

Maternal mortality in South Africa – lessons from a case study in the use of deaths reported by households in censuses and surveys

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South Africa is unique in being a developing country which has asked questions on pregnancy related deaths in both its 2001 census and 2007 household survey, and monitors maternal and pregnancy related mortality via vital registration and an annual survey into maternal deaths. These sources of data provide a wide range of estimates of maternal mortality for the country. This paper examines these estimates to assess to what extent the differences between them are due to data deficiencies, methodological deficiencies or definitional differences. The results show that being relatively rare it is fairly difficult to establish the maternal mortality rate with a great degree of accuracy in a setting where data are less than perfect. They also show that to some extent the differences are due to differences and errors in processing of data but that pregnancy related mortality should not be treated as synonymous with maternal mortality.

1. Introduction

As has been pointed out by others, e.g. Hill, Stanton and Gupta (2001) maternal mortality, being fairly rare, is difficult to measure accurately. This is particularly true where data are poor, as in many developing country situations, and including all African countries, where there is no or limited access to cause of death data from a vital registration system. In such situations researchers and policymakers have to rely on largely indirect measures from surveys. These include reports of women about the deaths of their sisters from DHSs, or verbal autopsies from DSSs. More recently, questions about pregnancy related deaths reported by household respondents in the census or large surveys have been added to these measures. Usually in such situations the assumption is made (either explicitly, e.g. Hill, Queiroz, Stanton *et al.* (2007), or implicitly, e.g. Garonne, McCaa and Nacro (2008) that the pregnancy related mortality rate (PRMR) can be regarded as being synonymous with maternal mortality rate (MMR).

South Africa is in the unique situation of having asked questions on pregnancy related deaths in both its 2001 census and 2007 household survey, and monitors maternal and pregnancy related mortality via vital registration as well as an ongoing confidential enquiry into maternal deaths. However, estimates of the MMR differ widely and will be examined to assess whether the differences are a result of data deficiencies, methodological deficiencies or definitional deficiencies. Particular attention will be given to the data derived from questions about deaths in the household from the census and the large household survey.

2. Methods and datasets

a. Confidential Enquiry into Maternal Deaths

In 1997 the Minister of Health set up the National Committee for Confidential Enquiry into Maternal Deaths which collects information on all maternal deaths through a facility based audit that assesses the cause, avoidable factors and issues related to care. Provincial assessors analyse each case with respect to primary and final causes of death, and suboptimal care received. Reports are then sent to the national committee for collation and analysis.

b. Vital Registration

Two series of MMRs are derived from the numbers of deaths from the death notifications reported by Stats SA. The lower series of ratios is based on the number of deaths where a maternal cause is specified as the underlying cause of death based on ICD-10. The higher series is an estimate of the PRMR, where in addition to deaths with underlying maternal causes, deaths of women who were pregnant or had given birth in the preceding 42 days, irrespective of the cause, provided that it was a natural cause (i.e. excluding external causes) were included.

c. Deaths in the household reported in census and community survey

Another approach to estimating the MMR has been to include questions in the census or large national household surveys on the deaths in a household in the preceding 12 months. Cause of death information is also obtained, using broad cause groups including maternal deaths. South Africa included such questions in 2001 census and also in the large Community Survey conducted in 2007.

c. Sibling history in the DHS

The 1998 South African Demographic and Health Survey included a sibling history which asked question about whether the sibling was pregnant or had given birth in the preceding 42 days of her death. The question was repeated in the 2003 SADHS but was too poorly answered to provide useful data.

d. Model estimates

In the face of incomplete death registration data, modelling approaches have been developed to estimate the MMR. The WHO and UNICEF developed a model to estimate the MMR based on the GDP, the fertility rate, access to health care during delivery and the prevalence of HIV - factors that are known to be associated with MMR (United Nations, 2000).

Each of the estimates is interrogated in turn in an effort to decide to what extent differences are do to data deficiencies, methodological deficiencies or definitional.

3. Results

As can be seen from the Figure 1 there can be a great deal of disparity between various estimates. Estimates of the MMR from vital registration data show an increase over the period 1997-2005 reaching a level of 117 per 100 000 births in 2005. When other causes are added to the maternal deaths, the rate reaches a level of 211 per 100 000 in 2005. The Confidential Enquiry shows a similar trend with rates falling in between the two VR based estimates. Census based estimates ranged from 575 per 100 000 derived by Dorrington, Moultrie and Timæus (2004) to 820 per 100 000 derived by Hill et al (2007). Stats SA have reported a figure of 674 per 100 000 based on the 2007 Community Survey (unpublished estimate). Model estimates for South Africa were 230 per 100 000 in 2000 and 400 per 100 000 in the year 2005 (Hill, Thomas, AbouZahr *et al.* 2007).

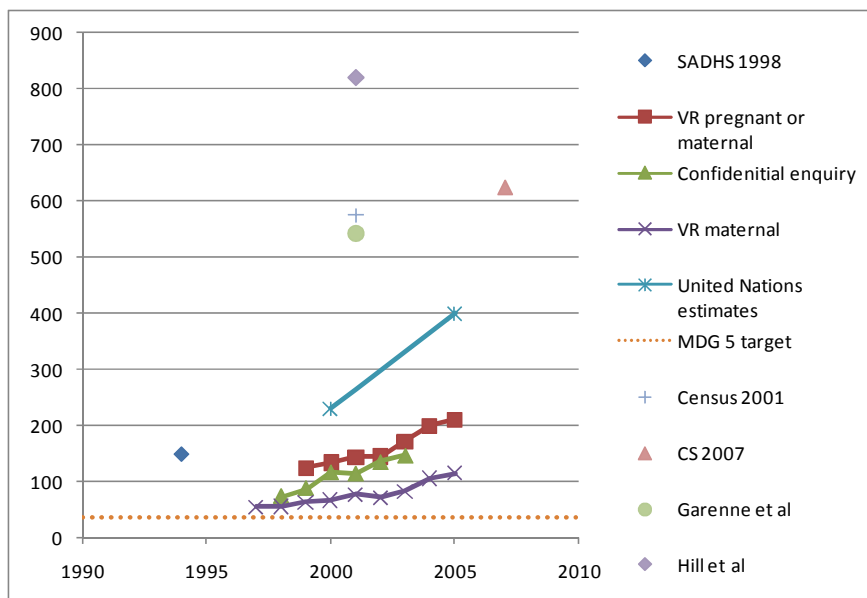


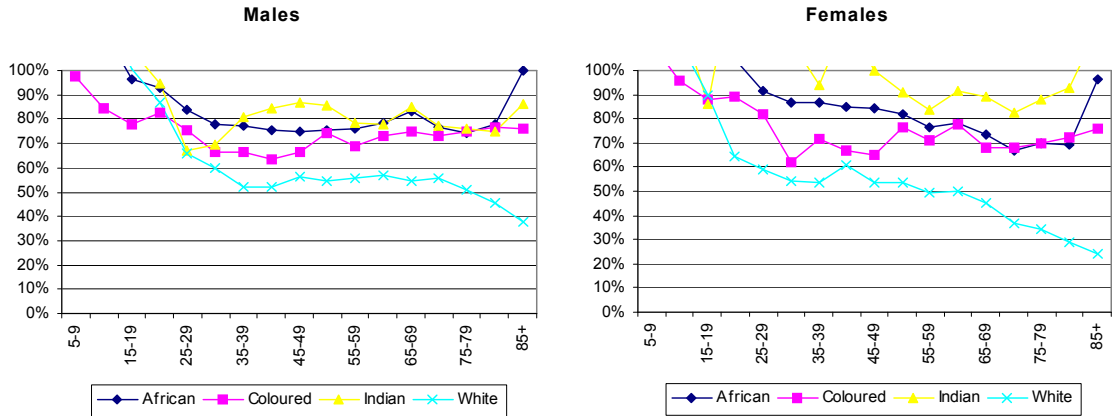
Figure 1. Various estimates of Maternal and Pregnancy Related Mortality Ratios for South Africa

The MMR based on the Confidential Enquiry is restricted to deaths that occurred in health facilities. In general, such systems are known to miss many of the maternal deaths that occur through an abortion as these women do not go to the labour wards. Furthermore, there is concern that the system may miss women who die during the post-partum period and who are not identified in the health facility as having been pregnant in the preceding 42 days. While the MMR from these data show a clear trend, it is likely to be an under-estimate of the true MMR.

Since vital registration is not yet complete in South Africa, the rates based on these data would also be an under-estimate the MMR. Since completeness of death reporting improved since the mid-1990s, part of the upward trend in the rates over time could be due to this. The inclusion of a question on the death certificate about the pregnancy status of the deceased appears to capture events that may be pregnancy-related but there is no information to indicate whether the pregnancy played a role in causing the death, or whether it was incidental.

Considering the estimates based on the 2001 census data, Dorrington, Moultrie and Timaeus (2004) questioned the reasonableness of the estimate they derived, both because of its magnitude (relative to the estimate of 150 per 100 000 from the 1998 DHS) as well as the extent of imputation of the pregnancy related death data. Although Garenne et al (2008) refer to their estimate as the MMR it is in fact the PRMR. The authors cite a number of supposedly independent estimates as corroboration of the reasonableness of their estimate, however, their argument is quite weak. In addition, they made no adjustment for completeness other than to reduce the number of deaths for excess of deaths reported for October relative to other months. Further, they argued that it was unnecessary to make any adjustment for the fact that some of the data were imputed. Finally, their estimate of the number of births is 10-20% lower than those estimated by applying the estimates of fertility to the numbers of women of reproductive ages.

Hill et al (2007) on the other hand argue on somewhat tenuous grounds that the PRMR is a reasonable approximation for the MMR. Certainly this doesn't appear to be the case in South Africa, where there appears to be a much larger gap between the two than might be accounted for by the deaths that are not recorded as pregnancy related by the vital registration system. Further, to a large extent the difference between their estimate and that of Dorrington et al is explained by their estimate that households report only 55% of all deaths. Estimates by Dorrington et al of the completeness of reporting of deaths by households relative to those expected on the basis of vital registration suggest, as is shown by Figure 2, that reporting is about 85% complete, with some evidence of an impact of dissolution of households on the death of the women.



4.

Source: Dorrington, Timaeus and Gregson (2006)

Figure 2: Estimates of completeness of reporting of deaths by households by population group in the 2001 census

The reason for this discrepancy is not clear at this stage but as discussed by Dorrington, Timaeus and Gregson (2006) estimating completeness of reporting of deaths over the most recent 12 months as reported by households may well not produce an accurate estimate when one has only one census reporting deaths and the immediately preceding census is 10 years earlier.

5. Discussion

While it is probably clear that the country is not on track to meet the MDG 5 target of reducing the Maternal Mortality Ratio by three-quarters (if we take the 1998 DHS estimate as base value) by 2015, and the data are suggestive of an upward trend over time (although to some extent this could be due to improving registration over time), it is difficult to draw any other conclusions from the data without more detailed analysis.

It can be seen from Figure 1 that the confidential enquiry numbers are higher than the number of registered deaths with a maternal cause as the underlying cause. The number is lower than the number of registered deaths from all natural causes where the woman was pregnant or had given birth in the previous 42 days. Since there is under-registration of deaths, and a proportion of the deaths are classified to ill-defined causes due to lack of information on the underlying cause, it is likely that the numbers of maternal and pregnancy-related deaths are actually higher.

On the other hand the estimates derived from the census and community survey may well exaggerate the true rate due to imputation and possible inclusion of non-natural causes, as well as incorrect adjustment for incompleteness of the death reporting. The extent to which these estimates can be reconciled is discussed in more detail in the final paper.

6. References

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