Author's response to reviews

Title: External validation of two prediction models identifying employees at risk of high sickness absence: cohort study with 1-year follow-up

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Author's response to reviews: see over
Dear Dr. Cullen,

We have carefully considered the Editor’s and reviewers’ comments on our manuscript 9425313637290184, entitled “External validation of two prediction models identifying employees at risk of high sickness absence: cohort study with 1-year follow-up”.

We have formatted the manuscript according to the Editor’s requests. The title page was edited into journal style and now includes all authors’ email addresses. All authors meet the criteria for authorship. Apart from the authors, there were not other persons or sources of funders contributing to the study. Therefore, there is no need to include an Acknowledgements section.

The Tables were edited into journal style. As regards the figures, we will upload Excel files containing the figures “as is” as supplementary material, so that the figures can be cropped and edited in the production process if the manuscript is accepted for publication.

After changing the manuscript according to the Editor’s requests, we have revised the manuscript in line with the reviewers’ remarks. Below, you find our replies to the reviewers’ comments. We will upload an extra version of the manuscript, highlighting where changes have been made as supplementary material. We would like to thank the reviewers for their constructive remarks, which helped to improve our manuscript.

Sincerely yours,
Dr. Corné Roelen, corresponding author

Reviewer: Martin Slade
The authors state that it is desirable to not rely on questionnaire data to make determinations about the likelihood of a given employee having high sickness absence in the following year. The idea of relying only on data readily available in administrative datasets is a good one as questionnaires typically have only a moderate response rate thereby reducing the number of employees that can be evaluated for risk of high sickness absence. And, though it is true that the predictive model used in the manuscript includes age, prior sickness absence, and (added by the authors) gender, all of which are readily available from administrative datasets, it also includes self-rated health. This is something that I would expect to not be available in administrative datasets. Thus, employees have to be asked that question. If it is through a questionnaire, then all of the same problems of non-responses still apply. If, on the other hand, this data is expected to be gathered at either an on-site health fair or from employee visits to the company’s medical department, I suspect that many would still not be represented.

We developed the prediction models for physician – patient contacts. We agree with the reviewer that this is a selected population. However, in contrast to questionnaire surveys (in which healthy subjects are more likely to participate than subjects with health complaints), employees who visit a medical department will have some health question or complaint. Therefore, physicians can identify more high-risk patients than questionnaire surveys. We have added these considerations in the text on page 3.

I understand that the authors are validating a previously defined model, but it would be interesting to understand the loss of predictive power if self-rated health was not part of the equation. As the authors did
add gender to the original model to determine its effect, the idea of tweaking the predictive model seems within the scope of the paper.

We have re-analyzed the models without self-rated health. The predictive ability of the sickness absence days model was significantly reduced, whereas the predictive ability of the sickness absence episodes model remained intact. Hence, the sickness absence episodes model could be applied to sickness absence register data without the need for self-rated health as predictor. These findings are now integrated in the results (page 9) and in the discussion (page 10).

Major Compulsory Revisions:
1. The authors state that a total of 633 office workers participated in the health check-ups and of these only 6% were unable to be included in the analysis. The concern I have has to do with not knowing the size of the company’s workforce. What percent of office workers is represented by the 633 office workers that showed up for the health check-ups and are they different from the employees that did not show up?

   In our study, external validation of the prediction models was the main focus and, therefore, the difference between the development sample and the validation sample was important rather than the representativeness of the validation sample for white collar employees. Nevertheless, we have now added a non-participant analysis on page 8.

Discretionary Revisions:
1. The authors state that “In daily occupational health care practice, however, employees can be asked to rate their health. Thus, SRH is a variable that is easy to obtain without the need for health surveys or check-ups”. I am skeptical about this claim. How often do employees go to the health care practice? Do some employees never go there? I would like to understand the true ability to get data on all employees.

   We agree with the reviewer that it is a challenge to get data on all employees. However, employees who visit a health care practice will be more likely to be at risk of (high) sickness absence than employees participating in health surveys or check-ups.

   We have re-analyzed the data without self-rated health and found that the predictive ability of the sickness absence episodes model remained acceptable. We have added this to the results and discussion sections of the paper. However, if self-rated health is available, we recommend to include it in prediction, because self-rated health was a strong predictor in the development sample (see Table 3, column ‘development setting’).

Minor Essential Revisions:
1. The discussion of the previous development setting should be moved from the methods section to the background section.

   Information on the development setting was transferred from the methods to the background section.

2. Episode should be explicitly defined.

   Episodes were defined more clearly on pages 6-7.

3. There are two typos:
   a. Page 7, top line: ..absence from work due [to] work-related…
   b. Page 11, 3rd line of 2nd paragraph: were should be where.

   The typos were corrected.

4. Table 1: I don’t understand why, under prior sickness absence, the N(%) days has 120 employees with 0 days absent, but the N(%) episodes has 123 employees without an episode. These should be the same value.

   This typo was corrected into N=123 employees without sickness absence days.

5. Table 1: There are 593 employees in the study, but adding up the number of people in the N(%) days section, it only sums to 590.

   See our reply to remark 4.

6. Table 3: Under the SA episodes model, Self-rated health, I believe values of standard errors for Re-estimation and Gender inclusive models are incorrect. The first appears to be missing the decimal.
The typos were corrected.

The second just seems incorrect as it is about 4x the standard error in the other 3 models.  
This was a typo and was corrected.

7. Table 3: Under SA episodes model, Gender, the standard error for the Gender inclusive model is incorrect.  
The typo was corrected.

Reviewer: James Hill

Discretionary Revisions:
1. Would only report the 593 sample in the abstract, not the 633.  
We have edited the text in the Abstract accordingly.

Minor Essential Revisions:
2. Without access to reference 15 (in press) I have very little information to go on regarding the original methods - which is important as this manuscript is a confirmation of previous work. It is difficult to make any definitive statement regarding the methods/choice of model/etc.  
The reference provides a doi and it should be no problem to download the Epub version of the manuscript from Pubmed. We could also provide a pdf-file of the paper.

3. Please define what the difference is between sickness days and sickness episodes: perhaps an example - a worker misses 3 days of work on one occasion and 4 days on another, this would be 7 SA days and 2 SA episodes?  
We have defined episodes more clearly now on page 6. In line with the reviewer, we have included an example in the text to clarify how sickness absence was counted and to show that 1 sickness absence day also counted as an episode.

Is there any qualifier for an episode, such as duration: at least 3 days? out for 1 day also counts as 1 episode?  
There is no qualifier for a sickness absence episode. Hence, off work for 1 days also counts as an episode. We have now clarified on page 6 that sickness absence is counted from the day of reporting sick to the day an employee resumes work at equal earnings as before sickness absence.

4. Building on #3 comment, how many employees share groups? Are they mutually exclusive or are the two samples made up of roughly the same number of individuals (you report 66 and 67, coincidence?)  
A total of 29 employees had both high sickness absence days and high sickness absence episodes. We have added this to the results on page 8.

In this case, the model and regression coefficients are only influenced by a very few data points.  
The reviewer is right that the effective sample sizes of both models are small, which was the reason why we restricted the number of predictors (max 4) in the regression models.

5. Table 3. It appears that the regression coefficients (SE) under the Development setting heading and the Validation setting no updating heading are exactly the same? Is this true or is this a data coding error?  
This is true: initially, both prediction models were validated in the office workers with fixed regression coefficients (see the section ‘Updating the prediction models’ on page 7), i.e. with the regression coefficients of the development sample. We have now clarified this in the table by replacing the header ‘no updating’ by the header ‘fixed coefficients’.