Reviewer's report

Title: Cause of death ascertainment for deaths that occur outside hospitals in Thailand: application of verbal autopsy methods

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Reviewer: Daniel DC Chandramohan

Reviewer's report:

The strength of this study is the application of verbal autopsy (VA) to ascertain causes of death in a large representative sample of deaths in Thailand. In my view the most important finding of this study is that VA is able to assign a specific cause of death to a substantial proportion deaths that were reported as ill defined causes or all other causes) by the vital registration system. This point is repeated by the authors in several places in this manuscript. Then they go on to adjust the cause specific mortality factions reached by VA using the difference in the CSMF between medical records (MR) diagnosis and VA diagnosis that was observed in a subset of deaths that occurred in hospitals assuming that these differences in CSMF observed in the VA validation study is generalisable to deaths occurring outside hospitals. This raises several questions:

1. Is there any evidence to support this assumption that the differences in CSMF observed in a hospital based validation study are generalisable to VA applied in community based deaths? The authors have shown a comparison of age and sex distribution (Table 2) and CSMF (Figure 1) between the deaths registered at the vital registration and the sample of deaths selected for VA. However no data is provided to assess the comparability of the deaths occurring outside hospitals and in hospitals. Are they comparable in age and sex distribution? The validity of VA may vary depending on age groups and this should be examined and discussed. Figure 1 is not really needed. Instead the authors should give more details about the comparability of hospital deaths and outside hospital deaths.

2. The authors imply that, to be useful, VA based estimate should be adjusted using data from hospital based validation studies. On the other hand they conclude that VA could be incorporated with routine vital registration system to improve the knowledge base on cause of death. However, they have not discussed the limitations of application of hospital based validation study data to adjust the VA estimates. Are they suggesting these validation study data can be applied throughout Thailand over an indefinite period of time? If validation study data are needed to adjust the CSMF estimates reached by VA as part of routine vital registration system then they should clarify how often (when and where) validation studies should be conducted to adjust the VA based CSMF and discuss the practical implications of such a requirement?

3. The validity of VA for determining HIV/AIDS has been shown to be relatively robust in Africa. It seems VA has underestimated substantially HIV in the Thai population. The authors should discuss why such a big disparity in the
performance of VA for ascertaining HIV is seen in Thailand compared to previously reported studies.

(4) VA has increased substantially the number HIV deaths reported by vital registration system (from 94 to 172). Most of this increase is due to reallocation of ill defined causes of death recorded by the vital registration system to HIV by VA. The number of HIV deaths was further increased based on the validation study data. The authors suggest that the adjustment made by the application of the validation study result has given a plausible estimate of HIV deaths. Plausible based on what estimate? If we already have a plausible estimate of causes of death why are we doing VA to estimate CSMF in the community? Furthermore by using hospital based validation study results to adjust the VA data, to some extent the authors are changing the pattern of community based VA data to become similar to the hospital based pattern of causes of death. Is this appropriate? This issue merits in-depth discussion.

Other specific comments:

1. The manuscript is too long partly due to repetition of statements and issues. For example the objectives of the study are repeated in the introduction and methods; the reduction in the ill defined cause of death by VA is repeated in three places.

2. The section on local adaptation of VA methods describes two previous VA studies. I do not see the value of this information to understand the results or conclusion of this paper. Similarly the information given in Table 1 is not helpful. I suggest dropping Table 1 and describing the relevant points in the development of VA in couple of sentences. The freed up space could be used to discuss the key issues mentioned above.

3. It seems only one physician reviewed each VA and assigned a causes of death. Most of the previous VA studies had used two physicians to code each VA and a third physician to resolve any discrepancies. The authors should discuss the rationale for deviating from the “norm”. Is this part of the reason for low validity of VA in Thailand for some common causes of death? The authors claim that each physician was trained in coding by reviewing at least 12 sample VAs and retrained until their performance is satisfactory. How did they define “satisfactory”? Was there any formal testing to certify a physician to be satisfactory to review VA?

4. The authors claim that a central study team systematically assessed the accuracy of selection and coding of underlying causes of death. However the criteria used to assess the accuracy is not described. How many VAs were re-coded by the central team?

5. The data on agreement between vital registration (VR) and VA (Table 5) is not useful. It is obvious that the VR and VA data would not agree because a substantial proportion of ill defined and all other causes were assigned a specific cause by VA. This table and quiet bit of the text on the agreement between MR and VA can be dropped.

6. In the discussion the authors mention that “the application of such algorithms,
enabled ascertainment of probable cause of death…..” What algorithms were used to ascertain causes of death? If indeed algorithms were used, it should be added to this manuscript as an appendix.

7. An independent review of medical records was used to ascertain the gold standard cause of death. The authors have mentioned that this process is reported elsewhere. Without some description of this process it is not possible to assess the quality of the gold standard causes of death of the validation study. Given that the authors have applied the validation study results to adjust the VA data one would like to know the quality of the gold standard.

General comments/suggestion

This manuscript merits publication. However it needs substantial revision before it can be considered for publication.

**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

I declare that I have no competing interests.