Reviewer’s report

Title: Sauna bathing is associated with reduced cardiovascular mortality and improves risk prediction in men and women. A prospective cohort study

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Reviewer: Hirofumi Tanaka

Reviewer's report:

In this population-based study, Laukkanen et al. investigated the association between sauna bathing and CVD mortality over a period of over 14-years in a sample of middle-aged to elderly men and women in Eastern Finland. The research topic is of growing relevance in the field and worthy of investigation. The manuscript is also well-written and easy to follow.

This study concluded that those who sauna bathe 4-7 times per week for greater than 45 min per week stood to gain the largest benefit in decreased CVD mortality risk. However, group characteristics were not homogenous at baseline which can thus change statistical outcome. The number of men, smokers, alcohol consumption, previous myocardial infarction, history of coronary heart disease, type 2 diabetes, and hypertension vary across groups. There is no control in this study which makes the Hazard Ratio's less impactful. Instead, the authors used the HRs to compare infrequent sauna users to moderate to heavy sauna users. They stratified the different categories based on questionnaires, but it would have been advantageous for them to maintain a control group of "0 sessions per week". This may be a result of the Finnish lifestyle as saunas are a normal part of life, but it brings into question the validity of their results. Due to the fact that this study was conducted over a long period of time, how do the researchers know that those classified in the "4-7 sessions per week" group maintained the same behavior over 14 years and vice versa for someone placed in the "0-1 sessions per week" group?

The researchers state that they adjusted the models for given characteristics but did not state how the models were statistically adjusted to be independent of age, sex, disease state, physical activity etc. More detail should be given about the covariate analysis used.

Sensitivity analysis used in the paper excluded the first 5 years of follow-up (Line 22-24). This is ~1/3 of the amount of time that data was collected. The implications of exclusion could have skewed data analysis and created bias. The researchers should explain why there was 5 years of exclusion.

Since the temperature has a wide range from 80-100 degrees Celsius, the temperature may have had an effect on the duration and frequency of the sauna bathing. Since subjects were classified based on duration and frequency, it is important to question what effect other variables such as temperature may have on the classification system. The researchers did ask the subjects to report
temperature in a questionnaire, but since the temperature varied significantly, it should have been a measured more carefully. In their reporting, the mean values were 77.1 C for men and 74.7 C for women which do not agree with the 80-100 C range.

It is unclear how this study sample was obtained. Was this data obtained 15+ years ago with the intention of completing a longitudinal observation or was this an older data set that was used for this additional purpose?

How realistic is it to expect people to attend the sauna 4-7 times per week for 45 min per week or greater? Culturally this may make sense for Europeans countries, however, on a large scale in warmer climate areas (South America, United States, etc.) is the feasible? Will people adhere to this ideology?

Figure 4 is not clear. What are the groups being shown for frequency and duration?

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

Yes

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