(1):51-64.
16. Mitchell RC, Carson RT. Using Surveys to value public goods: The contingent valuation method. Washington, D.C: Resources for the future, 1989
17. National. Statistics. Cancer atlas of the UK and Ireland 1991-2000. Accessed on-line on 25th November 2005 at: Table B2.2: http://www.statistics.gov.uk/downloads/theme_health/caUKI91_00/Appendix_B.pdf
18. Olsen JA, Donaldson C, Shackley P; EuroWill Group. Implicit versus explicit ranking: on inferring ordinal preferences for health care programmes based on differences in willingness-to-pay. J Health Econ. 2005 Sep;24(5):990-6.
19. Olsen JA, Smith RD. Theory versus practice: a review of 'willingness-to-pay' in health and health care. Health Econ 2001; 10(1): 39-52.
20. Olsen JA, Donaldson C. Helicopters, hearts and hips: using willingness to pay to set priorities for public sector health care programmes. Soc Sci Med. 1998 Jan;46(1):1-12.
21. Onwujekwe O, Uzochukwu B. Stated and actual altruistic willingness to pay for insecticide-treated nets in Nigeria: validity of open-ended and binary with follow-up questions. Health Econ. 2004 May;13(5):477-92.
22. Onwujekwe O, Chima R, Shu E, Nwagbo D, Akpala C, Okonkwo P. Altruistic willingness to pay in community-based sales of insecticide-treated nets exists in Nigeria. Soc Sci Med. 2002 Feb;54(4):519-27.
23. Smith RD. Construction of the contingent valuation market in health care: a critical assessment. Health Econ 2003; 12(8): 609-28.
24. Phillips KA, Van Bebber S, Marshall D, Walsh J, Thabane L. A review of studies examining stated preferences for cancer screening. Prev Chronic Dis. 2006 Jul;3(3):A75.
25. Philips Z, Whynes DK, Avis M. Testing the construct validity of willingness to pay valuations using objective information about risk and health benefit. Health Econ. 2006 Feb;15(2):195-204.
26. Protière C, Donaldson C, Luchini S, Moatti JP, Shackley P. The impact of information on non-health attributes on willingness to pay for multiple health care programmes. Soc Sci Med. 2004 Apr;58(7):1257-69.
27. Sach TH, Smith RD, Whynes DK. A 'league table' of contingent valuation results for pharmaceutical interventions: a hard pill to swallow? Pharmacoeconomics. 2007;25(2):107-27.
28. Shackley P, Donaldson C. hould we use willingness to pay to elicit community preferences for health care? New evidence from using a 'marginal' approach. Health Econ. 2002 Nov;21(6):971-91.
29. Shiell A, Rush B. Can willingness to pay capture the value of altruism? An exploration of Sen's notion of commitment. J Socio-Econ (2003):32: 647-660.
30. Walsh BM, Bartfield JM.Survey of parental willingness to pay and willingness to stay for "painless" intravenous catheter placement. Pediatr Emerg Care. 2006 Nov;22(11):699-703.
31. Wasserfallen JB, Currat-Zweifel C, Cheseaux JJ, Hofer M, Fanconi S. Parents' willingness to pay for diminishing children's pain during blood sampling. Paediatr Anaesth. 2006;16(1):11-8.
32. Whynes DK, Wolstenholme JL, Frew E. Evidence of range bias in contingent valuation payment scales. Health Econ. 2004 Feb;13(2):183-90.
33. Whynes DK, Frew E, Wolstenholme JL. A comparison of two methods for eliciting contingent valuations of colorectal cancer screening. J Health Econ. 2003 Jul;22(4):555-74.
34. Yasunaga H, Ide H, Imamura T, Ohe K. Women's anxieties caused by false positives in mammography screening: a contingent valuation survey. Breast Cancer Res Treat. 2007 Jan;101(1):59-64.
35. Yasunaga H, Ide H, Imamura T, Ohe K. Benefit evaluation of mass screening for prostate cancer: willingness-to-pay measurement using contingent valuation. Urology. 2006 Nov;68(5):1046-50.
36. Yasunaga H, Ide H, Imamura T, Ohe K. The measurement of willingness to pay for mass cancer screening with whole-body PET (positron emission tomography). Ann Nucl Med. 2006 Aug;20(7):457-62.

**APPENDIX:** Table 1:Variable definitions.

| **Variable (type)** | **Definition** (Number in each response category) [Non responders] |
|---|---|
| First choice group | (i) Altruistic (185); (ii) Egalitarian (487); (iii) Selfish (531) [R]. [37] |
| WTP ranking | (i) No ranking (816); (ii) weak ranking (224); (iii) strong ranking (37) [R]. [163] |
| Gender | (i) Male (526); (ii) female[R] (706). [8] |
| Current age | Mean 50.75 years (SD: 11.36; range 30, 78).<br>(i) >60 years old (288); (ii) >50 to 60 years old (354); (iii) >40 to 50 years old (293); (iv) 30 to 40 years old (291). [14] |
| Household income | (i) <£10,000 (220); (ii) £10,000-£20,000 (318); (iii) £20,000-£30,000 (207); (iv) >£30,000[R] (428) (Household income per annum). [67] |
| Age on finishing full-time education | (i) under 18 (889); (ii) 18 or over (316) [R]. [35] |
| Smoking status | (i) A smoker (194) ; (ii) An ex-smoker (418); (iii) Never smoked (620) [R]. [2] |
| Your weight | (i) Overweight (499); (ii) Underweight (30); (iii) About right (704)[R]. [7] |
| Number of visits to GP over past year | (i) >5 visits (261); (ii) 3 or 4 visits (269); (iii) 1 or 2 visits (476); (iv) No visits (224) [R]. [10] (Mean 3.06 (SD: 3.62; range 0, 50). |
| Number of visits to dentist over past year | (i) No visits (244); (ii)1or more visits (991) [R];[5](mean 1.63 (SD:1.34, range 0-14) |
| Chance of getting cancer (subjective) | (i) Higher (186); (ii) The same (864); (iii) Lower (177) [R] [13] |
| How worried about cancer are you? | (i) Very worried (109) ; (ii) Quite worried (212); (iii) A bit worried (662); (iv) Not at all (247) [R]. [10] |
| EQ-5D score | Mean 0.811 (SD: 0.257; range; -0.239, 1.000). [14] |
| Health today compared to over the past year | (i) Worse (133); (ii) Much the same (943); (iii) Better (158) [R] . [6] |
| Approximately how many people are diagnosed with cancer each year in the UK? | (i) Overestimate (388); (ii) Underestimate (290); (iii) About right (527) [R]. [35] |
| Does the respondent believe Bowel is one of the two most common cancers? | (i) No (761); (ii) Yes (472) [R] . [7] |
| Does the respondent believe Breast is one of the two most common cancers? | (i) No (317); (ii) Yes (917) [R] . [6] |
| Does the respondent believe Prostate is one of the two most common cancers? | (i) No (915); (ii) Yes (319) [R] . [6] |

[R] denotes that this group was used as the reference group when the categorical variable was included the regression analysis

**Table 2: What do women and men know about Cancer?**

| **Question** | **Answers for Women** (numbers/percentage) | **Answers for Men** (numbers/percentage) | **Pearson $\chi^2$** |
|---|---|---|---|
| Q1) Approximately how many people are diagnosed with cancer each year in the UK? | (i) 125,000 (38/5)); (ii) 200,000 (113/16)); (iii) 275,000 (140/20), **(iv) 350,000 (167/24)**, (v) 425,000 (106/15); (vi) 500,000 (120/17). [22/3] | (i) 125,000 (28/5); (ii) 200,000 (110/21); (iii) 275,000 (98/19), **(iv) 350,000 (118/22)**, (v) 425,000 (64/12); (vi) 500,000 (95/18). [13/3] | 6.337 (p=0.271) |
| Q2) Which are the two most common cancers in the UK? | (i) Bowel (292/41); | (i) Bowel (178/34); | 7.426 (P<0.007) |
| | (ii) **Breast (525/74);** | (ii) **Breast (386/73);** | 0.120 (p=0.729) |
| | (iii) Cervical (85/12); | (iii) Cervical (33/6); | 11.523 (p<0.001) |
| | (iv) **Lung (216/31);** | (iv) **Lung (167/32);** | 0.203 (p=0.652) |
| | (v) Prostate (140/20); and | (v) Prostate (176/34); and | 29.582 (p<0.000) |
| | (vi) Skin (melanoma) (127/18). [3/<1] | (vi) Skin (melanoma) (100/19). [3] | 0.221 (p=0.638) |
| Q3) Which of the following are risk factors for cancer? | | | |
| 3a) Being overweight | **(i) Major risk (188/27);** (ii) Minor risk (328/47); (iii) No risk (86/12); (iv) Don't know (76/11). [28/4] | **(i) Major risk (133/25);** (ii) Minor risk (237/45); (iii) No risk (79/15); (iv) Don't know (59/11). [18/3] | 2.196 (p=0.533) |
| 3b) Smoking tobacco | **(i) Major risk (680/96);** (ii) Minor risk (19/3); (iii) No risk (0); (iv) Don't know (0). [7/1] | **(i) Major risk (510/97);** (ii) Minor risk (13/3); (iii) No risk (0); (iv) Don't know (1/<1). [2/<1] | 1.398 (p=0.497) |
| 3c) Too much alcohol | **(i) Major risk (294/42);** (ii) Minor risk (274/39); (iii) No risk (66/9); (iv) Don't know (52/7). [20/3] | **(i) Major risk (192/37);** (ii) Minor risk (234/45); (iii) No risk (53/10); (iv) Don't know (35/7). [12/2] | 4.743 (p=0.192) |

| | | | |
|---|---|---|---|
| 3d) Lack of exercise | **(i) Major risk (97/14);** (ii) Minor risk (354/50); (iii) No risk (161/23); (iv) Don't know (73/10). [21/3] | **(i) Major risk (71/14);** (ii) Minor risk (246/47); (iii) No risk (147/28); (iv) Don't know (51/10). [11/2] | 4.000 (p=0.261) |
| 3e) Certain sexually-transmitted infections | **(i) Major risk (205/29);** (ii) Minor risk (278/39); (iii) No risk (102/14); (iv) Don't know (97/14). [24/3] | **(i) Major risk (99/19);** (ii) Minor risk (208/40); (iii) No risk (113/22); (iv) Don't know (98/19). [8/2] | 25.677 (p<0.000) |
| 3f) a family history of cancer | (i) Major risk (552/78); **(ii) Minor risk (136/19);** (iii) No risk (2/<1); (iv) Don't know (7/1). [9/1] | (i) Major risk (99/68); **(ii) Minor risk (20/26);** (iii) No risk (11/2); (iv) Don't know (25/3). [1/<1] | 29.306 (p<0.000) |
| 3g) Increasing age | **(i) Major risk (384/30);** (ii) Minor risk (592/48); (iii) No risk (147/13); (iv) Don't know (88/7). [29/3] | **(i) Major risk (357/33);** (ii) Minor risk (139/47); (iii) No risk (11/10); (iv) Don't know (18/8). [1/<1] | 3.718 (p=0.294) |
| 3h) Persistently high levels of stress. | (i) Major risk (208/22); (ii) Minor risk (340/43); **(iii) No risk (93/17);** (iv) Don't know (47/16).[18/2] | (i) Major risk (110/21); (ii) Minor risk (219/42); **(iii) No risk (106/20);** (iv) Don't know (82/16).[9/2] | 1.491 (p=0.684) |
| Q4a) "Sun-bathing can cause skin cancer" | **(i) True(694/98);** (ii) False (9/1); (iii) Don't know (0). [3/<1] | **(i) True (518/99);** (ii) False (6/1); (iii) Don't know (1/<1). [1/<1] | 1.386 (p=0.500) |
| Q4b) "Cancer is more common amongst women than it is amongst men" | **(i) True (155/22);** (ii) False (39/56); (iii) Don't know (154/22). [3/<1] | **(i) True (103/20);** (ii) False (267/51); (iii) Don't know (153/29). [3/<1] | 8.644 (P<0.013) |
| Q4c) "More people die of heart disease than die of cancer" | **(i) True (302/43);** (ii) False (220/31); (iii) Don't know (181/26). [3/<1] | **(i) True (224/43);** (ii) False (173/33); (iii) Don't know (128/24). [1/<1] | 0.487 (p=0.784) |
| Chance of getting cancer (subjective) | (i) Higher (120/17); (ii) The same (489/69); (iii) Lower (90/13). [7/1] | (i) Higher (66/13); (ii) The same (370/70); (iii) Lower (87/17). [3/<1] | 7.011 (p<0.030) |
| How worried about cancer are you? | (i) Very worried (111/16); (ii) Quite worried (365/52); (iii) A bit worried (146/21); (iv) Not at all (81/12). [3/<1] | (i) Very worried (134/26); (ii) Quite worried (294/56); (iii) A bit worried (66/13); (iv) Not at all (28/5). [4/<1] | 39.895 (p<0.000) |

**Table 3a: Preference for one service**

| | **Women (%)** | **Men (%)** |
|---|---|---|
| **Bowel** | 283 (40.8) | 203 (40.0) |
| **Breast** | 402 (57.9) | 176 (34.6) |
| **Prostate** | 9 (1.3) | 129 (25.4) |

Comparing men and women: $\chi^2 = 282.253$ ($p<0.000$).

**Table 3b: explicit ranking preference permutations**

| **Cancer screening service priorities (1st, 1st&2nd choice)** | **Women** | | **Men** | |
|---|---|---|---|---|
| **1= bowel, 2= breast, 3 = prostate** | **Group/Number** | **Percentage** | **Group/Number** | **Percentage** |
| **112** | **1 – 211** | **29.9** | **2 - 101** | **19.2** |
| **113** | 2 - 49 | 6.9 | **1 – 90** | **17.1** |
| **123** | 3 - 21 | 3.0 | 3 – 10 | 1.9 |
| **223** | **4 - 95** | **13.5** | **5 – 79** | **15.0** |
| **221** | **6 - 304** | **43.1** | **7 – 94** | **17.9** |
| **213** | 8 - 2 | 0.3 | 9 – 1 | <0.2 |
| **332** | 5 - 2 | 0.3 | **4 – 54** | **10.3** |
| **331** | 7 - 7 | 1.0 | **6 – 75** | **14.3** |
| **312** | 9 - 0 | 0 .0 | 8 – 0 | 0.0 |
| **No answer given (32 gave verbal protest statements)** | 10 - 15 | 2.1 | 10 - 22 | 4.2 |

* Table excludes 8 respondents who did not disclose their gender (one of who did not answer these questions). Note any disparities between table 3a and 3b in terms of numbers for first choice results from the fact that some respondents offered a first choice but then decided not to choose two programmes. Comparing men and women: $\chi^2 = 352.419$ ($p<0.000$).

**Table 4: WTP rankings**

| WTP for cancer screening services priorities | Women | | Men | |
|---|---|---|---|---|
| | Number | Percentage | Number | Percentage |
| No ranking (WTP same for all three services) | 418 | 59.2 | 367 | 69.8 |
| Weak ranking (WTP the same for two of the services but different for the third) | 154 | 21.8 | 90 | 17.1 |
| Strong ranking (WTP values differ for all three services) | 28 | 4.0 | 12 | 2.3 |
| No answer given | 106 | 15.0 | 57 | 10.8 |

* Table excludes 8 respondents who did not disclose their gender. Comparing men and women: $\chi^2 = 10.606$ ($p<0.005$).

**Table 5: Willingness to pay values by Strength of ranking of WTP values**

| WTP for cancer screening services priorities | Women | | Men | |
|---|---|---|---|---|
| | Mean/median | Min/max | Mean/median | Min/max |
| **No ranking (WTP same for all three services)** | | | | |
| **Bowel** | 58.21/20.00 | 0/1500 | 52.87/20.00 | 0/1000 |
| **Breast** | 58.21/20.00 | 0/1500 | 52.87/20.00 | 0/1000 |
| **Prostate** | 58.21/20.00 | 0/1500 | 52.87/20.00 | 0/1000 |
| **Weak ranking (WTP the same for two of the services but different for the third)** | | | | |
| **Bowel** | 56.05/40.00 | 0/500 | 58.11/50.00 | 0/500 |
| **Breast** | 76.28/50.00 | 1/1000 | 23.79/0.00 | 0/200 |
| **Prostate** | 23.18/0.00 | 0/1000 | 56.00/50.00 | 0/500 |
| **Strong ranking (WTP values differ for all three services)** | | | | |
| **Bowel** | 99.56/50.00 | 3/1200 | 63.18/25.00 | 5/300 |
| **Breast** | 144.63/75.00 | 0/1000 | 55.45/50.00 | 0/200 |
| **Prostate** | 31.63/10.00 | 0/300 | 34.55/25.00 | 0/100 |
| **No answer given (n=163)** | | | | |
| **Implausibly high values (n=2)** | 1,000,000 (n=1) | | 12,000,000 (n=1) | |

**Table 6: The results of the multinomial logistic regression for one choice of programme**

| Dependent variable | Independent variable | Coefficient | P value | Odds ratio (95% CI) |
|---|---|---|---|---|
| **ineligible** | Intercept | -3.169 | 0.000* | |
| | How worried are you about getting cancer? | | | |
| | Very worried | -1.393 | 0.025* | 0.248 (0.074 to 0.837) |
| | Quite worried | -0.834 | 0.033* | 0.434 (0.202 to 0.934) |
| | A bit worried | -0.612 | 0.025* | 0.545 (0.317 to 0.927) |
| | Not at all Worried[R] | | | |
| | Age >60 years old | -0.940 | 0.012* | 0.391 (0.187 to 0.815) |
| | >50 to 60 years old | -0.78 | 0.807 | 0.925 (0.495 to 1.728) |
| | >40 to 50 years old | 0.115 | 0.728 | 1.122 (0.586 to 2.147) |
| | 30 to 40 years old[R] | | | |
| | Sex Male | 4.377 | 0.000* | 79.584 (33.751 to 187.656) |
| | Female[R] | | | |
| | Does the respondent believe Bowel is one of the two most common cancers? | | | |
| | No | 0.016 | 0.951 | 1.016 (0.610 to 1.693) |
| | Yes[R] | | | |
| | Does the respondent believe Breast is one of the two most common cancers? | | | |
| | No | -1.070 | 0.001* | 0.343 (0.185 to 0.636) |
| | Yes[R] | | | |
| **Both eligible** | Intercept | 0.011 | 0.964 | |
| | How worried are you about getting cancer? | | | |
| | Very worried | 0.242 | 0.411 | 1.274 (0.712 to 2.269) |
| | Quite worried | 0.274 | 0.262 | 1.316 (0.815 to 2.124) |
| | A bit worried | 0.078 | 0.706 | 1.081 (0.722 to 1.618) |

| | | | | |
|---|---|---|---|---|
| | Not at all Worried[R] | | | |
| | Age >60 years old | -0.054 | 0.805 | 0.947 (0.617 to 1.455) |
| | >50 to 60 years old | -0.091 | 0.652 | 0.913 (0.610 to 1.354) |
| | >40 to 50 years old | -0.040 | 0.844 | 0.961 (0.646 to 1.430) |
| | 30 to 40 years old[R] | | | |
| | Sex Male | 0.920 | 0.000* | 2.508 (1.826 to 3.445) |
| | Female[R] | | | |
| | Does the respondent believe Bowel is one of the two most common cancers? | | | |
| | No | -0.959 | 0.000* | 0.385 (0.285 to 0.545) |
| | Yes[R] | | | |
| | Does the respondent believe Breast is one of the two most common cancers? | | | |
| | No | 0.383 | 0.020* | 1.466 (1.062 to 2.026) |
| | Yes[R] | | | |

Note: *significant at the level of 0.05, log likelihood = 1610.149, N = 988, $\chi^2$ = 391.094, pseudo $R^2$ = 0.376.