

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Utilisation of mammography by women with mobility impairments in the United Kingdom: a secondary analysis of cross-sectional data
AUTHORS	Sakellariou, Dikaios; Rotarou, Elena

VERSION 1 - REVIEW

REVIEWER	Helene Krouse University of Texas Rio Grande Valley Edinburg, Texas USA
REVIEW RETURNED	16-Jun-2018

GENERAL COMMENTS	<p>This is a well written and clearly organized study using secondary data analysis determine whether women with mobility impairments have lower odds of utilizing screening mammography than women without impairments across the UK. Approximately 28% of the 9,491 women from this cross-sectional dataset were classified as having mobility impairments based on their answers to two interview questions.</p> <p>The authors present a clear narrative and tabular description of comparative summary data between the two groups of women. They identified differences between these two groups of women in regard to education level, income quintile, and inactive in employment, which indicated that the women with mobility impairments were in a “disadvantaged” group. Relationships between these three variables are well substantiated in the literature, however what would be more interesting and informative to the reader is an analysis related to length of mobility impairment to these variables. This might help us to more directly understand trends or patterns in mammography utilization relative to length of mobility impairment. Table 2 presents similar data on these already known variables that impact screening behaviors of those in particular demographic groups, and those identified with physical impairments are not different from this larger population in their behaviors toward mammography.</p> <p>The findings from this secondary data analysis are consistent with results and conclusions from other studies that have examined preventative health behaviors in individuals with disability. So, in this regard it adds little to the literature. One of the points that was raised and could be beneficial in looking at ways to increase screening behaviors related to geographic distributions and mammography use in women with mobility impairments. The fact that women in Scotland had higher odds of mammography use than those in other parts of the UK certainly warrants further investigation. These types of studies can help identify trends in use of services but without well developed controlled, prospective studies we cannot fully understand these behaviors and how to</p>
-------------------------	--

	best work with patients to help improve health outcomes particularly in these vulnerable groups.
--	--

REVIEWER	Emily Hammad Mrig University of Colorado Denver, USA
REVIEW RETURNED	02-Sep-2018

GENERAL COMMENTS	<p>I appreciate the opportunity to review this manuscript. This paper uses strong quantitative methods and makes a substantial contribution to the literature on access to a critical preventive technology (mammography). I highly recommend this manuscript for publication in BMJ Open with some minor revisions and have outlined my comments to the authors below. Please let me know if you have questions about any of these points.</p> <p>1. The introduction overall makes a good case for the importance of the research and describes how this paper will address a key gap in the literature on equitable access to mammography for all women. Reorganizing some ideas in the introduction could help to make this point even stronger for the reader; the following points are just a few examples to illustrate this point</p> <p>a. Page 5, lines 4-12 – This sentence/idea (“Cochrane systematic review...” feels misplaced or perhaps is confusing because the idea could be developed further by explaining why mammography is associated with over-diagnosis rates and higher rates of aggressive treatment. Without further explaining the idea, this could open the door to reader questions about why the research on access to mammography is important if it could have other negative health implications.</p> <p>b. The paragraph that begins on page 5, line 40 could be moved ahead of the prior paragraph (page 5, line 14). This could lay out first what we know about mammography utilization generally and next known disparities about women with disabilities and mammography, but what is then not known (i.e., the main goal of the paper)</p> <p>c. Specific examples of what is meant by the term “lower limb mobility” would be helpful for international readers who may define this term differently (page 6, lines 4-16)</p> <p>2. Data and variables – This section is clearly articulated, and I have just a few suggestions and points for clarification:</p> <p>a. As a STATA user, I’m unclear on what the authors mean by “Due to case-deletion” (page 8, line 48) – is this case-deletion based on missingness in the data? Or something else?</p> <p>b. Page 8, lines 50-52 – How does the total sample size (9,491 observations) compare to the general population (i.e., what is the representativeness of the sample)?</p> <p>c. Page 9, lines 7-18 – The authors note that the survey has a significant number of women falling outside of the target ages of 50-69 – this can likely be explained by supportive literature on age/risk/family medical history factors, etc. This point is especially relevant considering the large number of women who fall into this age group – about one third of the sample! (Table 1)</p> <p>d. For a couple of the control variables (e.g., urbanization and income quintiles), it would be useful if the specific figures were provided – for instance, what is the range in pounds for someone in the “1st quintile” of net monthly income OR what is the population size of a “thinly-populated” area.</p>
-------------------------	---

	<p>e. Page 9, line 31 – “help from neighbors” – what do we know about social capital/network and how it’s associated with socioeconomic factors? There may not be the space for this manuscript to address this idea but find that it could be an intriguing concept after reviewing the results of the piece.</p> <p>3. The Results are also clearly and accurately described. I have two questions for the authors:</p> <p>a. Table 1 – Similar to point 2.c. above - the significant differences across age groups and mammography are notable and could be described in the written results; this could be tied to the point made by the authors regarding age for women with an impairment in Table 2 (page 12, lines 16-18).</p> <p>b. Table 2 – I found the OR for urbanization surprising; I would expect that women in a less urbanized areas would have lower odds of mammography – how can you explain this result?</p> <p>4. I read through the Discussion with a keen interest- the authors do a nice job of highlighting the key points that are most relevant to their paper aim. My suggestions below are based on some of the other points of discussion not included and simply some things to consider in a revision:</p> <p>a. The authors make note of the protective role of married civil status (page 15, line 44) and the link to stronger social networks; I would be interested in knowing more about the authors’ analysis on how the variable on neighborly assistance could be associated with married protective status. Social capital, marriage status, etc. point to the complex nature of an individual’s social network as a protective health factor.</p> <p>b. The paper concludes suggesting implications of this study, including the identification of barriers to mammography access. Perhaps, this idea could go a step further by suggesting some suggestions for how to not just acknowledge barriers, but also specific measures that could be adopted. One that jumps of the page at me is the mention of Scotland’s mobile mammography screening – is there an opportunity to extend that kind of program to other parts of the UK?</p> <p>c. This is more of an issue of organization – page 15, paragraph beginning on line 23 (“These inequalities...”) could be moved towards the end of paper where the discussion takes up the issue of policy implications.</p>
--	--

REVIEWER	Lennarth Nyström Department of Public Health and Clinical Medicine Umeå University Umeå Sweden
REVIEW RETURNED	12-Nov-2018

GENERAL COMMENTS	<p>The study is properly performed according to the school book, HOWEVER, EU is recommending inviting women 50-69 years to mammography screening (MS) and in some countries other age groups are also invited (Sweden 40-49 and 60-74, The Netherlands 70-75 and in England an RCT is ongoing inviting women <50 and >70 to one screen). In this study only 42.8% are 50-69 years, thus the results are not reflecting the age group invited to screening.</p>
-------------------------	--

VERSION 1 – AUTHOR RESPONSE

Thank you very much for these very helpful comments. Please find our detailed responses below.

Reviewer 1

Relationships between these three variables are well substantiated in the literature, however what would be more interesting and informative to the reader is an analysis related to length of mobility impairment to these variables. This might help us to more directly understand trends or patterns in mammography utilization relative to length of mobility impairment. Table 2 presents similar data on these already known variables that impact screening behaviors of those in particular demographic groups, and those identified with physical impairments are not different from this larger population in their behaviors toward mammography.

Response: Thank you for this comment. We agree that length of mobility impairment could offer useful insights. However, the EHIS does not include this information.

The findings from this secondary data analysis are consistent with results and conclusions from other studies that have examined preventative health behaviors in individuals with disability. So, in this regard it adds little to the literature. One of the points that was raised and could be beneficial in looking at ways to increase screening behaviors related to geographic distributions and mammography use in women with mobility impairments. The fact that women in Scotland had higher odds of mammography use than those in other parts of the UK certainly warrants further investigation. These types of studies can help identify trends in use of services but without well developed controlled, prospective studies we cannot fully understand these behaviors and how to best work with patients to help improve health outcomes particularly in these vulnerable groups.

Response: This was the first study to explore this issue in the UK, so it is of particular use and importance for UK policy makers. We also think it was interesting to see regional variations and we agree that this matter needs further investigation. Future research needs to confirm the existence of such variations and investigate the reasons behind it.

Reviewer 2

1. The introduction overall makes a good case for the importance of the research and describes how this paper will address a key gap in the literature on equitable access to mammography for all women. Reorganizing some ideas in the introduction could help to make this point even stronger for the reader; the following points are just a few examples to illustrate this point

Response: Thank you very much for these comments. We have addressed them all, as per below:

a. Page 5, lines 4-12 – This sentence/idea (“Cochrane systematic review...” feels misplaced or perhaps is confusing because the idea could be developed further by explaining why mammography is associated with over-diagnosis rates and higher rates of aggressive treatment. Without further explaining the idea, this could open the door to reader questions about why the research on access to mammography is important if it could have other negative health implications.

Response: We restructured this sentence to make it clear that the evidence shows that mammography is an accurate and useful screening test.

b. The paragraph that begins on page 5, line 40 could be moved ahead of the prior paragraph (page 5, line 14). This could lay out first what we know about mammography utilization generally and next known disparities about women with disabilities and mammography, but what is then not known (i.e., the main goal of the paper)

Response: We have moved this paragraph as suggested.

c. Specific examples of what is meant by the term “lower limb mobility” would be helpful for international readers who may define this term differently (page 6, lines 4-16)

Response: We explain we use this term to refer to women who report difficulty or inability to walk or climb stairs. We offer further explanation under ‘data and variables’.

2. Data and variables – This section is clearly articulated, and I have just a few suggestions and points for clarification:

a. As a STATA user, I’m unclear on what the authors mean by “Due to case-deletion” (page 8, line 48) – is this case-deletion based on missingness in the data? Or something else?

Response: We have clarified this issue in the text. We mean listwise-deletion, due to missing values in some variables.

b. Page 8, lines 50-52 – How does the total sample size (9,491 observations) compare to the general population (i.e., what is the representativeness of the sample)?

Response: We have added information on sample representativeness in the methodology section. The overall sample itself is representative of the population, and our sample as well (as test results have shown).

c. Page 9, lines 7-18 – The authors note that the survey has a significant number of women falling outside of the target ages of 50-69 – this can likely be explained by supportive literature on age/risk/family medical history factors, etc. This point is especially relevant considering the large number of women who fall into this age group – about one third of the sample! (Table 1)

Response: We have added a figure to demonstrate this important point, and we have referenced various sources as well, explaining this.

d. For a couple of the control variables (e.g., urbanization and income quintiles), it would be useful if the specific figures were provided – for instance, what is the range in pounds for someone in the “1st quintile” of net monthly income OR what is the population size of a “thinly-populated” area.

Response: We have provided a direct link to the methodological manual of EHIS that explains in detail all the variables used.

e. Page 9, line 31 – “help from neighbors” – what do we know about social capital/network and how it’s associated with socioeconomic factors? There may not be the space for this manuscript to address this idea but find that it could be an intriguing concept after reviewing the results of the piece.

Response: While this is a very interesting topic to investigate, in our study the “help from neighbours” variable, indicating social support, does not have a significant effect on use of mammography (see Table 2), and therefore we decided not to discuss this further in the discussion section.

3. The Results are also clearly and accurately described. I have two questions for the authors:

a. Table 1 – Similar to point 2.c. above - the significant differences across age groups and mammography are notable and could be described in the written results; this could be tied to the point made by the authors regarding age for women with an impairment in Table 2 (page 12, lines 16-18).

Response: Table 1 shows the characteristics of our study sample, i.e. women with and without mobility impairment. For the purpose of showing age groups, disability, and mammography use, we have added Figures 1 and 2, where we also discuss this relationship.

b. Table 2 – I found the OR for urbanization surprising; I would expect that women in a less urbanized areas would have lower odds of mammography – how can you explain this result?

Response: These results were not statistically significant and therefore we do not discuss them further.

a. The authors make note of the protective role of married civil status (page 15, line 44) and the link to stronger social networks; I would be interested in knowing more about the authors' analysis on how the variable on neighborly assistance could be associated with married protective status. Social capital, marriage status, etc. point to the complex nature of an individual's social network as a protective health factor.

Response: This is a very interesting point. We would be interested in exploring the protective role of these variables, and maybe that is something we could do in a subsequent paper. In this study, the "social networks" variable was not shown to have a significant effect.

b. The paper concludes suggesting implications of this study, including the identification of barriers to mammography access. Perhaps, this idea could go a step further by suggesting some suggestions for how to not just acknowledge barriers, but also specific measures that could be adopted. One that jumps of the page at me is the mention of Scotland's mobile mammography screening – is there an opportunity to extend that kind of program to other parts of the UK?

Response: Thank you for this point. Please see changes in that section.

c. This is more of an issue of organization – page 15, paragraph beginning on line 23 ("These inequalities...") could be moved towards the end of paper where the discussion takes up the issue of policy implications.

Response: We have moved this paragraph as suggested.

Reviewer 3

Please leave your comments for the authors below The study is properly performed according to the school book, HOWEVER, EU is recommending inviting women 50-69 years to mammography screening (MS) and in some countries other age groups are also invited (Sweden 40-49 and 60-74, The Netherlands 70-75 and in England an RCT is ongoing inviting women <50 and >70 to one screen). In this study only 42.8% are 50-69 years, thus the results are not reflecting the age group invited to screening.

Response: Thank you for your useful comment. We have decided to include women outside the target group because, as it can be seen in Figure 1 (which we have added to clarify another reviewer's query), 30% of women (with or without mobility impairment) that have undergone mammography are outside the target group. The fact that many women outside the target group undergo this test for a variety of reasons has been shown in many studies (which we present in the paragraph below Figure 1). So, while the recommendations are for women 50-69, we cannot ignore that women outside this age range use mammography.

VERSION 2 – REVIEW

REVIEWER	Helene Krouse, PhD, RN, FAAN University of Texas Rio Grande Valley School of Medicine Edinburg, Texas U.S.A.
REVIEW RETURNED	29-Nov-2018

GENERAL COMMENTS	<p>Authors did a good job addressing areas of concern within this revised manuscript. A few suggestions are provided to further improve this presentation:</p> <ol style="list-style-type: none"> 1. In abstract, consider renaming second heading from "Setting and Participants" to "Sample and Design". This more accurately reflects content provided. 2. P. 10, authors added a section on "Patient and Public Involvement" and refer to "the research question and outcome measures". Are they referring to the questions included in the survey or to an actual research question for this study? If the later, this needs to be corrected or else included since as written there is no research question(s) stated.
-------------------------	--

REVIEWER	Emily Hammad Mrig University of Colorado Denver (USA)
REVIEW RETURNED	09-Dec-2018

GENERAL COMMENTS	<p>I appreciate the work the authors have done in the preparation of the revised manuscript – they have done a nice job of incorporating many of the reviewer comments and as a result, the paper is more organized and the ideas are clearly articulated. I recommend the paper for publication; however, I still have some minor revisions that I would like to see the authors make prior to a final submission. These suggestions for revision are as follows:</p> <ul style="list-style-type: none"> • Two of the initial reviewer comments questioned the representativeness of the sample to the target population, including that only 42.8% of the participants fall within the age-group targeted for mammogram screening – I do not question the overall sample as being representative of the general population, I'm still not convinced the authors have addressed Reviewer 3's point. • Adding to the above point- the reviewers commented on a limitation of the study being the inability to distinguish between a short-term mobility impairment versus a long-term mobility impairment. This got me wondering about the overall sample, with appx one-third having a mobility impairment – how does this compare to population estimates of mobility impairments in the population? I'm having a hard time believing that one-third of the population have a mobility impairment (in the US I think the about 13% of the entire population has a disability- this includes non-physical disabilities). This may not mean the sample is not representative of the population, but perhaps could point to the idea that individuals are not distinguishing between short/long term impairment? Either way – this point needs to be addressed by the authors. • Fig 2. Perhaps a more compelling figure would compare the % of total respondents in each category (with/without mobility impairment) who undertook mammography (this could still break-out into age-groups or could be an additional figure?). <ul style="list-style-type: none"> o This sort of figure would substantiate the finding that women WITH a mobility impairment have significantly lower odds of undergoing mammography compared to women without an impairment (especially because this result is not shown in either Table 1 or 2)
-------------------------	--

	<ul style="list-style-type: none"> • Discussion: There are several sections of the discussion that seem redundant and arguably could be cut to make room in the paper for a more discussion around some of the compelling findings of the study. For instance: <ul style="list-style-type: none"> o Pages 16-17, first paragraph, lines starting top of 17 – “results showed a statistically...” – I don’t know if the reader needs to have the results re-stated here...what does it add to the discussion? o Page 17, paragraph starting line 7 – Forgetting my earlier comment about the “representativeness” of the study – I think the authors are underselling the strengths of the study here and restating some of the points they made about the study (or need for this study) in the introduction. Personally, I think the strengths start at the bottom of the page, with the last paragraph (pg 17, line 51). • Two reviewers commented on the interesting geographic variation in mammography utilization, with Scotland having much higher rates of utilization – I don’t feel the authors fully address this idea (maybe word length is a deterrent). To this end, one suggestion is to move the paragraph on page 18 starting line 41 and combining with the paragraph on page 19, starting line 19. Here, the authors are describing the mismatch between the UK strategic documents and the actual inequalities in access that exist – I am left wondering what we can learn from the Scottish policies on promoting delivery of cancer care and how this might address this mismatch in policy versus ‘reality’?
--	---

VERSION 2 – AUTHOR RESPONSE

Thank you very much for these very helpful comments. Please find our detailed responses below.

Reviewer 1

1. In abstract, consider renaming second heading from "Setting and Participants" to "Sample and Design". This more accurately reflects content provided.

RESPONSE: We changed the heading as suggested

2. P. 10, authors added a section on "Patient and Public Involvement" and refer to "the research question and outcome measures". Are they referring to the questions included in the survey or to an actual research question for this study? If the later, this needs to be corrected or else included since as written there is no research question(s) stated.

RESPONSE: We rephrased this to refer to the research aim of the study

Reviewer 2

3. Two of the initial reviewer comments questioned the representativeness of the sample to the target population, including that only 42.8% of the participants fall within the age-group targeted for mammogram screening – I do not question the overall sample as being representative of the general population, I’m still not convinced the authors have addressed Reviewer 3’s point.

RESPONSE: Our response to this remains the same: We have decided to include women outside the target group because, as it can be seen in Figure 1 (which we have added to clarify another reviewer’s query), 30% of women (with or without mobility impairment) that have undergone mammography are outside the target group. The fact that many women outside the target group

undergo this test for a variety of reason has been shown in many studies (which we present in the paragraph below Figure 1). So, while the recommendations are for women 50-69, we cannot ignore that women outside this age range use mammography.

4. Adding to the above point- the reviewers commented on a limitation of the study being the inability to distinguish between a short-term mobility impairment versus a longterm mobility impairment. This got me wondering about the overall sample, with appx one-third having a mobility impairment – how does this compare to population

estimates of mobility impairments in the population? I'm having a hard time believing

that one-third of the population have a mobility impairment (in the US I think the about 13% of the entire population has a disability- this includes non-physical disabilities). This may not mean the sample is not representative of the population, but perhaps could point to the idea that individuals are not distinguishing between short/long term impairment? Either way – this point needs to be addressed by the authors.

RESPONSE: Under data and variables we offer a clear definition of the variable 'mobility impairment', which includes people with short term impairment as well. In the third paragraph of the Discussion we state that this is a limitation.: "Another limitation of the study is the way mobility impairment was defined, which potentially included women with only short-term impairment, together with women with longer-term impairment; this might have had an impact on external validity." We cannot make any speculations as to the numbers of people with short term as opposed to long term impairment.

5. Fig 2. Perhaps a more compelling figure would compare the % of total respondents in each category (with/without mobility impairment) who undertook mammography (this could still break-out into age-groups or could be an additional figure?).

o This sort of figure would substantiate the finding that women WITH a mobility impairment have significantly lower odds of undergoing mammography compared to women without an impairment (especially because this result is not shown in either Table 1 or 2)

RESPONSE: We think it is better to keep this figure as it is, as we want to show the differences by age group. We have added a note in the findings that full results for the odds ratios are available upon request.

6. Discussion: There are several sections of the discussion that seem redundant and

arguably could be cut to make room in the paper for a more discussion around some of the compelling findings of the study. For instance:

Pages 16-17, first paragraph, lines starting top of 17 – "results showed a statistically..." – I don't know if the reader needs to have the results re-stated here...what does it add to the discussion?

RESPONSE: We follow the journal guidelines in briefly repeating the findings in the first paragraph of the discussion We also believe this is useful as it highlights the main findings, and hence we believe this paragraph needs to stay as it is.

7. Page 17, paragraph starting line 7 – Forgetting my earlier comment about the “representativeness” of the study – I think the authors are underselling the strengths of the study here and restating some of the points they made about the study (or need for this study) in the introduction. Personally, I think the strengths start at the bottom of the page, with the last paragraph (pg 17, line 51).

RESPONSE: We follow the journal guidelines in outlining both the strengths and the limitations of the study. We believe that the methodological strengths of the study need to be stated here.

8. Two reviewers commented on the interesting geographic variation in mammography utilization, with Scotland having much higher rates of utilization – I don’t feel the authors fully address this idea (maybe word length is a deterrent). To this end, one

suggestion is to move the paragraph on page 18 starting line 41 and combining with the paragraph on page 19, starting line 19. Here, the authors are describing the mismatch between the UK strategic documents and the actual inequalities in access that exist – I am left wondering what we can learn from the Scottish policies on promoting delivery of cancer care and how this might address this mismatch in policy versus ‘reality’?

RESPONSE: We include the following section in the discussion. We can of course speculate more about this, but we decided to keep this very brief and factual: “Our study also revealed that there are differences in the utilisation rates of mammography between women living in different regions in the United Kingdom, with women with mobility impairment living in Scotland having higher odds of undertaking the test than women in England. The reason behind this might be the usage of mobile screening units in Scotland, which appears to enable access to mammography for underserved populations.[39]”

VERSION 2 – REVIEW

REVIEWER	Emily Hammad Mrig University of Colorado, Denver
REVIEW RETURNED	07-Feb-2019

GENERAL COMMENTS	Thank you to the authors for addressing my comments and making changes as needed.
-------------------------	---