Author's response to reviews

Title: Gender Differences in the Health Belief Model Predicting Colorectal Cancer Screening Uptake: A National Study

Authors:

Reuben K Wong (mdcwkme@nus.edu.sg)
Mee Lian Wong (mee_lian_wong@nuhs.edu.sg)
Yiong Huak Chan (yiong_huak_chan@nuhs.edu.sg)
Zhu Feng (mdczhuf@nus.edu.sg)
Chun Tao Wai (dr_desmond_wai@yahoo.com.sg)
Khay Guan Yeoh (khay_guan_yeoh@nuhs.edu.sg)

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Author's response to reviews: see over
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We would like to the reviewers for the comprehensive review. Our responses, just below the reviewer’s comments (boxed) are as follows:

Gender Differences in the Health Belief Model Predicting Colorectal Cancer Screening Uptake: A National Study.

1. Reviewer 1: Dr Gemma Binefa’s comments

Introduction section should be replaces by Background section.

We have replaced ‘Introduction’ with ‘Background’, page 4, line 1. Thank you

A list of abbreviations should be provided.

We have provided a list of abbreviations on page 15, second paragraph

It is not necessary to abbreviate “Computerized Tomographic” (in the Background) because it only appears once.

This term appear three times in our text. Hence, we have abbreviated the term “Computerized Tomographic”.

The individual contributions of authors to the manuscript should be specified (in the Authors’ contribution section).

Thank you for pointing out this omission, the contributions of each author have been detailed in the “Author’s Contributions” section on page 15, 3rd paragraph.

References have to be cited following this format: Title. BMC Public Health [year], [volume number]:[article number].

We have done this.

English should be revised because there are sentences and words which are not suitable. It is difficult to understand some parts of the manuscript.
We have made major edits to the whole paper to make it clearer and more concise.

**Background**

It would be interesting to know the situation of CRC screening in Asia (for example if there are population based CRC screening programmes).

We have added an update on the availability of (or more accurately paucity of…) national screening guidelines and mass screening programs in Asia on page 4, 2nd paragraph starting line 9 in the Background section, and added references accordingly.

In the last paragraph, objectives are not clearly stated.

We have amended the objectives on page 5, last 2 lines and page 6 first 2 lines as follows:

This study was conducted to determine the prevalence of uptake of colorectal cancer screening and knowledge about CRC among adults aged 50 years or more in the general population in Singapore. In addition, we applied the HBM to compare gender differences in the factors associated with CRC screening.

**Methods**

There are some questions unclear:

How many interviewers conducted the survey?

40 interviewers conducted the survey. We have added this to page 6, 3rd paragraph, line 1.

CRC screening behaviour: it is necessary to explain a little bit more this point. Was it possible to answer more than one screening option? What happened if the interval of FOBT, sigmoidoscopy or colonoscopy was higher?

Yes it was possible to answer “yes” to more than one screening option, as the screening modalities are not mutually exclusive. Therefore, the sum of the individual screening methods do not add up to the final “any screening” rate.
As described in the “Methods” section under “Questionnaire”, on page 7, 4th paragraph we defined currency with screening according to the American Gastroentrological Association guidelines. So the questions posed to the respondents were structured to ascertain if they were current with (i.e. being compliant with) the screening guidelines. Respondents with a longer interval were not counted as being current. This is important, as a single negative screening test does not confer life-long protection from CRC. This is one of the strengths of our survey, which is, one of the few to assess “currency with” screening rather than “have you ever been screened”.

In the second paragraph after “Survey questionnaires” authors mentioned that subjects with a personal history of CRC, adenomas or inflammatory bowel disease are at a higher risk of CRC and would not be considered screening candidates. People with hereditary or familial CRC should not be considered neither but there is no mention about this.

We fully agree that individuals with hereditary or familial CRC conditions such as HNPCC or FAP should be excluded, and we had done so for our study. In the local Singaporean context, these conditions are extremely rare, and among our respondents none of them had a known familial polyposis syndrome. Hence we had not mentioned this in the manuscript.

Results
The authors say that the response rate was 86%, how is it calculated (numerator and denominator)?

The response rate was calculated by dividing the (i) number of eligible subjects ie. persons aged 50 years or more who responded to the survey by (ii) the total number of eligible subjects selected randomly in the sample. Hence, it is 1763/2000 which is 88.2%

We apologize for the error in the figure. As the survey took some time to be completed, there was some confusion about the latest updated figures.

We have recomputed the response rate. It is 88.2% and not 86%. The figure has been amended on page 9, 1st paragraph, line 1 of the results section.

It would be interesting to know the reasons of refusal.
Unfortunately, we were not able to get the reasons for non-refusal in this community-based survey. Those people who refused to participate in the survey, would close their door on seeing our interviewers and did not want to speak to them.

The percentage of female (60.4%) is not correct concerning the results included in the table (1,050 women and 693 men # 60.2% female)

We apologize for the typographical error. It is 60.2% and not 60.4%. We have changed it on page 9, 1st paragraph, last line.

Table 1:
The period (years) included in the title is not correct

We are sorry about the typographical error. It is between 2007 and 2008. WE have amended accordingly.

Include the n and % in each result and the p value instead of the total.

Yes, we have done it.

In Table 1, the sum of percentages of each category should be 100%.

Yes, we are aware that some of the percentages did not add up to 100%. This is because we have data under 'others' for occupation (6 each for men and women) which we did not include in the Table. As the ‘others’ included those who worked a few months a year on a 'project' basis, we have now included them under 'working'. In addition some adds up to 99.9% and some to 100.1%. This is probably because we have rounded up to 1 decimal point.

Table 2:
Include the n and % in each result.
Identify significant results (bold, italic…)

We have included the n and %
We did not change the format of the p values because we note that articles in BMC public health do not bold or italicized significant p values.
We'll leave the decision to the editor.
Table 3:
It is very extensive, which makes it difficult to follow the results. It is necessary to change the format in order to make it more attractive to readers.

We agree that Table 3 is very long. We have broken it into 2 Tables, with one Table (Table3) showing screening by socio-demographic characteristics and the second Table (Table 4) showing screening by the various components/domains of the HBM. We have also improved the format of the table such that the statement for each component of the HBM is on one line instead of 2 or 3 lines. We have also reduced the number of words in each statement to make it easier to read.

Include the n and % in each result.
Identify significant results (bold, italic…)

We have included the n and %
We did not change the format of the p values because current articles in BMC public health do not bold or italicized significant p values.
We'll leave it to the editor to decide

Table 4:
It would be interesting to see all the results (significant and no significant, identifying the significant in some way).

Table 4 on multivariate anlaysis s now Table 5. We have done this. Thank you.

Figure 1
Put the numbers in the same format (with one decimal).

We have done it. Thank you.
Figure 2
An alternative title: Reported symptoms of colorectal cancer
Put the numbers in the same format (with one decimal).

We have done it. Thank you.

Discussion
The main results are discussed but should also be compared with other studies. In Europe, some studies have been conducted with similar results to those in the manuscript. It is necessary a more comprehensive literature search.

Our discussion was previously more extensive, but had been pared down to keep it concise. In response to your suggestion, we have since discussed and included references to a number of European studies, amongst which are the pan-European survey on colorectal cancer on page 13, 2nd paragraph, line 4-5 in the discussion section.

References
References have to be cited following the BMC Public Health format.

We have done it. Thank you.
Reviewer 2: Dr Johannes Blom’s comments

1. Firstly, my major comment is that there is need for much more detailed information about how CRC screening actually is performed in Singapore. When was it adopted? Organized? What is the target group? What are the tests recommended?

We have inserted a brief description on the target group, methods and limitations of the Singaporean program, and relatively newly introduced CRC screening guidelines on page 4, second paragraph starting line 9 in the background section.

The relevant references (5-9) are also inserted.

2. The is a lack of general knowledge of CRC screening and there is a need for at better structure of the Introduction. E.g. Second paragraph: “If detected early, CRC is curable and preventable…”: how can a disease be preventable when it is already diagnosed? I believe the authors refer to mortality.

We have re-worded the sentence, and clarified that prevention is thorough the detection of colorectal adenomas, the precursor lesions of colorectal cancer (Page 4, 2nd paragraph, line 2).

3. Established screening modalities for CRC exist – namely...barium enema”. Barium enema is very seldom used and I suggest the authors to be more updated on current recommendations. There is a lack of quite important references, e.g. the European Guidelines, but even more important some other Asian studies. Pls, describe the actual CRC screening in Singapore instead. I do not believe you screen 93 year olds (oldest female study participant)?

We agree with the reviewer that Ba Enema is not an optimal tool for CRC screening. However, it still remains a widely available test in some parts of the world and is used in some countries where endoscopy is not readily available. To more accurately reflect the limitations surrounding its use, we have inserted a sentence on page 4, paragraph 2, line 5-9 (Background section) and inserted as references the major CRC screening guidelines where this issue is discussed in detail (2-5).

We apologize for having inadvertently omitted the important WGO/IDCA Practice Guidelines on CRC Screening, and have inserted it into our manuscript and as a reference (5). We have extensively alluded to the Asia Pacific CRC Consensus as well.
We have inserted the Singapore screening guidelines, in which there is no upper limit imposed on screening on page 4, 2nd paragraph, line 13-14 (Background section).

The 93 year old respondent who underwent screening is not a unique case. Singapore has a high life expectancy (79.0 years for females and 83.7 years for males), so age is not a barrier for individuals with a good functional status, and they often are offered screening by their general practitioners (physicians).

4. The manuscript only refers to USA and in one single study to Canada. As a reader I have difficulties to understand, e.g., the similarity between an organized screening program of the population of Canada and Singapore.

We had cited this Canadian study for comparison, as it was a similar population representative study in a developed nation with similar socio-economic demographics to Singapore, which has an equally high CRC incidence rate.

5. The Method with structured interviews is very ambitious. When performing such a study you really want to get the most out of it, but I believe that the three-fold aim of this study is a bit to shoot over the target. I would prefer the authors to be more precise about the design of the study.

We would like to clarify that the study was not overly ambitious because we were only assessing the subjects’ knowledge of symptoms of CRC and whether they knew that CRC was a common cancer. The perceptions and attitudes refer to the components of the Health Belief Model.

We have amended our objectives to make it clearer and more concise as follows on page 5, last paragraph, last 2 lines and page 6, first 2 lines as follows: :

“This study was conducted to determine the prevalence of uptake of colorectal cancer screening and knowledge about CRC among adults aged 50 years or more in the general population in Singapore. In addition, we applied the HBM to compare gender differences in the factors associated with CRC screening.”
In the second scenario, the interviewer encountered a household which has no eligible resident. A replacement has to be done for this household which has already been selected in our sample.

Ideally, our sampling frame should consist of a list of eligible subjects i.e., persons aged 50 or more years. However, we were not able to get this list. Hence, we adopted the next best sampling frame, which is, a sampling frame of households from the Department of Statistics.

The interviewers encountered 5% of households in the sample which did not have an eligible subject i.e., a resident was in but when asked whether there was any eligible resident (i.e., aged >=50 years), he replied that there was no one aged >=50 years. This household was replaced with a household with an eligible subject who was very similar to the non-eligible household. Replacement is a common procedure used to replace non eligibles. To reduce selection bias, the interviewer moved to the next-door dwelling on the right in the same block till a household with an eligible subject was found. Dwellings in the same block are similar in type with regard to size and number of rooms; hence, residents living in the same block are very similar in socio-economic status. Replacement was NOT done for refusals because it would introduce selection bias.

We have amended the paragraph to make it clearer on page 6, last paragraph and page 7, 1st paragraph, under methods section.

The flow chart is shown in Figure 1. We now have 3 Figures and 5 Tables. If the editor feels that there are too many figures and if the text is clear enough, this figure can be removed. We leave the decision to the editor. Thank you.

7. Were the residents informed about the study in beforehand and at what time they could expect the interviewer to knock on their door?

No. The residents were not informed.
8. The definition of exposure need a better motivation – in northern Europe biennial FOBT is standard in CRC screening.

We are not entirely sure what this comment entails, but would like to clarify that in assessing the use of FOBT for CRC screening, the Singaporean guidelines are similar to that advocated by the American Gastroenterological Association guidelines,, which is a FOBT annually in an average risk individual.

9. I suggest all the information about the study questionnaire in top of page 7 is demonstrated in a separate table (not in results) and not detailed in the text.

If the HBM items are presented in a separate Table, we may end up with too many tables. Besides, all the items in the Health Belief Model will be presented again in the results in Tables 2 to 4.

We have decided to reorganize and summarize this paragraph as follows:

1. The knowledge statements and possible response categories have been moved up to the first paragraph on page 7, 3rd para, line 4-6 under the subheading “questionnaire” so that the current paragraph only describes the HBM domains.

2. We explained only 1 or 2 domains in full as examples because all the domains and the respective items within each domain are already presented in full in Table 2. This style is often used by most authors who applied the HBM.

The amended paragraph is shown on page 7, 5th and last para as follows:

“Questions covering the 5 domains of the HBM included perceived susceptibility to acquiring CRC, perceived severity of the disease, benefit of going for screening, barriers to action and cues to action. The items used to assess each of the five HBM domains are listed in Table 2. For example, perceived susceptibility was assessed by 4 items - chance of developing CRC, worry about getting CRC, it is fated to get CRC and whether one can prevent oneself from getting it. Barriers were assessed by 7 items and these included the fear, unwillingness to find out the results, perceived danger, pain, embarrassment, financial cost and inconvenience of screening.”

10. The Result section is too extensive. There are many results that are presented with no differences between genders. What are the major results of interest?

We have condensed it and taken out the ‘minor’ findings which have less clinical or public significance. For example, in the bivariate analysis, we removed the sentences on the borderline association of CRC screening with the belief that it will affect family
members and social life and the non-significant association of CRC screening with perceived severity that CRC will lead to suffering.

In the multivariate analysis, we also removed the sentences on those variables which were already found to be not significant and have been mentioned earlier in the section on bivariate analysis.

We have now presented only the results of interest and which have clinical/public health implications.

11. I believe second paragraph page 9 is just the way it looks like in Singapore and is not a result of the study?

The results on the socio-demographic characteristics were from our study. We have stated this in Table 1. To make it clearer, we have changed the surveyed population to surveyed sample.

12. There are many variables studied. Some of differences by gender – of course – could be of statistical significance only by random. It would be relevant with a better hypothesis of differences between genders in the Introduction.

We are not able to state a hypothesis of the specific factors in the Health Belief Model that will differentiate between males and females because no such survey has been conducted. Hence, this study aims to identify ALL possible factors associated with CRC screening and then compare whether there are any gender differences for these factors.

We have amended our objectives on page 5, last 2 lines and page 6, first 2 lines.

13. Statistical differences do not have to be clinical relevant. Highlight the important ones. The Malay females are a very good example and also discussed.

We have taken out the sentences on the non-significant associations and condensed the first two paragraphs on page 11.

14. I believe the limitation you highlight – if people were screened or investigated due to illness is very important and needs to be more in detail discussed. Together with clarity of the target population of screening in Singapore this is the key to generalizability of the results into a screening setting.

This constraint arises from our study, which is a large community based cross-sectional survey. Unlike a managed healthcare population and for confidentiality purposes we did not have access to our respondents’ healthcare records, and hence were unable to verify if the subjects who had CRC screening tests were truly asymptomatic at the point
of testing. However, we minimized this by excluding from the analysis individuals with significant colonic pathology.

Previous large population studies on CRC screening behavior and attitudes did not restrict respondents to those who were “screening eligible”. Our study specifically targeted individuals who met the criteria for CRC screening, namely those above the age of 50 years, and excluded those with significant underlying pathology (e.g. IBD or pre-existing cancer).

15. I also have some minor comments regarding the text:
1. Be consequent with figures. If you use one decimal, do so even with 81.0% (see abstract).

We have done it for the relevant variables.

16. Clarify participation by test. If 27% participate, 21% FOBT and 14% endoscopy? I believe some did both. Again, what does the screening look like in Singapore?

As requested for previously, we have described the local screening program in the second paragraph, page 4, line 13 onwards of the Background section.

Yes it was possible to answer “yes” to more than one screening option, as the screening modalities are not mutually exclusive. Therefore, the sum of the individual screening methods do not add up to the final “any screening” rate.

17. What is the * after ref 16 refer to?

Sorry. It was just an artifact. We have removed it

18. Page 9, second paragraph – comparing between…

This phrase “comparing between genders” does not appear anymore as we have rephrased the sentence.
We have also taken out this phrase and highlighted only the significant findings of clinical /public health significance.

20. The conclusion should be shortened. What are the “punch lines”?

We have shortened it on page 14, 2\textsuperscript{nd} paragraph as follows:

“In summary, our study showed a low level currency of CRC screening among Singaporeans despite their high level of awareness of the disease. We also found gender differences with Malay females being half as likely as non-Malay females to undergo screening. Other significant gender differences included women being more fearful about endoscopic screening and being; more likely to respond to cues such as public talks and having a family member with CRC to undergo screening. Our findings clearly call for the need to implement gender specific approaches to increase CRC screening. Finally, given the strong association of CRC screening with a doctor’s recommendation for both genders, the influential role of the doctor in promoting screening should be widely promoted.”

We have also decided to change the title of our manuscript as follows to make it clearer

“Gender Differences in Predictors of Colorectal Cancer Screening Uptake: A National Cross Sectional Study Based on the Health Belief Model”

Thank you very much.

Dr Mee Lian Wong.