Reviewer's report

Title: Measuring and Explaining Mortality in Dutch hospitals; the Hospital Standardized Mortality Rate between 2003 and 2005

Version: 2 Date: 20 December 2007

Reviewer: Mette Nørgaard

Reviewer's report:

The manuscript “Measuring and Explaining Mortality in Dutch hospitals; the Hospital Standardized Mortality Rate between 2003 and 2005” addresses an important topic.

Major Compulsory Revisions:

1. A main concern regarding this paper is the fact that, as mentioned by the authors on page 5, for indirect standardisation the study population itself is the standard, as this is the population to which the category specific mortality rates are applied. Consequently, in this study 96 different standards have been used each year. Indirect standardisation can be used to make valid comparisons of the hospitals’ performance if 1) the hospital populations have identical distributions or 2) when the mortality rates in a hospital are all the same multiple of the national category specific mortality rates. Thus, in order to be able to compare HSMR between hospitals the authors must check if either condition 1) or 2) is met. The authors need to specify whether this has been checked and how.

2. If the proportionality of the death rates or the distribution of the patients has not been checked, the HSMRs are not necessarily comparable. In that case, the underlying premises for ranking them and for including them in the same model are not met.

3. In the conclusion of the abstract it says: “We see no reason why the HSMR cannot be used â to compare hospitals with peer hospitalsâ. This statement is only true if the hospitals have the same patient distributions as the Peer hospital, or if the mortality rates are all the same multiple of the category specific mortality rates. Therefore, this statement should be modified.

4. The authors also conclude: “A comparison of hospitals by type might adjust for possible unobserved case-mix differencesâ. This is correct when comparing with the national mortality. However, there is not necessarily adjustment for neither unobserved nor observed differences between the different hospitals â as these are all compared with their own standards.

5. In the background section it is stated: “HSMR is an indicator that corrects hospital inpatient mortality for case mix differencesâ. The reference is a not yet published paper â The authors must explain how case-mix differences are
6. The statement: "Besides, within (specific departments of) a hospital HSMR information can be used, because it can be split up..." also needs a more thorough explanation since there are some concerns when using disease specific SMRs as well.

7. The decision to separate academic hospitals from other hospitals does probably make sense. It should, however, be based on testing of the differences in the patient distributions or the proportionality of the mortality rates and not just based on the fact that their HSMRs have worse scores. It could be interesting to see what would happen to the HSMR ranking if, for instance, cancer patients were excluded from the analyses as a sort of sensitivity analysis. Cancer patients in academic hospitals could differ in several ways from cancer patients in other hospitals.

8. The results of the ecological analyses are similar to results found in England (Reference 5). The paper would benefit from a couple of lines in the discussion that highlights what this paper adds of new information.

Minor Essential Revisions:

1. Table 2 shows the results of a higher ordered function tested but not used, since the model was not better than a linear model. Table 2 could, therefore, be left out of the paper.

2. Figures 1 and 2 do not provide much additional information than the information already given by table 1. Thus, these two figures could be left out. Figure 3 is much more useful.

3. What does OLS refer to?

4. In table 3, the last three rows could be replaced by the ICC.

5. In line 2 in the background section it says that various studies tried to measure hospital outcomes. Yet, only a single reference is given.

6. Page 5 line 9 it says: "third, indirect..." There are, however, no first and second mentioned in the text.

7. Page 5 line 16 it says: "The primary diagnosis is the main diagnosis that led to the admission and not the diagnosis that caused death..." The primary diagnosis is the main diagnosis that led to the admission but not necessarily the diagnosis that caused death.

Discretionary Revisions:

1. HSMRs are useful for each hospital in order to evaluate if their overall mortality is higher than expected compared with the national average mortality. If a hospital has a HSMR above 100 this can be a marker of lower than expected quality of care. However, the hospital needs to consider if it has higher than
expected prevalence of comorbid diseases, if its SES differ from the average, or if its organisation differ from the average i.e. if terminally ill patients to a high degree are transferred to hospices or their homes. In this regard, HSMRs may be useful for the hospitals â## not in order to make comparisons between different hospitals.

**What next?:** Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I am involved in estimating HSMR for all Danish Hospitals as a part of a national Danish campaign referred to as "operation Life". The Danish National Board of Health is part of the steering committee of this project. I don't regard this as competing interests.