Author's response to reviews

Title: Geographical variation in radiological services: a nationwide survey

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Author's response to reviews:

Dear Lolu da-Silva

Thank you for the insightful comments and for being aloud to improve our manuscript accordingly. We have addressed all comments and our response to the concerns is as follows:

General

A table of the requested key figure is included as additional file 1 and referred to in the method chapter.

Method

1. The notion "frequency" is changed to "rates per thousand", or sometimes simply "rates".

2. The data format used in the study, NORAKO codes, does not include home county of the patients examined. Hence, the analyses presuppose that the vast majority of the patients are examined in their home county. Assessment of this assumption is given in the discussion.

3. "Pearson's R" is exchanged to "Pearson's r"

4. Measures of accessibility are now described, with details in the additional file 1. The rationale for calculating the "proportion of the population living in municipalities with general radiological services" is also explained.

Yes, it is called radiographers in British English.

Results

1. High/low ratio and COV is included in the tables as requested. We believe the reason why COV is not being distorted by an extreme high or low value is already given in the method chapter where the definition of the measure is given. The reason for using both values is now mentioned.

2. The suggested additional statistical analyses is performed and included.

3. Figure 1: The bar chart is replaced by a scattergram, with regression line.

4. When it comes to private and public institutions impact on variability, we agree that the COV is not a good measure, due to the lack of private providers in 5 counties. However, we really think the manuscript will miss a valuable point if we drop the whole section, so we have tried to make it more informative: The COV
analyses are replaced by a correlation between the variability of single examinations and the portion of these examinations performed by private institutions. The analysis reveals that private institutions tend towards performing a higher portion of the examinations with high COV. Figure 3 (bar chart of knee examinations) is deleted.

Discussion

1. We are well aware of the problem of migration and do not state that we have any hard evidence to exclude it. In our arguments we try to establish as probable that the scope of the problem is limited. The discussion of the migration problem is reframed.

2. The reviewer asks for quantitative analyses of morbidity as explaining factor and assumes that the required statistics is available. Unfortunately this is not the case. The Statistics Norway surveys the health conditions in the population and provides data of e.g. the prevalence of chronic disease, which varied from 51 % (Aust-Agder) to 68 % (Nordland). This dose not correlate to examination frequency at all ($r = -0.09$). The problem is that they can not guarantee that the data is representative on a county level (only on a regional level). Hence, they can not be used in our study. Other nationwide health surveys available are either limited by age groups or specific diagnoses that can not be easily linked to use of radiological services (like cardiovascular disease, diabetes, cancer etc.). For instance is the high/low ratio of incidence of cancer 1.4, which neither correlates to examination rates ($r = 0.085$). But cancer can not meaningfully represent general morbidity, or be linked to single examinations. The whole paragraph of morbidity is deleted, though a few remarks are added in the discussion of appropriateness of services.

3. The deletion includes the final paragraph.

4. The discussion of accessibility is expanded, and corresponds to changes in the result chapter (including a new figure 3).

5. The measure of accessibility is now explained in the method chapter. It is correct that this means proximity, i.e. if people have to travel out of their home county. This is a simple indicator of how easily people can get to radiological services, in lace of information on exact travel distances and time. Norway is a rather scarcely populated country, hence it is not unreasonable assume that having to leave the home county to get an examination is associated with a long travel. We believe that this is an important factor because the patients and their GPs might “think twice” about ordering an examination if it takes a lot of time and effort to get it done.

6. The sentence is deleted.

7. Hopefully the result chapter regarding private and public institutions contribution has become clearer, and can justify a short discussion part. The sentence about US pelvis is deleted.

8. Also this sentence is deleted. Instead we here explain why we have not performed quantitative analyses of morbidity.

Conclusion

We agree with reviewer in the wish for further quantitative analyses. Unfortunately we are not able to fulfil provide all of these as explain above and/or in the manuscript. However, we do have extended the analyses when possible, and deleted “questionable assumptions and anecdotal reasoning”.

Yours sincerely
Kristin Bakke Lysdahl