Author’s response to reviews

Title: Over-indebtedness and its association with sleep and sleep medication use

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Author’s response to reviews:

Dear Ms Szunyogova,

Thank you for your email dated 29 April 2019 enclosing the Reviewer reports.

We greatly appreciate the time and effort that you and the Reviewers have dedicated to providing your valuable feedback on our manuscript. We have carefully revised the manuscript according to the insightful comments, and provide point-by-point responses as follows. We would like to thank you for the constructive comments that helped us to improve the quality of our manuscript substantially. We have been able to incorporate changes as suggested by the Reviewers, and highlighted these within the revised manuscript attached as supplementary file.
We look forward to hearing from you in due time and to respond to any further questions and comments you may have.

Sincerely,

Jacqueline Warth

On behalf of all authors

Research associate

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Response to Editor

1. In your manuscript, you state: "Informed consent was not obtained in order to ensure anonymity". could you please clarify this sentence?

Response: We appreciate the Editor’s careful review. We have clarified the description of informed consent (Declarations section, lines 557-563, page 27f.): “Respondents received information on study procedures, anonymity and confidentiality, and were informed that participation in the study was strictly voluntary both verbally and in writing. Formal consent requiring witnessed signature was not collected, however, the return of the anonymous questionnaire indicates consent from the participants for their data to be used in the study. Respondents could complete the questionnaire at the debt advisory centre or any other setting and return it using the stamped addressed envelope provided by mail or by handing the sealed envelope to one of the debt advisors.”
Response to Reviewer 1

Dear Yu Sun Bin,

Thank you very much for your insightful comments. We are grateful for your valuable suggestions that were very helpful for revising and improving our original manuscript. Our answers to your points are as follows.

Thank you for this manuscript on the link between over-indebtedness and sleep problems. The authors describe a cross-sectional study in which data on indebtedness from German debt advisory centres was compared to data from a national survey. The findings provide evidence for the common-sense notion that being over-indebted affects sleep and may therefore have longer term consequences on health.

The manuscript has potential, but its reporting can be improved. Notably the Introduction and Discussion could be made more concise and the reporting of the Methods and Results should illustrate the data more clearly. I have made some suggestions as to how below.

1. Over-indebtedness is defined as insufficient income and assets to cover the cost of living over some period of time. It would be helpful to stipulate what that period is, whether there is a formal definition in the literature, how participants qualify for advice, or the definition used by the advice centres to refer participants into the study.

Response: We appreciate the Reviewer’s thoughtful comment. As suggested, we have added a brief description of a formal definition of over-indebtedness in the literature and the definition used in the present study (Methods section, lines 182-187, page 8).

“A broadly accepted definition of over-indebtedness is not yet available. However, over-indebtedness commonly refers to a household’s persistent and ongoing difficulties meeting financial commitments that can be measured by using data on arrears, debt settlement, financial burden or consulting debt counselling services [1]. In our study, we classified all clients of debt advisory centres that were eligible to participate in the survey as over-indebted whereas all participants of the DEGS1 survey were classified as non-over-indebted.”
2. The sampling frame for the OID and the DEGS are clearly different, despite similar questionnaires and reasons for inclusion/exclusion of data. It would be helpful if the authors summarised this in a flow diagram. The key is to show that OID and DEGS samples are comparable in all ways except for over-indebtedness, making the DEGS a valid control/comparison group. Ideally, the study should only include DEGS participants from North-Rhine-Westphalia, and the OID data should include only participants 18 - 79 to be consistent with DEGS.

Response: We agree with the Reviewer’s constructive comment that it is difficult to interpret the comparability of the OID and DEGS1 samples in the original manuscript. We have therefore developed a flow diagram to illustrate differences in methods of the OID and DEGS1 survey as online supplement (Additional File 1). If the Reviewer prefers to include the figure in the main text, we would like to revise the Methods section of the manuscript to avoid redundancy.

We referred to the figure in the Methods section (lines 137-139, page 6): “The present study is based on a cross-sectional survey among over-indebted individuals (OID survey) that was combined with to the first wave of the German Health Interview and Examination Survey for Adults (DEGS1) (Robert Koch Institute, Department of Epidemiology and Health Monitoring (RKI) 2015) (see detailed comparison in Additional file 1).”

Figure S1 Methods of the OID and DEGS1 survey

Moreover, we have refined the information provided on the characteristics of the participants in the OID and DEGS1 samples in the Results section (lines 245-266, page 11f.): As the Reviewer suggested, we have revised Table 1 (Results section, Table 1, page 11) to include results of significance testing to illustrate differences between the two samples on the sociodemographic and health factors.

Table 1 Study population characteristics and prevalence of sleep problems and sleep medication use, 4 weeks (n=7985).

We have described these bivariate analyses in the Methods section (lines 231-233, page 10): “Descriptive statistics were used to illustrate population characteristics and to examine differences in the distribution of sociodemographic and health characteristics between the OID and DEGS1 samples using chi-squared test.”
In order to examine the association between over-indebtedness and sleep outcomes independent of differences in the samples’ characteristics, we controlled for sociodemographic and health variables in multiple logistic regression analysis as described in the original manuscript.

3. Please comment on the representativeness of the advisory centres included in OID vs. all advisory centres.

Response: We appreciate the Reviewer’s comment on the representativeness of the advisory centres included in the OID study. We have included a paragraph in the Methods section (lines 142-147, page 7) to specify the selection of debt advisory centres that acted as recruiters: “Of 145 non-profit debt advisory centres that were invited to act as recruiters by their umbrella organisation, 70 centres agreed to participate. All debt advisory centres were associated with the local German Consumer Organisation or one of the member organisations of the ‘Expert Committee Debt Counselling of Non-statutory Welfare NRW’ (German: Fachausschuss Schuldnerberatung der Freien Wohlfahrtspflege NRW). Counselling services offered by debt advisory centres across Germany are similar.”

4. Please comment also on the information provided to participants about the survey, i.e. if framed as a health survey, then more comparable to the DEGS than if framed as a sleep survey, in which people with sleep problems are more likely to respond.

Response: We agree with the Reviewer that the focus of each survey might appear ambiguous. Therefore, we have included additional information on the OID survey earlier in the Methods section (lines 140-142, page 7) that was framed as a health survey, thus, is more comparable to DEGS1 than if framed as a sleep survey: “An anonymous health survey using a self-administered written questionnaire was conducted among clients visiting approved debt advisory centres in North Rhine-Westphalia, Germany, between July and October 2017.”

We have also clarified the focus on health rather than sleep health when describing the questionnaire developed for the OID survey (Methods section, lines 162-163, page 7): “The health survey focused on the assessment of medication use and self-medication use among over-indebted individuals.”
5. Line 154 on Ethical approval "Informed consent was not obtained in order to ensure anonymity" does not sound correct. It is more likely that formal consent requiring witnessed signature was not collected, however, the return of the anonymous survey indicates consent from the participants for their data to be used in the study. Please clarify.

Response: We appreciate the Reviewer’s constructive comment. We completely agree with the comment and have clarified the description of informed consent accordingly in the Declarations section (lines 557-563, page 27f.): “Respondents received information on study procedures, anonymity and confidentiality, and were informed that participation in the study was strictly voluntary both verbally and in writing. Formal consent requiring witnessed signature was not collected, however, the return of the anonymous questionnaire indicates consent from the participants for their data to be used in the study. Respondents could complete the questionnaire at the debt advisory centre or any other setting and return it using the stamped addressed envelope provided by mail or by handing the sealed envelope to one of the debt advisors.”

6. The aim of Table 1 is not only to characterise the 2 samples but also to indicate demographic points of difference between them. Suggest remove "full sample" columns and instead show results of significance testing to show differences between the two samples on the demographic/health factors.

Response: We fully agree with the Reviewer’s recommendation that it is useful to include significance testing for differences between the OID and DEGS1 samples in Table 1. We have revised Table 1 accordingly (see above, point 2.).

7. "Full sample columns" should also be removed from Table 2. Table 2 should be incorporated into the bottom of Table 1. What would be of greater interest than current Table 2 is to show the rates of the 3 sleep indicators by demographic/health characteristics either through including row% with sleep problem in Table 3 or as a Figure.

Response: We appreciate your constructive comments on the presentation of results. As recommended, we have incorporated the prevalence of sleep problems and sleep medication use (Results section, Table 2 in the original manuscript) in Table 1 in the revised manuscript (Results section, Table 1, page 11; see above, point 2.).

We have prepared an additional table to illustrate the distribution of sleep problems and sleep medication use by sociodemographic and health characteristics among those affected (Results section, Table 2, page 14f.):
Table 2 Distribution of sleep problems and sleep medication use by sociodemographic and health characteristics.

8. Please show the degree of overlap between the 3 related sleep indicators, either through Venn diagram or description in text.

Response: We appreciate the helpful recommendation to include a description of the degree of overlap between the three outcome variables, and have added a diagram (Results section, Figure 1, page 14) and the following description in the Results section (lines 273-276, page 13): “In the combined dataset of OID and DEGS1 participants (n=7985), 39.5% (n=3154) participants reported both problems with sleep onset and sleep maintenance (Figure 1). Of all participants included in the study, 5.9% (n=471) reported problems with sleep onset and sleep maintenance as well as sleep medication use.”

Figure 1 Proportional distribution of sleep problems and sleep medication use (n=7985).

9. In Table 3 it may be helpful to bold or italicise ORs that do not span 1.0 to draw readers' attention to important results.

Response: As suggested by both Reviewers, we have italicized any statistically significant results and added a footnote on the significance of results (Results section, Table 3, line 296, page 17): “†Italics show significant results at alpha = 0.05.”

Table 3 Adjusted odds ratios(aOR) and 95% confidence intervals(CI)† of sleep problems and sleep medication use (n=7985).
10. A major confounder not considered by the authors is time. Data for OID was collected in 2017 and data for DEGS was collected between 2008-2011. If it is true that sleep problems are increasing over time (as stated in the Introduction), then OID sample may have higher rates of sleep problems regardless of indebtedness. Please Discuss.

Response: We appreciate the Reviewer’s comment on time as potential confounder that we have not discussed in our original manuscript. However, we assume that other risk factors suggested by previous research besides time itself explain the increase in sleep problems, and that these risk factors remain constant for this short period of time (2008-2017). It is unclear whether risk factors for sleep outcomes other than those included in our multiple logistic regression analysis have emerged over time. Therefore, we consider risk factors that we have not taken into account as potential confounder rather than time. We have emphasized potential for unmeasured confounding in the Discussion section (lines 505-509, page 25), as suggested by the Reviewer in the following point 11: “Confounding might arise from different sampling and recruitment frames of the two samples compared in this study. However, in both samples, participants were randomly chosen, and we adjusted for relevant variables to account for confounding. Due to a lack of data, a number of possibly relevant covariates that can affect sleep outcomes were not statistically controlled for and may induce unmeasured confounding.”

11. Discussion should note potential for unmeasured confounding due to the different sampling and recruitment frames for the 2 samples compared in the study (in the same paragraph as unmeasured confounding for other reasons in lines 433 - 443).

Response: As suggested by the Reviewer we have prepared a flow diagram to illustrate differences in the sampling and recruitment frames for the OID and DEGS1 samples (see point 2.; Additional File 1). In the Discussion section (lines 505-509, page 25), we have pointed out unmeasured confounding linked to these differences as described above (see point 10.): “Confounding might arise from different sampling and recruitment frames of the two samples compared in this study. However, in both samples, participants were randomly chosen, and we adjusted for relevant variables to account for confounding. Due to a lack of data, a number of possibly relevant covariates that can affect sleep outcomes were not statistically controlled for and may induce unmeasured confounding.”
12. Paragraphs spanning line 81 - 113 in the Introduction could be moved to the Discussion for a more pithy and punchy rationale for the study. i.e. over-indebtedness increasing, sleep problems increasing and affect health, is there a link to suggest over-indebtedness an issue for long-term health consequences?

Response: We appreciate the careful review. As suggested, we have removed these paragraphs from the Introduction (lines 88-118, page 4f.) to draw attention to the brief rationale for the study in the Introduction. Accordingly, we have also specified long-term health consequences of over-indebtedness based on longitudinal data (Introduction section, lines 71-74, page 4): “More specifically, a first longitudinal register-based study of 48778 Finnish adults during 1995-2010 has recently shown an association between over-indebtedness and an increased incidence of various chronic diseases [2].”

13. Around line 134, can the authors please characterise North Rhine-Westphalia briefly for non-German readers i.e. is the population there similar to that of Germany overall and why were the 70 advisory centres there chosen?

Response: We appreciate the Reviewer’s comment on the lack of information provided on the characteristics of North Rhine-Westphalia, and have added the following description in the Methods section (lines 148-150, page 7): “North Rhine-Westphalia is the most populous of the 16 federal states in Germany (17.5 million inhabitants, 2011). Its demographic structure (gender, age distribution, foreigners) is similar to the national average [3].”

As suggested by the Reviewer we have included a paragraph in the Methods section (lines 142-147, page 7, see above point 3.) to specify the selection and representativeness of debt advisory centres: “Of 145 non-profit debt advisory centres that were invited to act as recruiters by their umbrella organisation, 70 centres agreed to participate. All debt advisory centres were associated with the local German Consumer Organisation or one of the member organisations of the ‘Expert Committee Debt Counselling of Non-statutory Welfare NRW’ (German: Fachausschuss Schuldnerberatung der Freien Wohlfahrtspflege NRW). Counselling services offered by debt advisory centres across Germany are similar.”

Moreover, we described why we chose to cooperate with advisory centres in North Rhine-Westphalia (Methods section, lines 150-152, page 7): “We chose to invite advisory centres in North Rhine-Westphalia to participate in the study due to the location of our study centre in that federal state which facilitated contact to both the local umbrella organisations and advisory centres.”
14. The authors should avoid the word "linked" to describe combining OID and DEGS1 data, as this implies that individual records are linked across different sources to extend the dataset for one person (e.g. linkage of hospital records to death records to determine if someone died of disease).

Response: We agree with the Reviewer’s comment on the use of the word “linked”, and have replaced it with “combined” throughout the manuscript to avoid misunderstanding.

15. Remove mentions of the "full sample" as it is misleading because it suggests that the data is collected from one cross-sectional survey and then partitioned into two groups. Recommend referring to the OID and DEGS samples (and ns) throughout the manuscript for clarity (e.g. lines 216 - 218).

Response: We appreciate the helpful remark and have rephrased the term “full sample” throughout the manuscript accordingly.

16. The authors mention sensitivity analysis (line 428) but do not explain what they did. Please attach sensitivity analysis as online supplements for full information. Similarly, the statement about multicollinearity in the same paragraph could be removed or explained more clearly.

Response: As recommended by the Reviewer, we have described sensitivity analysis in the Methods section (lines 238-239, page 11) in more detail, and have removed the statement about multicollinearity due to word limit (Discussion section, lines 502-504, page 25): “As a sensitivity analysis, we conducted complete case analysis to validate the approach to handle missing data (Additional File 2).” These results integrate the Reviewers’ comments on analysis (e.g. dichotomization of marital status).

17. In Discussion, no need to report the statistical results again (lines 275 - 277).

Response: As suggested, we have removed the report of statistical results in the Discussion section mentioned (lines 330-337, page 18): “In the present study, an increased risk of problems with sleep onset and sleep maintenance as well as sleep medication use was observed for over-indebted individuals compared to the general population.”
Response to Reviewer 2

Dear Kathryn Lee,

Thank you for your time and constructive comments that contributed to improving the quality of our manuscript substantially. We have answered each of your points below.

Over-indebtedness is a neglected health risk experienced by millions of Europeans. This manuscript reports on over-indebtedness and its association with sleep problems and sleep medication use in a cross-sectional sample of German participants representing a single household from a 2017 survey administered within 70 debt advice centres in one region of Germany. The response rate was 50% with 699 participants, yet there are only 538 with data in tables. The survey data were then linked to Germany's national health surveys that included data on sleep problems. After controlling for many socioeconomic factors, over-indebtedness still accounted for risk of difficulty with sleep onset and maintenance as well as sleep medication use.

1. Significance was set at p < .05 yet 95% CI were used and very little is reported by p values.

Response: We appreciate the Reviewer’s thoughtful comment. We have revised Table 1 and added significance testing, including p-values to illustrate differences between the OID and DEGS1 samples (Results section, Table 1, page 11). In Table 3 we indicated statistical significance by reporting the 95% confidence interval. We have italicized any significant results and included a footnote in the revised manuscript to clarify the interpretation of results (Results section, Table 3, line 296, page 17): “†Italics show significant results at alpha = 0.05.”.

Table 1 Study population characteristics and prevalence of sleep problems and sleep medication use, 4 weeks (n=7985).

Table 3 Adjusted odds ratios(aOR) and 95% confidence intervals(CI)† of sleep problems and sleep medication use (n=7985).
2. Women and single adults were at higher risk. Some of the dichotomization of sociodemographic variables needs clearer rationale or should be kept in the original categories. For example, marital status was dichotomized as married or cohabitating, but also included living apart (i.e., sleeping separately), and the concept of sleeping with someone having an effect on one's sleep was not considered. The unemployed category included full time students whereas the employed category included part-time and full time; hours of employment, shiftwork, and working at more than one job was not assessed and could be major confounding factors in the risk of poor sleep.

Response: We would like to thank the Reviewer for the careful review, and appreciate the comments on the dichotomization of sociodemographic variables. We agree that the rationale for dichotomization requires clarification.

Therefore, we have revised the description of the dichotomization of current employment status as follows: “We dichotomized current employment status as “employed” or “unemployed” to control for occupational factors such as work stress, workload and unemployment that might influence sleep. The data on the current employment status of OID and DEGS1 respondents were derived from multiple answers questions. When participants reported any kind of full or part-time employment, we considered these as currently employed.” (Methods section, lines 210-215, page 9f.)

We agree with the Reviewer that it would have been interesting to examine potential confounding of more specific employment characteristics yet data was not available. We have added this aspect as further limitation of the present study (Discussion section, lines 508-513, page 25f.): “Due to a lack of data, a number of possibly relevant covariates that can affect sleep outcomes were not statistically controlled for. For instance, factors such as individual characteristics (e.g. stress response), employment characteristics (shift work, having multiple jobs, caregiving) and ethnicity could not be taken into account, but may confound the association between over-indebtedness and sleep problems and sleep medication use.”

As recommended by the Reviewer, we have revised the categorization of marital status to control for the potential effect of sleeping in a shared bed as well as the potential protective effect of marriage related to socioeconomic advantages on sleep variables (Methods section, lines 215-218, page 10): “Marital status was classified into three groups a priori: we compared the married that were cohabiting (1) with individuals that were divorced, widowed or living separately (2) and singles (3) to account for the potential effect of sleeping in a shared bed and the effect of socioeconomic advantages of marriage.”. We have updated Table 1, 2 and 3 and reporting of results throughout the revised manuscript accordingly.
Moreover, we acknowledge a reporting error in Table 3 of our original manuscript that affects the tenths and hundredths place value. When preparing the original manuscript, we had first controlled for a broader spectrum of psychological disorders (depression, anxiety and burnout). Finally, we decided to focus on the main confounding factors, namely depression and anxiety, that have been associated with sleep problems [4–8] and sleep medication use [9, 10] in previous studies. However, we failed to update the final Table 3 in the original manuscript accordingly. We affirm that this error was unintended. We have corrected the original Table 3 that was subject to inaccurate reporting and have attached the results for your information to ensure transparency (see attached document ‘Response_Reviewer_2_Table_3_additional_information.docx’, not for publication).

Table 3: Original Manuscript

Revised Table 3 (I): Correction of reporting error relating to the operationalization of psychological disorders as confounding factor

Revised Table 3 (II): Correction of reporting error and revised classification of marital status variable; included in revised manuscript

3. The way in which categorical sleep variables were dichotomized is also somewhat troubling. Insomnia (either sleep onset latency or sleep maintenance) is clinically operationalized as 3 or more nights per week, yet Table 2 and text indicate that "no" was score of 1 and "yes" included all remaining scores of 2-4.

Response: We appreciate the Reviewer’s insightful comment on the dichotomized sleep variables. Based on the items that had been developed for the representative population study DEGS1 by the national public health agency, we have integrated these into the questionnaire for the survey among over-indebted individuals (OID). We acknowledge that this operationalization of sleep problems does not reflect diagnostic criteria for clinical insomnia, yet we rather aimed to assess the prevalence of any sleep problems related to sleep onset and sleep maintenance to gain an insight into over-indebted individuals’ complaints for the first time. We have refined the description of dichotomizing the sleep variables to clarify our aim: “For logistic regression analysis, the outcome variables were dichotomised referring to the experience of problems with sleep onset, sleep maintenance and sleep medication use (not at all, yes) to assess any complaints related to sleep problems and sleep medication use rather than to identify insomnia disorder.” (Methods section, lines 201-204, page 9). To our knowledge, this explorative study examines sleep outcomes in the over-indebted population for the very first time but warrants further research on the prevalence of insomnia.
Taking a sleep medication is not independent of the two types of insomnia (initiation and maintenance) under investigation.

We agree with the Reviewer who has pointed out that sleep medication use is not independent of problems with sleep onset and maintenance. We have addressed this relationship by controlling for sleep problems in an additional multiple logistic regression model for sleep medication use that we have enclosed as supplementary file (Additional File 3). Even after adjustment for sleep problems, however, the association between over-indebtedness and sleep medication use was significant (aOR 3.12, 95%-CI 2.32-4.20).

Table S4 Adjusted odds ratios (aOR) and 95% confidence intervals (CI)† of sleep problems and sleep medication use (n=7985).

It is interesting that taking a sleep medication did not necessarily reduce the risk of poor sleep, but this was not adequately addressed in the analyses.

Response: We agree with the Reviewer that it would be interesting to examine this aspect. However, we have not addressed the link between poor sleep and sleep medication use in our manuscript because of our primary objective to examine the association between over-indebtedness and sleep problems as well as sleep medications.

We have examined this association by including sleep medication use as a covariate in an additional multiple logistic regression model (Additional File 3, Table S4, see above point 4.). Individuals who used sleep medication had greater odds of problems with sleep onset and sleep maintenance.

Given potential interactions between being female, single, having children, and low SES, many interaction terms should be tested in the multivariate models.

Response: We appreciate the Reviewer’s recommendation to consider interaction terms in the multiple regression analysis. We acknowledge that there is a potential for interactions between covariates yet the primary objective of the analysis was to examine the association between over-indebtedness and sleep variables rather than to obtain the best model fit. Therefore, we have included relevant covariates in line with previous research into the model but have not tested interaction terms.
7. I do have some specific comments that authors should consider that may improve the manuscript: Abstract: the sample in the abstract is 699 whereas the sample in the tables is 538.

Response: We appreciate the comment on the description of the OID participants included in the study. We have revised this paragraph to clarify that 699 individuals responded to the OID survey but only 538 individuals were included in the present study that had complete data on all sleep variables (Abstract, lines 28-34, page 2):

“A cross-sectional study on over-indebtedness (OID survey) was conducted in 70 debt advisory centres in Germany in 2017 that included 699 over-indebted respondents. The survey data was combined with the nationally representative German Health Interview and Examination Survey for Adults (DEGS1; n=7987). We limited analyses to participants with complete data on all sleep variables (OID: n= 538, DEGS1: n=7447). Descriptive analyses and logistic regression analyses were used to examine the association between over-indebtedness and difficulty initiating and maintaining sleep, and sleep medication use.”

8. Introduction is long and some redundancy could be edited, as 96 references are cited in this section alone. The aim is very clearly stated.

Response: We fully agree with the Reviewer's constructive comment and have revised the introduction accordingly. We have modified the detailed description of existing research by removing lines 88-118 in the Introduction (page 4f.) to avoid redundancy.

9. Sleep problems had a time frame of the past 4 weeks, with four response options (1 indicates none and 4 indicates 3 or more nights per week). It is not clear why the 2-4 response options were combined.

Response: We would like to thank the Reviewer for the careful review. We agree that we need to clarify the dichotomization of sleep variables. As described above (point 3.), we have therefore modified the description of this approach in the Methods section (lines 201-204, page 9):

“For logistic regression analysis, the outcome variables were dichotomised referring to the experience of problems with sleep onset, sleep maintenance and sleep medication use (not at all, yes) to assess any complaints related to sleep problems and sleep medication use rather than to identify insomnia disorder.”
10. Results include many statistical numbers that disrupt the flow of each sentence. To help readers, these numbers could be removed, as they are already in the tables; I would also suggest three subheadings in the results: sleep onset, maintenance, and medication.

Response: We appreciate the constructive comment on the reporting of results. We have removed the statistical numbers to facilitate the flow of each sentence accordingly. As suggested by the Reviewer, we have added four subheadings in the Results sections that highlight the prevalence of sleep outcomes examined in the present study (Results section, line 267, page 13 “Prevalence of sleep problems and sleep medication use”) and the results of multiple regression analyses for problems with “sleep onset” (line 299, page 17), “sleep maintenance” (line 304, page 16) and “sleep medication use” (line 322, page 18), respectively.

11. Discussion is also long and has only one subheading, which is really where the discussion begins, as the initial part of this section also includes detailed statistical results. Rather than repeating these, authors could help readers interpret all the OR's (i.e., what an aOR of 1.45 or 3.94 means in terms of comparison to the reference group).

Response: We agree that the initial part of the Discussion section includes a rather detailed description of the statistical results. We have revised this paragraph in order to draw attention to the public health relevance of sleep problems and sleep medication use among the over-indebted in comparison to the general population:

“In the present study, an increased risk of problems with sleep onset and sleep maintenance as well as sleep medication use was observed for over-indebted individuals compared to the general population. In view of the increasing trend of over-indebtedness of individuals across high-income countries and adverse health effects of inadequate sleep, the study results highlight over-indebtedness as a public health concern. Until today, this is the first study that considers over-indebtedness as a determinant of sleep problems and sleep medication use in health research at the global level. The results suggest that conventional measures of socioeconomic status are insufficient to describe the complexity of financial hardship with regards to its association with health, and sleep specifically.” (Discussion section, lines 330-346, page 18f.)

We have added additional subheadings to highlight the spectrum of relevant previous studies that we present in the Discussion section: “Financial difficulties” (line 353, page 19) “Psychosocial stress” (line 414, page 21).
12. The discussion includes a great deal about stress, yet perceived stress was not measured in this study but assumed present in the over-indebted group.

Response: We agree with the Reviewer that we have not examined perceived stress in this study. Previous studies have suggested that over-indebtedness might reflect a cause and consequence of poor health [11], yet mechanisms that explain this association are unclear. We have revised the paragraph that describes the role of stress in the over-indebted population group in the Discussion section to emphasize that this interpretation reflects our assumptions but requires further research to determine its role:

“In line with previous research we assume that mechanisms that link over-indebtedness and sleep outcomes are not only related to material but also psychosocial effects emerging from a persistent lack of financial resources to cover payment obligations and living costs. A reduction of absolute material standards, for instance, in terms of living conditions, can result from accumulating debt over time and facilitate unparalleled experiences of stigmatization, feelings of shame, failure and hopelessness that may induce high levels of stress [12, 13].” (Discussion section, lines 415-420, page 22)

“Yet further research is necessary to understand the mechanisms between financial difficulties and psychosocial stress related to over-indebtedness, and health outcomes.” (Discussion section, lines 469-470, page 24)

13. Sometimes "gender" is used and other times it is "sex" - to be consistent, most recommend the term "sex" unless you actually have gender-identified data.

Response: We appreciate the constructive comment, and have modified the manuscript to use “sex” consistently.

14. Tables indicate a sample of 538 rather than 699.

Response: We acknowledge that the description of the OID participants included in the study possibly seems inconclusive. Therefore, we have revised the paragraphs not only in the Abstract (see 7.) but also Methods section (lines 189-195, page 9) to clarify that 699 individuals responded to the OID survey but only 538 individuals were included in the present study that had complete data on all sleep variables:

“We limited analyses to participants with complete data on all sleep variables (OID: n= 538; DEGS1: n=7447). Thus, all participants of the OID survey and DEGS1 with missing data on sleep-related outcome variables, i.e. problems concerning sleep onset, sleep maintenance and/or sleep medication use (OID survey: n=161; DEGS1: n=540) were excluded from analyses.
Following the merging of data from the OID survey (n=538) and the DEGS1 survey (n=7447), the combined dataset used for analysis comprised 7985 individuals in total.

15. Table 3 should include a footnote or some notation to indicate which 95% CI's are significant.

Response: As suggested by the Reviewer, we have italicized significant results and included a footnote to indicate statistical significance in Table 3: “†Italics show significant results at alpha = 0.05.” (Results section, line 296, page 17).

16. Limitations are adequately addressed, however there are also limitations due to self-report for sleep measures, not including a measure of shiftwork or having more than 1 job, and caregiving or parenting children in the home. Finally a comment about generalizability of the findings needs to be made.

Response: We appreciate the Reviewer’s recommendation to describe further limitations. Therefore, we have pointed out limitations related to self-reported sleep measures: “Concerning data collection, bias might have been introduced by the retrospective assessment of sleep problems and sleep medication use, and errors related to self-reporting.” (Discussion section, lines 496-498, page 25)

As described above (point 2.), we have also indicated that we did not account for potential confounding of more specific employment characteristics (Discussion section, lines 508-513, page 25f.): “Due to a lack of data, a number of possibly relevant covariates that can affect sleep outcomes were not statistically controlled for. For instance, factors such as individual characteristics (e.g. stress response), employment characteristics (shift work, having multiple jobs, caregiving) and ethnicity could not be taken into account, but may confound the association between over-indebtedness and sleep problems and sleep medication use.”

As suggested, we have clarified the generalizability of the findings in the Discussion section (lines 516-520, page 26): “While these aspects limit the generalizability of our findings, the present study nevertheless provides important evidence on the independent association between over-indebtedness and sleep problems as well as sleep medication use that may be used to guide public health intervention throughout Germany and initiate new lines of research.”
References


