



Estimating maternal mortality and causes in South Africa: National and provincial levels



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ABSTRACT

Objectives: maternal mortality estimates for South Africa have methodological weaknesses. This study uses the Growth Balance Method to adjust reported household female deaths and pregnancy-related deaths and the relational Gompertz model to adjust reported number of live births and estimate maternal mortality in South Africa at national and provincial level; examines the potential impact of HIV/AIDS prevalence; and investigates the recorded direct causes of maternal mortality.

Design: data from the 2001 Census, 2007 Community Survey and death registrations were utilised. Information on household deaths, including pregnancy-related deaths was collected from the aforementioned census and survey.

Setting: enumerated households in the 2001 Census and a nationally representative sample of 250,348 households in the 2007 Community Survey.

Participants: information about members of households who died in the preceding 12 months was collected, and of these deaths whether there were women aged 15–49 who died while pregnant or within 42 days after childbirth.

Findings: maternal mortality ratio of 764 per 100,000 live births in 2007, ranging from 102 per 100,000 live births in the Western Cape province to 1639 in the Eastern Cape. Maternal infections and parasitic diseases as well as other maternal diseases complicating pregnancy, childbirth and the puerperium are the major causes. The study found a weak correlation between provincial HIV prevalence and maternal mortality ratio.

Conclusion: despite strategies to improve maternal and child health, maternal mortality remains high in South Africa and it is unlikely that the Millennium Development Goal of reducing maternal will be achieved.

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Introduction

Maternal mortality is specifically an indicator of reproductive health and socio-economic development in general. The Safe Motherhood Initiative was partly to reduce maternal mortality (Liljestrand and Pathmanathan, 2004). Globally maternal deaths decreased by 47% between 1990 and 2010 (World Health Organization (WHO), 2012). Shah and Say (2004) have provided the following maternal mortality ratios (per 100,000 live births): globally in 2005, 400; Sub-Saharan Africa: 920 in 1990 and 900 in 2005; South East Asia: 450 in 1990 and 300 in 2005; developed regions: 11 in 1990 and 9 in 2005. Despite the decreasing levels of maternal mortality globally and in Africa in general, they remain relatively unchanged in Southern African countries (Botswana, Lesotho, Namibia, South Africa and Swaziland). Trend in maternal mortality ratio (250 in 1990 and 360 in 2005) in Southern Africa (World Health Organization (WHO), 2012) is in adverse contrast to international trends. The issue of maternal mortality has been

thrust again to the fore by its inclusion in the Millennium Development Goals (MDGs) and has provided further impetus to studies on maternal mortality in recent years (see for example, Human Rights Watch, 2011; Horton, 2012; Hsu et al., 2012).

Changes in health legislation, health policy and delivery of health services in post-apartheid South Africa have led to reforms in reproductive health (National Committee for the Confidential Enquiry into Maternal Deaths, 1998; Cooper et al., 2004). Despite these reforms, the high rate of maternal mortality is one of the country's major population concerns (Department of Welfare, 1998).

Rationale for the study

The rationale for this study is as follows:

- (1) There is dearth of reliable estimates for monitoring maternal mortality in South Africa. Although several studies have provided estimates, the studies have weaknesses. Garenne et al.'s study (2008) used the general pattern of the UN model life table system in estimating and assessing the plausibility of

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their estimates of maternal mortality for South Africa. This life table is inappropriate for South Africa as it disregards the effects of the HIV/AIDS epidemic (see Udjo (2008)). Furthermore, they suggest that mortality in the preceding 12 months to the 2001 Census (Statistics South Africa, 2003) was overestimated whereas the application of the Growth Balance Method to the data shows that deaths were underreported. Also, they noted that the number of births they projected backwards appeared to be low and argued that the number of women who delivered in the preceding 12 months appeared to be high, which compelled them to make adjustments. The study on which this article is based shows that it was not about too many women giving birth in the preceding 12 months but rather that some births that occurred in the reference period were not reported. A follow-up study by Garenne et al. (2009) has similar limitations. Although they provided confidence intervals for their estimates, the confidence intervals do not resolve the biases in their estimates.

One of the sources utilised in the Hogan et al. (2010) study was vital registration data. Their estimates for South Africa are biased as they did not adjust for incomplete registration that is often the case in vital registration data (see Brass (1971), Hill (1987) and Udjo (2006)). Secondly, an examination of the UN Population Division data base used in their estimates indicated that, in the case of South Africa, the denominator in their estimate for 2008 was the number of live births obtained from the 2007 Community Survey (Statistics South Africa, 2007b). Besides the fact that the universe of the estimates (2008 death registration) and reported live births in the 2007 Community Survey are different, the number of live births (in the preceding 12 months) was not adjusted for reference period error.

WHO, UNICEF, UNFPA and the World Bank (2010) estimates used global adjustment factors for a group of countries (including South Africa) they considered lacking good vital registration, to adjust for mis-classification and incomplete registration. Such global adjustments may produce estimates that are either too low or too high as some countries may lie towards the extreme end of the median value. Also, the magnitude of underreporting of deaths tends to get smaller over time due to improvements in the registration system (Udjo, 2006). In providing additional explanation on the WHO, UNICEF, UNFPA and the World Bank estimates, Wilmoth et al. (2012) noted that the evidentiary basis underlying the assumptions in the estimates is fairly weak. They further noted that the model underlying the WHO, UNICEF, UNFPA and World Bank estimates is clearly an enormous simplification of reality. In view of these limitations, a different approach is needed to determine maternal mortality levels in South Africa to impart a better understanding of their magnitudes.

- (2) Both national and provincial estimates of maternal mortality are needed to ensure that suitable interventions are appropriately targeted. Most studies provide estimates at national level.
- (3) There are challenges when using currently available data, such as changes to provincial boundaries (in 2005, 2008 and 2011) and the possibility that the high prevalence of HIV/AIDS may mask other issues contributing to maternal mortality. HIV/AIDS is likely to be an indirect cause of maternal death rather than a direct cause. It is important to distinguish between direct and indirect causes of maternal death.

Study objectives

The objectives of this study therefore are (1) to use the Growth Balance Method to adjust reported household female deaths and pregnancy-related deaths, and the relational Gompertz model to adjust reported number of live births so as to provide estimates of maternal mortality in South Africa at national and provincial

levels; (2) to examine the potential impact of HIV/AIDS prevalence on maternal mortality at provincial levels in South Africa; and (3) to examine the recorded direct causes of maternal mortality in South Africa.

Methods

Data and subjects

Censuses, sample surveys and vital registration are the primary sources of nationally and provincially representative mortality data. Censuses and surveys usually do not provide information on perinatal mortality but they may be obtained from vital registration. Censuses, sample surveys and vital registration in South Africa have several weaknesses as is the case in many other countries. Besides coverage errors in censuses, these sources of data have content errors and, in the context of maternal mortality, include underreporting of deaths as well as errors in the number of live births. The District Health Information System (DHIS) in South Africa collects mortality data but these are hospital-based and, therefore, cannot be used to generate nationally and provincially representative mortality estimates. Furthermore, the quality of the DHIS data varies from one province to another. Thus, estimates of maternal mortality in South Africa rely heavily on censuses and surveys and to a lesser extent, on vital registration.

This study therefore utilised the 2001 South African Census, 2007 Community Survey and Death registrations for 1997, 2001 and 2007 (Statistics South Africa, 2007a). The 69 questions in the 2001 Census covered demographic and socio-economic profiles of the population and households. The overall undercount in the 2001 Census was 18%. The 2007 Community Survey was the largest sample survey ever conducted by Statistics South Africa. The objectives of the survey were (a) to provide information at lower geographical levels; (b) to build human, management and logistical capacities towards the 2011 Census; and (c) to facilitate the linkage between the establishment of the national address system and database of dwelling units. A two-stage stratified cluster sampling method, comprising 947,331 individuals from 250,348 households, was used. Institutions were excluded from the sampling. There were 88 questions in the 2007 Community Survey and like the 2001 Census, it covered demographic and socio-economic profiles of the population and households. The overall response rate in the 2007 Community Survey was 93.9%. (Statistics South Africa, the government department responsible for official statistics in South Africa, instituted the 2001 Census and the 2007 Community Survey. Statistics South Africa makes census and survey data available to the public through various media soon after the results have been officially released).

Regarding mortality, and aside from the orphanhood questions, the 2001 Census and the 2007 Community Survey included questions about the number of deaths in the household in the preceding 12 months, sex of the deceased, age of the deceased and whether the cause of death was natural or unnatural. If the deceased was a female aged 12–50 the question was posed as to whether she was pregnant at the time of death or whether death occurred within six weeks after childbirth. The date of the last live birth was also asked of females aged 12–50 years. These questions constituted the basis for the computation of maternal mortality ratios.

The analysis of the direct causes of maternal deaths was based on the death records for 1997, 2001 and 2007. Death records in South Africa are obtained through vital registration. The medical certification includes the immediate and underlying causes of death. The certification forms are processed by Statistics South Africa using ICD-10 coding. An inherent problem in vital registration data in less developed countries hinges on completeness of registration. The adjustments carried out on the data are described in another section of this article.

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