Abstract

Background: While there has been a significant global reduction in maternal mortality rates from 546 000 in 1990 to 287 000 in 2010 (Zureick-Brown et al., 2013;Merdad, et al., 2013), maternal mortality in Zambia continues to be above at 483 per 100 000 live births, eluding the millennium development target of 162 (CSO, 2012). Data on maternal mortality are not disaggregated by provinces. Various studies on maternal mortality conducted in Zambia (Ahmed et al., 1999; Banda et al., 2007; Hazemba & Siziya, 2009; Kilpatrick, Crabtree & Kemp, 2002) have evaluated maternal deaths at national level using direct death inquiry and though it is useful for international comparisons, neither one of these approaches are appropriate for evaluating maternal mortality in small districts where safe motherhood initiatives are often carried out. These studies have rarely included neighbourhood influence on maternal mortality risks. Moreover, no known study has attempted to use the Zambia Demographic and Health Survey maternal health indicators to evaluate maternal mortality by regions in Zambia. Yet, analyses of differentials within small districts provide an improved awareness of the social situation in which the risks are high for regional priority interventions. In addition, other researchers (Achia & Mageto 2015; Stephenson & Elfstrom 2012) have all posted that inclusion of neighbourhood level variables is helpful to understand several maternal health outcomes.

Objective: Guided by the conceptual framework developed by McCarthy & Maine (1992), this study contributes the new method of use of the mean Maternal Death Risk Factor Index model to estimate the levels and differentials in the risks of maternal mortality by regions and enhance the understanding of determinants of maternal mortality risks. This model is helpful in that it highlights regional and socioeconomic differentials in maternal mortality risks and ranks regions

according to their potential maternal mortality burdens. Benchmarks are set by using this model and indicators are used to identify probable high-risk areas or regions.

Methodology: The study utilised existing data sources from the 2007 Demographic and Health Surveys (DHS) and 2011-2013 Health Management Information System Routine Data (HMIS). Bivariate analysis was utilised to investigate the distribution and differentials in exposure to maternal mortality risks. Multilevel logistic regression was performed to investigate the independent and moderating functions of neighbourhood aspects on exposure to maternal mortality risks and the moderating functions of neighbourhood causes on the relationship between individual circumstances and exposure to maternal mortality risks. The mean Maternal Death Risk Factor Index (MDRFI) model that uses the history of individual women health indicators was used to predict maternal mortality and highlight regional and socioeconomic differentials of maternal mortality risks. The analysis was based on 5 410 women aged 15 to 49 who had a live birth in the five years prior to the 2007 Zambian Demographic and Health Surveys. The HMIS 2011-2013 data was also utilised for a comparative analysis and complementing DHS data on maternal health matters in Zambia.

Results: The predicted maternal mortality ratios (MMRs) values by region showed larger regional disparities. All the seven rural regions had MMR above the national average (591/100 000 live births); the highest being in Northern Zambia (738 per 100 000 live births) and Central Zambia (679 per 100 000 live births). The predicted ratios in the two urban regions of Lusaka and Copper-belt were significantly below the national average. The findings of both bivariate and multivariate analyses showed that skilled birth attendance at delivery significantly lowered the risks of exposure to adverse pregnancy outcome. The likelihood of using skilled personnel at birth was advanced for women who resided in neighbourhoods, with advanced

proportion of women who utilized skilled delivery at birth compared to women who lived in neighbourhoods that had a high proportion of women giving birth at home. The outcome from the multilevel analysis showed that the consequence of individual and neighbourhood influences on the exposure to high risk pregnancy in Zambia operates at different levels. Women with no education were found to be more exposed to high risk pregnancy than women with post primary education. The rate of women in the neighbourhood who utilized skilled birth attendance had a strong positive impact on the reduction of exposure to high risk pregnancy. In the analysis of autonomy level – although results indicated that women with low autonomy had higher odds of exposure to high risk pregnancy compared to women with high autonomy – the results were not significant, and therefore autonomy level in terms of exposure to high risk pregnancy was not supported in this study.

Conclusion: The MDRFI model is much easier to use at any level and quicker to forecast interventions as well as prevent probable risks compared to the use of the sisterhood method. The model proposed here could serve as the basis for a new and better system of mortality estimation for populations with incomplete data. The results reveal a number of challenges to confront with the purpose of reducing maternal mortality in Zambia. Women's high risk reproductive behaviours and the use of imperative fertility healthcare utilities have yet to increase considerably to result in a decrease in maternal deaths in the nation. The continuous disparities in maternal death hardship by province, rural-urban dwelling and socioeconomic position of the society further heightened the issue, making attempts to enhance maternal health and thereby decrease maternal deaths more demanding. Advancements to lower maternal mortality should either lessen the probability that a woman will become pregnant or lower the possibility that a

pregnant woman will experience adverse reactions during pregnancy or childbirth or better the outcomes for women with complex pregnancies.

This research makes it evident that programs to combat maternal mortality risks in the country require several avenues that embrace diverse protective measures looking beyond the individual level as women's health is essentially affected by their social environment. The amount of differential at neighbourhood and individual level found in our study indicates the need to contextualise efforts to increase resources towards mitigating exposure to high risk pregnancy. Hence, adopting neighbourhood-specific strategies along with identifying and addressing neighbourhood factors affecting the exposure to high risk pregnancy would give better results. The use of multilevel analysis in this research has shown that individual and neighbourhood aspects are crucial components associated with the exposure to high risk pregnancy. The multilevel framework demonstrated crucial neighbourhood differentials in the exposure to high risk pregnancy. Improving quality and access to health services is essential if the most deprived are to benefit. The Ministry of Health should align its plans of action to Zambia's development strategy articulated in its own Vision 2030. Neighbourhood health workers need to be involved in sensitising pregnant women about the risks of maternal mortality, for instance short birth interval, risky maternal age and danger signs during pregnancy.

To close the gap in exposure to high risk pregnancy between neighbourhoods, interventions should aim at poverty reduction, increasing neighbourhood maternal education and facility delivery in deprived neighbourhoods. The model used in this study could serve as the basis for a new and better system of mortality estimation for populations with incomplete data and will be much easier to use at any level, as well as vital for quick forecasting of priority interventions.