Reviewer's report

**Title:** Distribution and determinants of functioning and disability in aged adults - Results from the German KORA-Age study

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**Reviewer:** Bart Klijs

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Distribution and determinants of functioning and disability in aged adults – Results from the German KORA-Age study

Review by Bart Klijs

1. Is the question posed original, important and well defined?

I think the research question is not very original. Quite a substantial number of studies are available describing the burden of disability and risk factors of disability (e.g. the review by Stuck et al.) These studies are not referred to in the introduction. It might be that it is the first study in Germany, but it is not described if and why risk factors for disability would be different in Germany as compared with other countries.

2. Are the data sound and well controlled?

The study sample is not described very well in the method part. Also, the structure of the data is not obviously clear. Later on I understand that the data are cross-sectional, but this was not immediately clear to me. It is not clear which questions were used to construct the covariates and which and how the variables were constructed from the questions. Model selection is not described well in the method part, it is not clear which models were fitted, which variables were included to the models and on what (theoretical) basis this was done. No difference is made between proximal (lifestyle) and distal (SES) variables.

3. Is the interpretation (discussion and conclusion) well balanced and supported by the data?

Comparisons with other studies, as well as the interpretation of the results could be more into depth. It is argued that a comparison of the prevalence of disability that was found with findings from other studies is hampered due to diversity of disability measures and study populations, which is not a valid argument.

4. Are the methods appropriate and well described, and are sufficient details provided to allow others to evaluate and/or replicate the work?

Please see point 2.

Statistical analyses need to no assessment by an additional reviewer with statistical expertise.

5. What are the strengths and weaknesses of the methods?

Strength of the method is that quite a variety of determinants for disability are
used. Weakness is the cross-sectional nature of the data, which limit interpretations in terms of causality.

6. Can the writing, organization, tables and figures be improved?
I think the quality of the written English is below standard at some points and the manuscript could benefit from review by a native English.

7. When revisions are requested.

8. Are there any ethical or competing interests issues you would like to raise?
No

Other points:

DISCRETIONARY REVISIONS
1. P12. It might be interesting to include some results regarding the role of disease prevalence and disabling impact in contributing to the burden of disability.

MINOR ESSENTIAL REVISIONS

Background
2. Often it is not entirely clear what you mean to say. For example, “Although old age is not a sufficient cause for disability, the prevalence increases with age. Nevertheless, the pace of this increase is unknown”. What do you mean by “sufficient cause for disability”. What do you mean by “the pace of this increase”. Do you mean to say that the prevalence of disability is higher at older ages, but that the exact prevalence according to age groups is unknown? Or do you mean to say that it is unknown how the prevalence of disability will change when ageing of the population occurs? Another example is the way “functioning” is defined, namely as “the umbrella term for the positive aspects of the interaction between individuals and the environment”. To me, this is vague and a reference is lacking.

Methods
3. P6. It is mentioned that the surveys are based on representative samples of the population of Ausburg and two surrounding counties. Which counties are you referring to?

4. P 7. Disability questions can be answered on a scale from 0 (no difficulty) to 3 (unable to perform). Please clarify how the categories in between 0 and 3 defined?

5. Please include the full questions for measuring disability to the paper, not only the categories as in table 1).

6. P7. “As fractures older than five years are unlikely to influence today’s functioning, we used the variable “Fracture in the last 5 years”. I may be wrong, but is seems to me that recovery from fractures and consequences of fractures on functioning would take substantially less than 5 years. Please explain more
precisely why you chose this time frame.

7. As compared with lifestyle variables, malnutrition is investigated on the basis of quite an extensive number of questions. Could the number of questions have an effect on the precision or validity of the measurements and could a disbalance in the precision across variables have an effect on your results/conclusions? Please discuss this point in the discussion.

8. Why is socioeconomic status defined as years of education and not as highest obtained level of education. I can imagine that persons may have had quite some years of education but still have not a high level of education. This may need some discussion.

9. P8. “To analyze the factors associated with disability..” Do you mean “To investigate which factors were significantly associated with the presence of disability”?

10. Attribution model: The paper states “prevalence of disability attributed to disease on a population level depends on both: the frequency of disease in a population and the disabling impact of the disease estimated by a disease-specific odds ratios in a multiple regression model. Odds ratios refers to logistic regression which does not provide attributions. It should be “rates” or “hazards” in stead of “odds ratios”.

Results

11. Page 10: that add up to total burden of disease is confusing, as is also background. Better would be to say that is add up to total disability prevalence.

12. P.11. The results in table 3 may be described somewhat more extensively.

13. It may be more appropriate to move the description of the study population to the method part.

14. There is no distinction in proximal variables, such as BMI, and distal variables such as education. Part of the effect of education is likely to be via lifestyle factors.

Discussion

15. P13. The study of Klijs et al. (Plos one 2011), to which is referred to elsewhere in the paper, included quite a substantial number of persons aged older than 80, but is not mentioned here.

16. Why is it not surprising that the association of physical activity and disability persisted even after controlling for diseases? Please elaborate a little bit more on this.

17. Please discuss to what extent you think the study population is representative for the German population and to what extent selective non-participation may have influenced representativeness.
MAJOR COMPULSARY REVISIONS

Background
18. Quite some studies have investigated determinants of disability, but none of them are cited in the background part. As the aim of the study is “to examine factors that are related with disability”, this is a serious shortcoming. It remains unclear what this study would add to existing literature. In the abstract and introduction it is mentioned that “there are few representative findings on the prevalence and determinants of disability in aged persons in the German population”. Would you expect to find different determinants of disability as compared to other countries? In short, from the text, the relevance of the study it not clear to me.

19. My impression of the “background” part is that it consists of a number of descriptive paragraphs lacking an obvious connection rather than it is a coherent text leading to the main aim of the study. A more focused introduction is desirable.

Methods
20. For each of the lifestyle variables, please mention the questions they were based on and explain precisely how the variables were constructed on the basis of these questions.

21. A more precise description of the data would be desirable. From the text I assume the data are cross-sectional, but I am not sure. Are determinants and outcomes measured at one moment in time?

22. It is not clear to me which variables were used for alcohol intake. Did you use a continuous variable for years or alcohol abstinence and a dummy for abstinent yes/no, or did you use a dummy only? I would say at least three categories are required, non-drinking, moderate drinking and heavy drinking. Non-drinking is more likely to be a result of a disease (that may have caused disability) rather than it is a real cause of disability, i.e. reversed causation.

23. The way lifestyle variables are defined is inconsistent in my opinion. Why are only two categories used for alcohol consumption and physical activity and four categories for smoking behavior?

24. P8. “We calculated mean and standard deviation for continuous variables and absolute and relative frequency for categorical variables. We used... to test for difference..” It is not clear to me which means and frequencies are calculated and which differences are tested.

25. It is not clear which variables were included in which models and on which (theoretical) basis this was done, i.e. variable selection procedure is unclear.

Results
26. It was not immediately clear to me what figure 1 represents. I suppose the
“percentiles of disability” represent percentiles of scores on the HAQ-DI? Please be more precise here.

Discussion

27. P13. “Background” may be defined more accurately as “disability attributed to causes other than the diseases included in the analysis”.

28. P13. I agree that studies investigating disabilities may differ with respect to disability measures used. But, when taking into account these differences, some reasonable comparison should be possible. I don’t think diversity of populations and differences in living conditions hampers a comparison with other studies. Moreover, it would be interesting to discuss to what extent differences might be due to different living conditions.

29. P13. I think a longer time in nursing care, along with a rise in life expectancy is no clear-cut evidence for expansion of morbidity, as more years spent in nursing care may also result from change over time in the “uptake threshold” for nursing care. Quite a vast amount of literature is available in which compression or expansion is assessed in a more direct way. It is unclear to me what is meant by “a sudden point of compensation” and I don’t understand how inferences regarding compression of expansion can be made from a cross-sectional study such as this.

30. P 15. Please explain more precisely the implications of reversed causation, which is likely to have occurred, for the interpretation of your study results.

31. Discussion of the limitations could be extended, and should include limitations of the attribution analyses, e.g. assumption that distribution between the causes is proportional to the distribution of the risk of becoming disabled in the time-period preceding the survey; that causes of disability (diseases and background risk) act as independently competing causes, and assumption of same start of the time at risk for disability from each cause.

Level of interest: An article of limited interest

Quality of written English: Needs some language corrections before being published

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

'I declare that I have no competing interests'