Author’s response to reviews

Title: Socio-economic differences in life expectancy among persons with diabetes mellitus or myocardial infarction: results from the German MONICA/KORA study

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Author's response to reviews:

Laura Perna, PhD, MPH, LLM
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Dear Editor,

Please find attached our revised manuscript

"Socio-economic differences in life expectancy among persons with diabetes mellitus or myocardial infarction: results from the German MONICA/KORA study" (MS: 2092930773289972) which we have changed according to the comments made by the reviewers.

We are very grateful to the reviewers for their helpful and constructive comments, which we address point-by-point below.

Yours sincerely,

Laura Perna
Reviewer: Jacques van Eijk

1. This paper suffers from unclarity about its objective. I think the authors should make a choice between a methodological article (description of a method for analysing small data sets) or an article on SES differences in Life expectancy. They should much more precisely describe their research question and in the introduction demonstrate the relevance of their study, either from the methodological point of view or the other. If they for example choose the SES differences they can much more elaborate on the causation, the direct or indirect hypothesis. Also they could more convincingly make clear why it is important to study SES differences within disease groups.

   Many thanks for raising this important point. We recognize that the methodological challenges of the analysis may have distracted us from the main goal of our article, which is the analysis of socio-economic differentials in life expectancy within disease groups. We revised the introduction accordingly, strengthening our objective and toning down the discussion of the method.

   We also deleted from the abstract the following sentence:
   
   This study also describes an innovative method based on the software package SAS® for calculating LE with relatively small datasets and left-truncated data,
   
   from the discussion the following one:
   
   The description of the statistical method used in the present analysis could also contribute to incentive further studies in this field,
   
   and from the conclusions the following one:
   
   As demonstrated here, suitable maximum likelihood estimators in combination with parametric hazard function models can deal with the inherent limitations of cross-sectional studies, like data censoring and truncation, and provide estimates of LE even for relatively small datasets.

2. Furthermore they should be careful with regard to the choice of the diseases. Diabetes is known to be a risk factor for cardiovascular diseases. So there may be overlap.

   We have now introduced, in the section of the methods describing the data relating to diabetes and myocardial infarction, the following passage:

   Focusing on these two diseases gave us the possibility of analysing the effect of a chronic and non chronic disease, respectively, on the LE. As, however, diabetes is a risk factor for cardiovascular disease, this created some overlap in our analysis. In particular, 43 persons (out of 542) with diabetes also had a myocardial infarction.

3. They could make more clear what selections occurred by making the typology for SES as they did.

   We have fully revised the section titled "socio-economic status". Please refer to our response to the reviewer Richard Peter, where we reported in detail the changes.

4. Can they clarify how they handled the different follow periods an the rather strong variability regarding age?

5. How exactly was their dependent variable measured?

   Our dataset consists of 3 different cross-sectional surveys. The only follow up information available to us was the vital status, assessed for all participants in 2002. In this year, all participants were contacted in order to assess whether they were still alive, and for those who did not give any information the vital status was assessed through official registers. We were therefore able to know if a person at this date was alive, the age and, if she or he had died, the
date of death. Knowing this information, we were then able to build for each person a distinct survival function, which gives the probability of being still alive at a certain age. By maximizing the product of all the probabilities of the survival times of the persons in the dataset we were able to estimate the LE. Thanks to its generality, the maximum likelihood approach can accommodate large variability in age and different follow up periods without statistical biases in the survival function estimate.

6. The paper could be written more concisely.

In revising the introduction, the abstract and the conclusions, we made it more concise; the necessary edits to address the main concerns of the other reviewer led, however, to some additions in other parts of the paper.
Reviewer: Richard Peter

1) Page 8, measurement of SES: the computation of one index including different indicators of social stratification is critically discussed in the literature. Single indicators of social status do not necessarily complement each other. They are more likely to represent different aspects of social inequality (Geyer et al 2006 in JECH). Accordingly, it is recommended not to compute one single measure but to analyse indicators of social status separately.

Many thanks for this very constructive comment. We are grateful for this reference, which is indeed important for our topic. We have now deleted the sentence to some extent they complement each other, as they give information on the material and intellectual resources of the participants, respectively in our paper. In addition to our previous estimates based on computing one index, we now have also analysed the indicators of social status separately. Substantial modifications in text were necessary to accommodate this change.

We have completely rewritten the section entitled "socio-economic status", the first part of which now reads as follows:

A important part of the literature [1] holds that the most common indicators of social status – income, education, and working position – cannot be used interchangeably as they represent different dimensions and different causal processes on the development of health outcomes. Following this approach, we investigated the independent contribution of income and of education to the estimation of LE in Germany separately. As, however, we also wanted to build two very distinct socio-economic groups, such as a group ranking low (resp. high) in both education and income, we constructed an additional variable - 'socio-economic status' - defined by combining the indicators income and educational level as follows:

- Low: low income level – plus – low educational level
- Medium: medium income level - plus – medium educational level
- High: High income level - plus - high educational level

Within each of these three socio-economic groups, the estimated LE was calculated in the total sample, separately for men and women.

As regards the analysis of the impact of diabetes and myocardial infarction on the LE, it was made by comparing only the two following income groups: 'low' (< lowest quartile) on one hand and 'medium or high' (other quartiles) on the other because the sub-sample of participants with diabetes mellitus and myocardial infarction (n=542 and 262, respectively) was too small for a finer grading of the income groups. The small number of deceased persons in the highest education groups also prevented us from performing an additional analysis with the indicator education among people with diabetes or myocardial infarction. In the highest education level, there were, in fact, only 11 deceased men and 3 deceased women among those with diabetes and 9 deceased men and none deceased woman among those with a myocardial infarction.

In the Results we introduced the following passages:

Further analyses (not presented here in tables or figures) have been conducted looking at the educational and income level separately. The results show that while the LE of men with a high education is approximately one year shorter than the LE of those who have
high education and high income (81.96 vs. 82.77), the LE of those belonging to the low education group is approximately one year longer than the LE of those men who have low income and low educational level (79.71 vs. 78.98). For the women this reduction of approximately one year only applies to those belonging to the high educational level (88.37 vs. 89.63). For the low education group there is no such difference (85.57 vs. 85.53).

Looking just at the income, the LE of those men and women belonging to the lower income group remains almost unchanged if compared to the LE of those who have low income and low education (79.06 vs. 78.98 and 85.95 vs. 85.53, respectively). The LE of men and women belonging to the higher income group is instead reduced by approximately one year if compared to the LE estimation computed by looking at both high income and high education (81.83 vs. 82.77 and 88.57 vs. 89.63, respectively).

In the Discussions we introduced the following passage:

Income and education seem to have similar effects on the LE of both men and women. The computation of the LE analysing income and education separately yielded, in fact, similar estimates (79.06 vs. 79.71 and 81.83 vs. 81.96 for the men in the lower and higher groups, respectively, and 85.57 vs. 85.95 and 88.57 vs. 88.37 for the women). These figures also show that the social group ranking consistently high in both income and education is the group with the best LE in our analysis.

2) Increasing parts of the working population in modern societies are characterized by social status inconsistency. The authors precluded information about social status inconsistency. This lead to the exclusion of an important group concerning social inequality in health. Due to this exclusion underestimation is likely since effects of status inconsistency on cardiovascular health have been shown to be greater than effects of status consistency (see Peter et al 2007 in JECH). I recommend to either include subjects characterized by status inconsistency in the analysis or to argue very carefully why they have been left out.

Many thanks for drawing our attention to this important issue and paper. We have now conducted LE estimates among subjects characterized by status inconsistency and modified the text correspondingly. In the section entitled "socio-economic status" the issue is now addressed as follows:

An increasingly important aspect of social epidemiology is the impact of inhomogeneity concerning the socio-economic indicators of a person on the development of health outcomes [2]. We analysed the impact of this status inconsistency on the LE of two groups characterized by high income (third tertile) and low educational level (lower secondary school) and by low income (first tertile) and high educational level (qualification for university entrance/completion of undergraduate studies), respectively.

Due, however, to the limited number of deceased cases (n=3) among those with diabetes or myocardial infarction in the latter group, we were not able to estimate the effects of status inconsistency on the reduction of LE within this group. This is why we conducted this further analysis only among the group characterized by high income and low educational level.
In the Results we introduced the following passages:

Our results also show that the effects of status inconsistency on the LE are noticeable. Those men and women, in fact, who have an income corresponding to the lowest tertile and an education corresponding to a qualification for university entrance/completion of undergraduate studies have a LE shorter than those men and women characterized by low income plus low education. The corresponding figures are a reduction of about one and half year for the men (77.16 vs. 78.98) and 3 years for the women (82.97 vs. 85.53). On the contrary, those men and women characterized by an income corresponding to the highest tertile and an education corresponding to a lower secondary school have a longer LE than those having low income plus low education, and a shorter LE than those having high education and high income. The corresponding figures are 80.78 vs. 78.98 and 80.78 vs. 82.77 for the men and 86.86 vs. 85.53 and 86.86 vs. 89.63 for the women.

The reduction of the LE among those who have diabetes or myocardial infarction and high income plus low education is not very pronounced as well, if compared to the group of men earning more than the lowest quartile. The corresponding figures concerning the groups with diabetes are a reduction of 5 years for the men (75.67 vs. 80.53), and 4 years for the women (82.73 vs. 86.91). Almost unchanged are also the results for the men having myocardial infarction if compared to the group of men with high income (77.12 vs. 80.31 and 77.32 vs. 80.97, respectively). In the group of women, the reduction is about 2 years (84.47 vs. 86.52).

In the Discussions we introduced the following passage:

On the contrary, the group of those men and women who have an income corresponding to the lowest tertile and an education corresponding to a qualification for university entrance/completion of undergraduate studies has the worst LE in our analysis. This group would also probably show the most significant reduction in LE when affected by a disease\[2\]. In our dataset the limited number of cases did not make an estimation of LE within the group of people with diabetes or myocardial infarction possible. This remains an important topic for future research.

3) page 8 first para: The description how the income variable was computed is not understandable. We have rewritten the passage. It reads now as follows:

In our dataset, the variable 'net household income' was measured in 8 categories (all figures in DM): < 1000, 1000 to < 1500, 1500 to < 2500, 2500 to < 3500, 3500 to < 4500, 4500 to < 5500, 5500 to < 6000, > 6000. In order to calculate the income level, we first calculated the 'mid-points' of each income class. For the lowest (< 1000) and highest (> 6000) income class, we calculated two-thirds and four-thirds of the corresponding limits\[3\], respectively. The resulting values were then divided by the number of household members, yielding the new variable 'per capita income', which was roughly divided into tertiles (low, medium or high per capita income).
4) References: German article and book chapter titles need an English translation.

We have translated them.

5) page 9 Has information about the endpoints (myocardial infarction / diabetes) been objectively validated?

There was no validation available for this study.

REFERENCES