

Can CRVS and survey data provide insight into maternal deaths in South Africa?

The Sustainable Development Goals agenda sets the target to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030 - SDG Target 3.1 (UN 2019). Maternal mortality ratios “remain among the least equitable of all health indicators” both across and within countries (Cabal and Stoffregen 2009; Restrepo-Méndez and Victora 2014). Notwithstanding; the issue of measurement is important, particularly for sub-Saharan Africa with disproportionately high maternal mortality burden and where Civil Registration and Vital Statistics (CRVS) systems, that are the primary source of data for maternal mortality important for tracking the progress thereof, are not universally sound (Graham et al. 2016; Hill et al. 2018), except for South Africa (Mathers et al. 2005).

Maternal deaths are defined as having both temporal and causal relationship to the pregnant state (contrasted with surveys that only have temporal relationship). The cause of death is ascertained by the health practitioner, although maternal deaths are widely known to be affected by under-reporting and misclassification (Kao et al. 1997; Say and Chou 2011). Surveys – mainly censuses and sample surveys are a source of maternal mortality data, given the lack of progress in the CRVS systems (Cleland 1996). With the exception of specialised demographic surveillance systems (DSS) that have available cause of death data from mainly verbal autopsies (VAs), surveys do not include the cause of death (Garenne 2015). However, the assumption is that non-maternal deaths and omitted maternal deaths cancel each other out, so pregnancy-related deaths could approximate true maternal deaths (Hill et al. 2001) and that non-maternal deaths are insubstantial to bias the true maternal deaths (Garenne et al. 2013).

The United Nations organisation is strongly promoting questions on maternal mortality for inclusion in the 2020 round of censuses. In South Africa the maternal mortality module has long been included in surveys. However, in recent years, questions have been raised about whether maternal mortality questions should continue to be included in surveys. This is because it appears that the initial assumption for maternal deaths may not always hold. While PRMR and MMR deaths are distinguishable from DSS data (Garenne *et al.* 2013), and the latter is comparable to national figures (adjusted for underreporting and misclassification of maternal deaths - an approach suggested in research) (Dorrington et al. 2019), this is not true for other survey data.

The increase in the sample of the Demographic Health Surveys (DHS) has grown to almost double the initial sample size, including high standards for the surveys, making it possible to estimate mortality not previously possible (Cleland 1996)¹. Using the 3rd South African DHS conducted in 2016 pregnancy-related mortality (PRMR) and maternal mortality ratios (MMR) produced an estimated 536 and 475 deaths per 100 000 births respectively (ICFI 2012) – the latter is excluding the previously included accident-related deaths (Garenne 2015), effective with the DHS phase 7 (ICF 2017). Both PRMR and MMR are comparable to the 580 estimate derived using Census 2011 data (Statistics South Africa 2015), considering that the DHS time location is seven years before the survey, so the timing converge around 2010, with the Census 2011 data which refer to a year before the survey. Studies on limited geographies suggest that the health transitions, specifically the HIV/AIDS epidemic may have exaggerated the PRMR and MMR from surveys (Garenne *et al.* 2013; Mnyani *et al.* 2017) – this is consistent with research in countries equally affected by HIV/AIDS (Colbourn *et al.* 2013). In countries less-affected by the epidemic, HIV do not significantly affect the MMR (Makuei 2019).

It is against this background that the study seeks to estimate and characterise non-maternal deaths in survey data, and underreported and misclassified maternal deaths in CRVS data. This is by using mortality and cause of death data from the national CRVS system, and from VAs from the data from the Agincourt, Dimamo and Africa Health Research Institute DSSes located in three out of the nine provinces of South Africa that are run as part of the international INDEPTH and/or ALPHA networks, and locally the recently minted SAPRIN network. The maternal mortality--related deaths from the most recent 2011 census household deaths are also used. The CRVS adult deaths are >90 complete, meeting the UN standard for complete data (UN 2014), census deaths are 80 complete (StatsSA 2019), and therefore usable for demographic purposes using the 60 percent standard provided by Preston (1984). DSS are designed to capture all the deaths that occur within the sites' designated boundaries, and the completeness of mortality data from SAPRIN may vary across the sites. Using data from the multiple sources, the study provides an opportunity to investigate maternal mortality for the purposes of continued improvement of CRVS system in South Africa. Such research is also supported to better quantify maternal deaths using surveys, given that they are the region's main source of mortality data (Hill *et al.* 2018). There are previous suggestions to separate presentations for countries with pregnancy-related mortality (PRM) and maternal mortality (MM) (Garenne 2015)

¹ Notwithstanding that DHS questions in some countries potentially produce implausible results because of contextual factors that affect the responses for maternal mortality-related questions during data collection (Rerimoi *et al.* 2019).

which would be of little help to eradicate maternal mortality in the most affected areas (Schulte-Hillen and Cabrol 2014).

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