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Status of Maternal Mortality in Zambia: Use of Routine Data[1]

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Abstract

Maternal mortality constitutes a major public health problem in developing countries. Although Zambia has been experiencing a decline in maternal mortality ratio (MMR) at a minimal rate, MMR still remains high, at 483 maternal deaths per 100 000 live births. Data from HMIS between 2011 and 2013 was used to analyze levels and trends of maternal mortality at national and subnational level. By yearly variation, MMR records 257/100,000 live births in 2011, (146/100,000) in 2012 and (171/100,000) in 2013. The major delivery complication was abortion which accounted for 57.4%, 55.6% and 52.6% in 2011, 2012 and 2013 respectively. Obtaining data on the magnitude of the health problem and its causes at the subnational level is vital for effective policy and program implementation and sustainability. However, improvement in skilled birth attendant and prompt efficient and enhancement routine data reporting will assist in the fight to reduce maternal mortality in Zambia

Keywords Maternal Deaths; MMR; Lifetime Risk; HMIS, Zambia

Résumé

La mortalité maternelle constitue un problème majeur de santé publique dans les pays en développement . Bien que la Zambie a connu une baisse de taux de mortalité maternelle (TMM) à un taux minimal, ROR reste encore élevé , à 483 décès maternels pour 100 000 naissances vivantes . Les données de HMIS entre 2011 et 2013 a été utilisé pour analyser les niveaux et tendances de la mortalité maternelle au niveau national et infranational. En variation annuelle , MMR enregistre 257 / 100.000 naissances vivantes en 2011 , (146 / 100.000) en 2012 et (171 / 100.000) en 2013. La principale complication de livraison était l'avortement qui a représenté 57,4 % , 55,6 % et 52,6 % en 2011 , 2012 et 2013 respectivement . Obtenir des données sur l'ampleur du problème de santé et de ses causes au niveau infranational est vital pour la politique efficace et la mise en œuvre du programme et de la durabilité . Toutefois , l'amélioration de accoucheuse qualifiée et la déclaration rapide de données de routine efficace et l'amélioration aidera dans la lutte pour réduire la mortalité maternelle en Zambie.

Mots-clés: décès maternels ; MMR ; Risque à vie ; HMIS ; Zambie

[1] An extract from the doctoral thesis on Socio-economic and Demographic Determinants of Maternal Mortality Risks in Zambia to be submitted to the University of The Witwatersrand in partial fulfillment of the requirements for the award of Doctoral Degree of Philosophy

Introduction

Reduction of maternal mortality has long been a global health priority and a key concern, with persistent high rates prevailing principally in underdeveloped countries (Say et al., 2014; Pacheco et al., 2014). Each year, more than 208 million pregnancies occur worldwide; 185 million occur in the developing world alone (Kassebaum et al., 2014). More than 500,000 women die annually due to pregnancy related complications (Mayokun 2015). In many low-income countries, the maternal mortality ratios are 100-fold greater than in high-income countries (Kassebaum et al., 2014). For instance, the adult lifetime risk of death due to pregnancy was 1:39 in Sub-Saharan Africa against 1: 3800 for developed countries (WHO 2014).

Despite much forward momentum with regard to enhancing health services, Zambia continues to face high levels of maternal mortality with an average of 38 women dying every month due to pregnancy and childbirth (UNDP, 2013) and close to 500 women out of every 100,000 dying in the process of giving birth (CSO, 2012). This figure masks wide provincial disparities which range from 343 per 100,000 live births in the Southern to 786 per 100,000 live births in the Western as indicated by the presentation from latest census survey (CSO, 2012).

Zambia has sought to reduce maternal mortality by ensuring universal access to family planning, skilled attendance at birth, and basic and comprehensive emergency obstetric care. However, use of skilled delivery at birth has been fluctuating from 50.5% in 1992 to 43.4 in 1996, 46.55 in 2007 to 44% in 2010. Although, maternal mortality ratio has improved from 649 deaths per 100,000 live births in 1996 to 483 deaths per 100,000 live births in 2010 (CSO, 2012), this is a lot higher than the MDG target of 162.3 deaths per 100,000 live births by 2015. Unable to achieve the 2015 Millennium Development Goal and now working towards attaining the 2030 Sustainable Development Goals (SDGs) a concerted global effort is needed to reduce high levels of maternal mortality (Silver & Singer 2014).

Literature Review

Measuring maternal mortality accurately in most developing countries is a challenge especially that it is a rare event coupled with unreliable data with limited availability of cause of death from vital registration system (Hill et al. 2001). In such circumstances, researchers and policy makers have relied on estimates from local studies (community-based or hospital-based) or surveys. Some researchers have stressed the need for countries to invest in the systems needed to monitor maternal mortality as well as the technical capacity to analyze such data (Bradshaw & Dorrington, 2015; Graham et al. 2008).

Many times, policies or programs are implemented despite a lack of data that identifies which women are at highest risk of pregnancy related death and insufficient data of what actions are most likely to reduce the risk of such deaths. The Zambian government, working with cooperating partners, is working to implement locally tailored initiatives to reduce maternal mortality based on the unique needs at the subnational level (UN 2009). However, challenges of measuring maternal deaths in developing countries and in small geographical areas have been cited (Ahmed & Hill 2011) though obtaining data on the magnitude of the health problem and its causes at the subnational level is vital for effective policy and program implementation and sustainability (Gan et al., 2014; Pattinson et al., 2011).

In Zambia, maternal mortality rates are disseminated every seven (DHS survey) and ten years (Census). In order to assess progress on maternal deaths on regular basis, there is need to in-cooperate and enhance routine data for effective policy/program implementation and sustainability since data is collected on a regular basis. Routine data can only be enhanced if it is regularly utilized by the public. This study therefore, assessed the status of maternal mortality using an adjusted direct approach from the routine data reported in the three years conducted by health management information system in Zambia from 2011 to 2013.

Use of health facility at birth

The majority of maternal deaths arise from complications that are not predicted or prevented; care for these conditions must be readily available to all women (Goldenberg & Mcclure 2015). Therefore, delivery at a health facility becomes crucial for effective intervention to women during childbirth. To ensure optimal pregnancy outcomes, all women need access to skilled birth attendance, and provision of basic and emergency obstetric care (Yakoob et al. 2011), this could prevent up to 33% of maternal deaths due to presence of skilled attendance at birth (Graham et al, 2001). Delivery at health facility could provide skilled personnel at delivery with an enabling environment, adequate supplies and equipment and an adequate referral system (Phiri et al., 2014; Adegoke & Broek, 2009). Lack of competence of health workers and provision of EmOC services has prompted many women not to utilize health facility at birth (Chi et al., 2015; Phiri et al., 2014).

Zambia, like the rest of sub-Saharan Africa, has shown little improvement in maternal mortality and use of health facility at birth (Bhutta et al., 2012).

Estimated proportions of use of skilled personnel at delivery have remained low at 47% with rural and urban differences existing at 83% in the urban and 31% in rural areas (CSO, 2012). Although much has been said about contributing factors, more is still needed in terms of planning how to implement interventions that would improve women's use of skilled personnel at delivery especially in most rural areas where there is inadequate basic EmOC.

Measures of maternal mortality

There are three distinct measures of maternal mortality in widespread use: the Maternal Mortality Ratio (MMR), the Maternal Mortality Rate (MM rate), and the Lifetime Risk of Maternal Death. The main indicators used to measure is the Maternal Mortality Ratio (MMR), defined as the number of maternal deaths for every 100 000 live births (UN, 2013).

$$\mathbf{MMR} = \frac{\mathbf{Number\ of\ maternal\ deaths}}{\mathbf{Number\ of\ live\ births}} \quad (1)$$

The maternal mortality rate, defined as the number of maternal deaths over a period in women of reproductive age;

$$\mathbf{MM\ Rate} = \frac{\mathbf{Number\ of\ maternal\ deaths}}{\mathbf{Woman{-}years\ lived\ at\ ages\ 15{-}49}} \quad (2)$$

Lifetime Risk of Maternal Death is an accumulated risk of maternal death across a woman's reproductive age. It takes into account both the probability of becoming pregnant and the probability of dying as a result of that pregnancy (Graham et al. 2008). According to (Wilmoth 2009) the measure can be calculated per 1,000 women reaching age 15, thus:

$$\mathbf{LTR} = \frac{(\mathbf{T}_{15} - \mathbf{T}_{50} \times \mathrm{MMRATE}}{l_{15}} \quad (3)$$

Where T_{15} and T_{50} are the person-years lived above ages 15 and 50 respectively, and l_{15} is the survivors to age 15, in an appropriate life table for the population in question.

Maternal mortality ratio can also be used to calculate life time risk in the absence of life tables. Lifetime risk of maternal death can be calculated using maternal mortality ratio as 1–(1–maternal mortality ratio/100 000) total fertility rate (Abouzahr 2010).

$$\mathbf{Life\ Time\ Risk} = 1 - (1 - \mathbf{MMR})^{1.2 * \mathbf{TFR}} \quad (4)$$

(TFR is multiplied by 1.2 to make allowance for pregnancies not ending in live births).

The Maternal Mortality Ratio (MMR) is generally regarded as the preferred measure of maternal mortality because it describes the frequency of maternal death relative to the risk as measured by the number of live births. In this study, we used maternal mortality ratio and life time risk of death to estimate the levels and magnitude of maternal mortality in Zambia using routine data. In Zambia, vital registration is poor despite legal instruments for its implementation being in existence for years. The maternal mortality ratio can be calculated by dividing recorded (or estimated) number of maternal deaths by total recorded (or estimated) number of live births in the same period and multiplying by 100,000 (UN 2009). Measurement requires information on pregnancy status, timing of death (during pregnancy, childbirth, or within 42 days of termination of pregnancy), and cause of death. The maternal mortality ratio can be calculated directly from data collected through vital registration systems, household surveys or other sources. We used HMIS data to estimate maternal mortality from 2011 to 2013.

Materials and methods

Study design

A descriptive cross sectional study was conducted based on secondary data set from the 2011-2013 ZHMIS to assess and analyze the distribution of maternal deaths in Zambia. This included variables on region of residence, delivery complications, mode of delivery, and designation of attendant at delivery and outcome of the pregnancy.

Data Source

All data that is submitted from the health facilities to the national office follow an HMIS data flow guideline. The guideline was designed to detect and minimize the number of errors that may be captured at each level of the service delivery starting from the health center to the national level (MOH 2014). This implies that before data is submitted to the next level, it is verified and validated making it more reliable for policy formulation, analysis and program implementation (see figure 1).

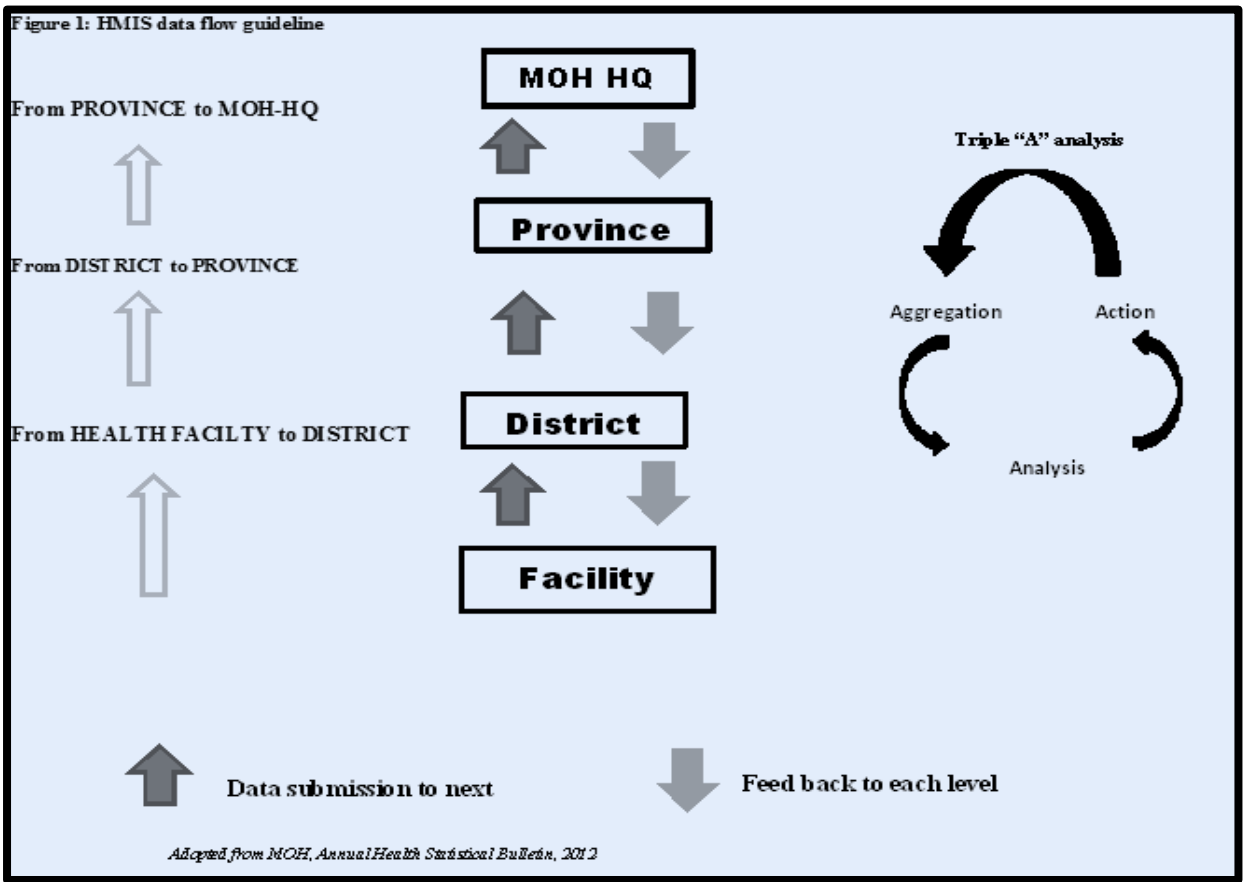

Figure 1: HMIS data flow guideline

Methods

The maternal mortality ratio (MMR) which is the main indicator used to measure Maternal deaths defined as the number of maternal deaths for every 100 000 live births (UN, 2013), was expressed as follows:

$$\mathbf{MMR} = \frac{\textbf{Number of maternal deaths}}{\textbf{Number of live births}} \quad (1)$$

An estimate of Lifetime Risk of Maternal Death which is an accumulated risk of maternal death across a woman's reproductive age was calculated using maternal mortality ratio as 1–(1–maternal mortality ratio/100 000) total fertility rate (Abouzahr 2010) assuming a constant risk of maternal death throughout the reproductive period.

$$\textbf{Life Time Risk} = 1 - (1 - \text{MMR})^{1.2*\text{TFR}} \quad (2)$$

(TFR is multiplied by 1.2 to make allowance for pregnancies not ending in live births).

Statistical analysis

The data was analyzed using Stata 12. Univariate graphs of all maternal deaths for each year and for all the other variables relevant to the study were generated for assessment and comparisons.

Ethical consideration

In order to access the data, permission was sort and granted by Ministry of Health Headquarters.

Results

Figure 2 presents the percent distribution of institution deliveries by province from 2011 to 2013. Proportion institutional delivery according to HMIS, refers to the total number of deliveries conducted in a health facility expressed as a percentage of the expected pregnant women in a given population for a specified period (MOH 2014). The trend analysis indicated in figure 1 shows that there is a noted increase in the overall proportion of women who delivered at health facilities from 45 percent in 2011 to 50 percent in 2012 and 52.6 percent in 2013. Eastern and North-Western Provinces each at 55 percent had the highest coverage in 2011. While in 2012, Lusaka Province had 81 percent as the highest coverage. In 2013, Eastern Province recorded the highest coverage of 81 percent. Muchinga was not included in 2011 as it was a new province recently created and information on expectant pregnant women was missing.

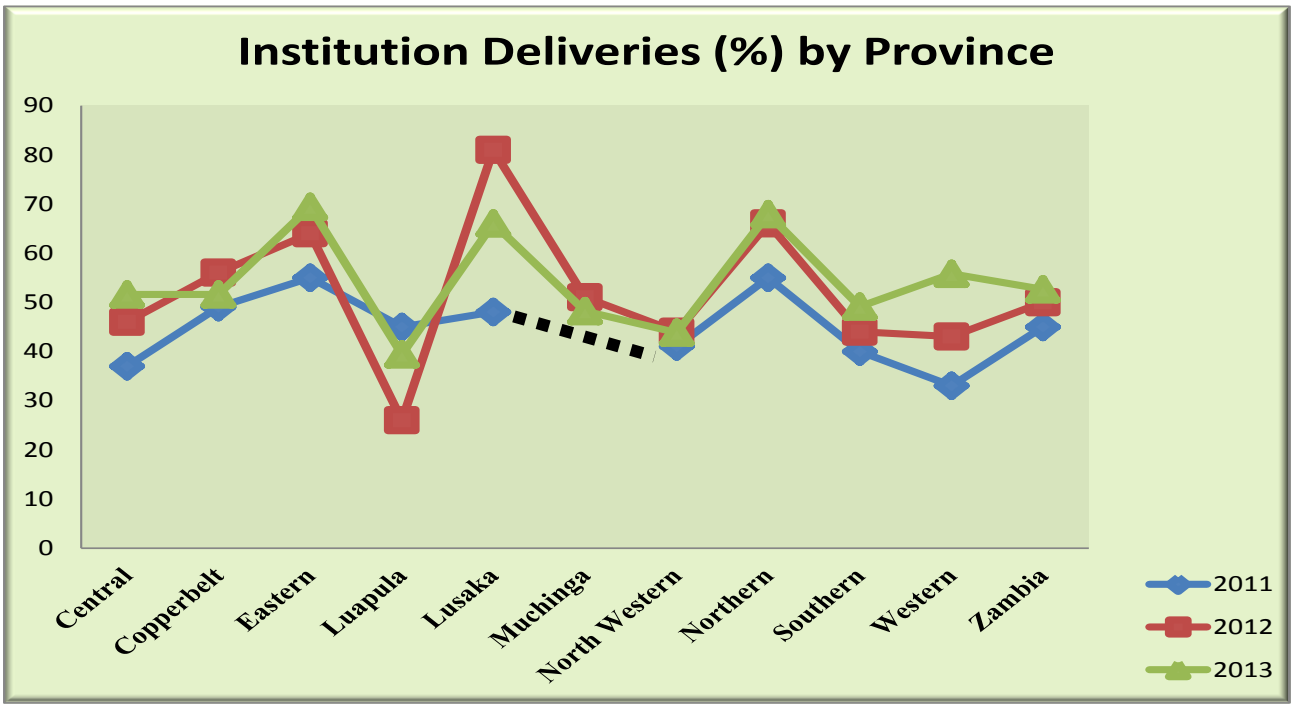

Figure 2: Institutional Deliveries by Province, 2011-2013

Figure 3 presents data on delivery complications as obtained from HMIS data for the period 2011 to 2013. The figure indicates that of the complicated deliveries in health facilities, abortion was the leading cause of complications for three consecutive years under review. The percent distribution of delivery complication due to abortion ranged from 57.4 in 2011 to 55.6 and 52.6 in 2012 and 2013 respectively. This was followed by obstructed labor; however, in contrast to the reduction observed in abortion complication, obstructed labor increased from 9% in 2011 to 12.9% and 13.2% in 2012 and 2013 respectively. There was a variation in the follow up complications as hypertensive disorder was the third highest in 2011 at 9% whilst Sepsis at 9.2% was the third highest in 2012 and Hemorrhage at 11% in 2013. Overall, Raptured uterus was the least recorded at 1.2% for 2011 and 2012 and 1.5% for 2013.

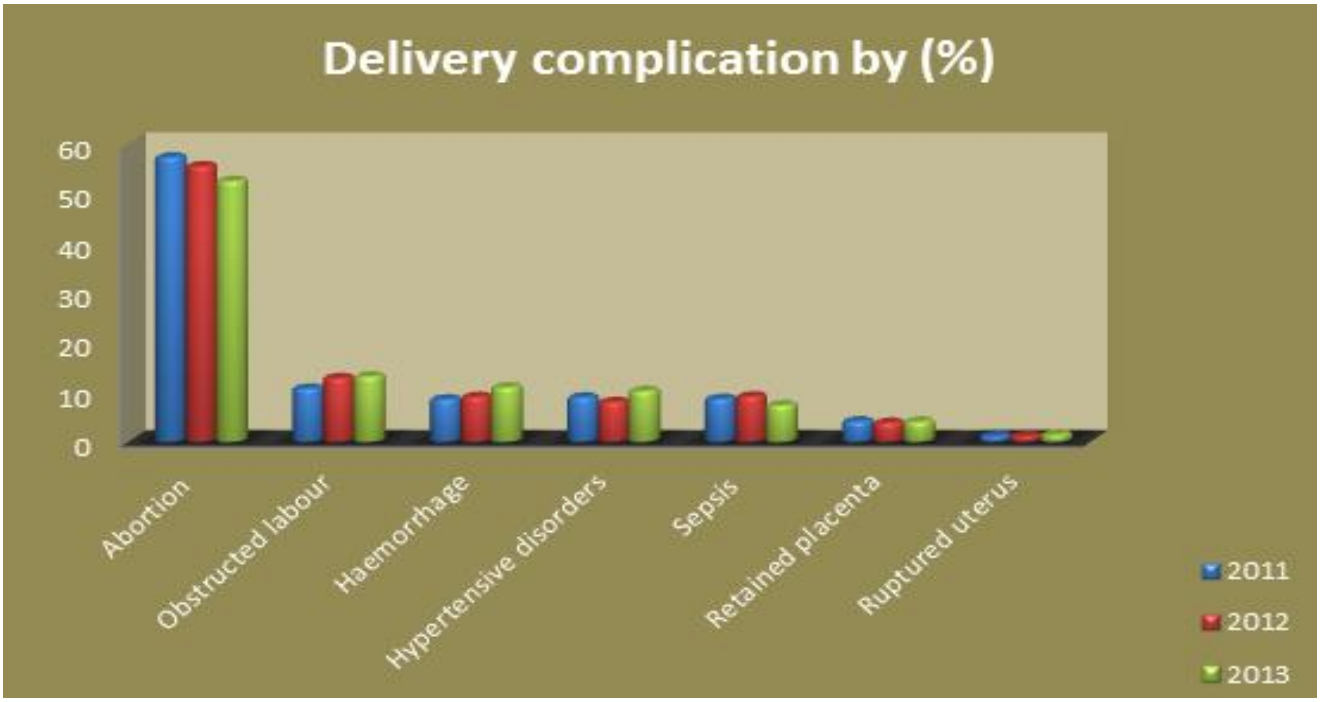

Figure 3: Percent Distribution of Complicated Deliveries

Figure 4 presents trends of estimated maternal mortality ratio by province based on health facility reporting in the period 2011 to 2013. The results show that the two rural provinces of Luapula and Northern had the highest proportion of MMR, at 380 and 347 per 100,000 live births in 2011. Whilst the urban province Lusaka recorded the lowest at 42 per 100, 000 live births. Just like in 2011, Luapula and Northern provinces recorded the highest at 332 and 212 per 100, 000 live births and Lusaka recorded the lowest at 29 per 100, 000 live births in 2012. However, in 2013 one urban and rural province (copper belt and southern) recorded the highest MMR at 258 per 100, 000 live births, whilst Lusaka maintained the lowest at 34/100, 000. Overall National health facility maternal mortality ratio appears to have decreased from 257 per 100 000 live births in 2011 to 171 per 100,000 live births in 2013.

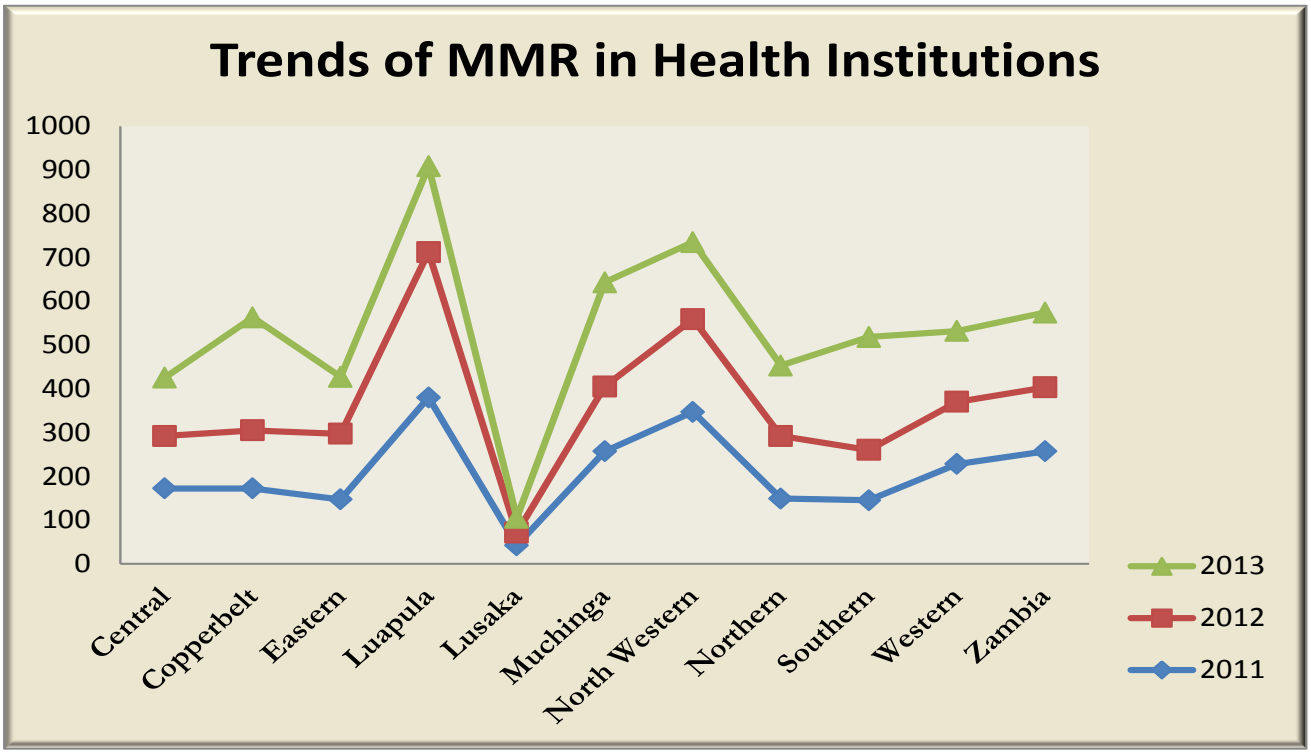

Figure 4: Trends of Maternal Mortality Ratio by Provinces, 2011-2013

Figure 5 presents comparison of life time risks of exposure to maternal death across the provinces for the period 2011 to 2013. For all the three years under study, life time risk of death was lowest in Lusaka province ranging from 1 in 432 women likely to experience the risk of dying from maternal causes among those who delivered in health facilities in 2011 to 1 in 617 and 1 in 529 for 2012 and 2013 respectively. Luapula province recorded a higher life time risk at 1 in 31 and 1 in 35 women likely to experience the risk of dying from maternal causes among those who delivered in health facilities in 2011 and 2012 respectively. In 2013, Muchinga recorded the highest life time risk of 1 in 51 women likely to experience maternal death among those who delivered in health facilities. The overall picture portrayed is that life time risk in most rural provinces was higher in all the three years under review compared to the urban provinces.

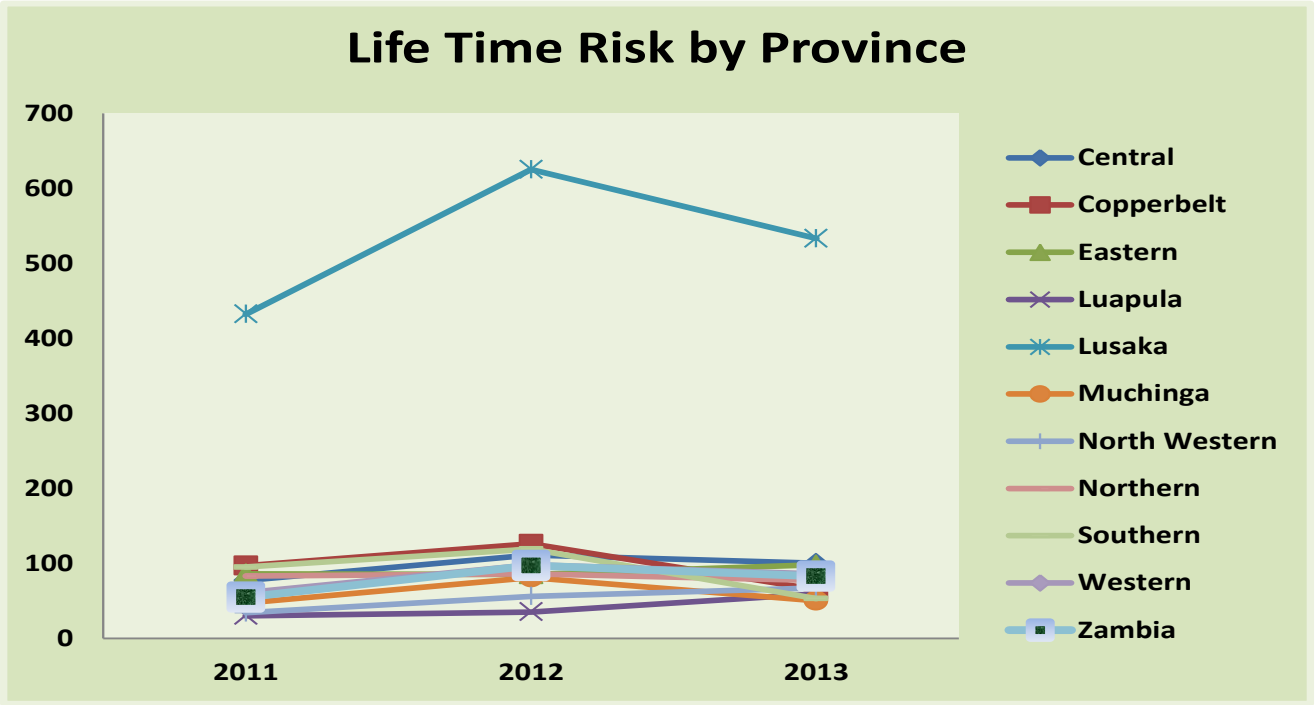

Figure 5: comparison of Life Time Risk of Maternal Death across Provinces

Discussion

Maternal mortality is still a public problem in Zambia, considering that the estimated maternal mortality ratios from facility reported data are high, knowing that less than fifty percent of women in Zambia deliver from the health facility (CSO, 2009). Maternal mortality ratio across provinces ranged from 42/100000 to 347/100000 live births in 2011; 29/10000 to 330/10000 live births in 2012 and 34/100000 to 258/100000 live births in 2013. Overall national health facility maternal mortality ratio appears to have decreased from 257 per 100 000 live births in 2011 to 171 per 100,000 live births in 2013. The estimated MMR within the country for 2011–2013 is consistent with the population survey estimates for each province as the pattern is similar in almost all provinces.

However, in the present study MMR was lower than the most recent estimations of the population based MMR for the regions in Zambia which ranged from 330/100000 live births (Muchinga Province); 343/100000 live births (Southern); 357/100000 live births (Lusaka); 423/100000 live births (North Western); 442/100000 (Eastern); 474/100000 (Copper belt); 475/100000 (Northern); 500/100000 (Central); 573/100000 live birth (Luapula) and 786/100000 live births (Western Province); (CSO, 2012).This is expected because population survey captures the whole population whilst facility reporting is based on women who visit the facility or deliver at the facility. What is expected is that all maternal deaths occurring in health facilities should be reported in the routine health management information system (HMIS). However, not all deaths occurring in facilities are actually captured in the health management information system (Abouzahr 2010). Hypothetically, we can deduce that if only less than 50% of women deliver in health facilities in Zambia (CSO, 2009), then this ratio is only representing half the population of pregnant women and if we are to meet the whole population we can multiply by two assuming all risk remain constant which takes us to double MMR of what we have gotten.

The study revealed significant geographic variations in life time risk of death and maternal mortality, which suggests the importance of maternal health interventions at subnational level. This geographical variation may be related to the different socio-economic, demographic and environmental features in the provinces. Our findings on the differentials in maternal mortality within countries are in accord with the published literature (Bomela, 2015;Yuan et al. 2013; Hogan et al., 2010).

The life time risk of maternal death was observed to be high in most rural provinces in all the three years under review compared to the urban provinces. The life time risk from some rural provinces was as high as 1 in 31 to 1 in 51 of women likely to experience the risk of dying from maternal causes among those who delivered in health facilities from 2011 to 2013. Women in rural places have been cited to be exposed to risks of pregnancy related deaths (Ononokpono & Odimegwu, 2014; Yaya & Lindtjørn, 2012; Ronsmans & Graham, 2006). In

Zambia, this has been attributed to lack of basic EMOC in some rural health centers (Owens et al., 2015; Saving Mothers Giving Life Report, 2013).

Estimated Life Time Risk of maternal deaths in Zambia stands at 1 in 59 women likely to experience the risk of dying from maternal causes (WHO 2014). Comparing this with our results indicate that in 2011, Luapula, Muchinga and Northern provinces had higher LTRMD compared to the computed national LTRMD of 1 in 59 women likely to experience the risk of dying from maternal causes. In 2012, only Luapula and Northern had higher LTRMD than the national. In 2013, Muchinga and Southern had higher LTRMD whilst Luapula was at par with the national LTRMD.

A further computation of the national life time risk of maternal death using the routine data shows the national life time risk for 2011 was 1 in 59, implying that Muchinga, Northern and Luapula provinces had higher life time risk than the national. In 2012, the nation LTRMD was 1 in 97 putting Eastern, Luapula, Muchinga, Northern and Northwestern higher in the risk than the national. For 2013, the national life time risk of death was 1 in 83 thereby, having Copper belt, Luapula, Muchinga, Northern, Northwestern and Southern with higher life time risk compared to the national. However, Copper belt province can be viewed as better reporting which led to having higher rates compared to the rural provinces.

Abortion was the leading cause of complications for the three consecutive years under study. The proportion of delivery complication due to abortion ranged from 57.4% in 2011 to 55.6% and 52.6% in 2012 and 2013 respectively. Complication of abortion is a problem worldwide regardless of abortion laws existing in some countries. This is because in most countries unintended pregnancies are high culminating in women who are desperate to resort to abortion whether safe or unsafe (Sedgh et al. 2008). Abortion in Zambia is legal on social and medical grounds under the 1972 Termination of Pregnancy Act. However, the high number of hospital admissions due to abortion complications and the many school drop-outs attributed to pregnancy suggest that unwanted pregnancy is high in Zambia. A study conducted in Western province reviewed a maternal mortality ratio of 120 induced abortion-related deaths per 100 000 live births, more than half the deaths were of school girls (Koster-oyekan 1998). The Zambian government has expressed concern about the continuing high incidence of unsafe abortion in Zambia, but efforts to reduce these have so far had little effect (Coast & Murray 2014).

There are several factors such as socio-economic and geographical inequalities that lead some women to resort to aborting the pregnancy. Some women attempt abortion due to financial hardship and the stigma of being an unmarried mother (Dahlbäck et al. 2007). Most women from rural household are financially handicapped to have resources for health matters. This has also been revealed in the national living conditions and monitoring surveys where rural household were found to be associated with household poverty and lack of development (CSO,2011) which leads women from such household to have limited resources for health care.

Several studies in Zambia have recommended that most rural health facilities cannot provide basic emergency obstetric care due to lack of the required number and appropriately skilled health personnel and facilities for use (Gabrysch, Simushi, and Campbell 2011; Kyei, Chansa, and Gabrysch 2012; Levine et al. 2008; Stekelenburg et al. 2004), hence, some of these teenagers are assisted by traditional healers, midwives or health workers to attempt in the same vice and some have no clue of the Pregnancy Termination Act (Dahlbäck et al. 2007;Castle et al. 1990). It is argued that better educated women are more aware of health problems, know more about the availability of health care services, and use this information more effectively to maintain or achieve good health status (Celik and Hotchkiss, 2000; Mekonnen and Mekonnen, 2003; Chakraborty et al., 2003). In most developing countries, urban dwellers may be relatively closer to health care facilities than their rural counterparts, increasing the distance from home to a health facility for rural dwellers as compared to those living in urban centers. For example Lusaka province one of the urban provinces has the highest concentration of health workers (Ferrinho et al., 2011) as opposed to rural provinces constrained most by the lack of infrastructure, roads and communication.

One of the critical Interventions for making pregnancy safer is ensuring that pregnant women have assisted deliveries by skilled attendants. However, in Zambia the availability of skilled attendants at births remains low at only 46.5% (CSO, 2009). According to the Ministry of Health, 38 women die every month on average during pregnancy and childbirth (UNDP, 2013). Reliable information about provincial maternal mortality in Zambia is essential in order to identify where the risk is highest as well as where the numbers of deaths are the largest within the country. This information is essential for mobilization of resources and implementation of specific policies to reduce maternal deaths. Some countries have set up Provincial Maternal Mortality Surveillance Systems (PMMSS) in almost all provinces in order to monitor

within country maternal mortality levels useful for prioritizing interventions relevant to the local situation (Gan et al. 2014).

Limitations

Our study has some limitations. First, we included only hospital deaths. We did not attempt to assign an underlying cause of death on the basis of the limited information available in the database. We were therefore unable to classify maternal deaths precisely as direct, indirect, or incidental. Instead, we explored the association between region codes and maternal death. Health Management Information System in Zambia does not collect individual variables on maternal deaths. These limitations have been noted elsewhere, where underreporting and lack of details in causes of maternal death have been cited that limit the use of hospital data (Gan et al. 2014). Depending on the type of facility, the rate of maternal mortality may vary significantly. Maternal mortality is difficult to measure. Even estimates derived from complete vital registration systems, such as those in developed countries; suffer from misclassification and underreporting of maternal deaths.

Conclusion

Although maternal mortality is still high in Zambia, estimated maternal mortality based on health facility reporting has been reducing from year 2011 to 2013. This is in line with the population survey reports of 2009-2014 showing reduction in maternal mortality in Zambia. The results from the HMIS revealed the same pattern as observed in the population based surveys in the differences of maternal deaths rate between regions of resident. A systematic approach to maternity care for rural–urban pregnant women is recommended.

The study calls for improvement of the health system focusing on strategies that will accelerate reduction in maternal deaths such as availability of skilled birth attendants, access to emergency obstetrics care and promotion of facility delivery. An accelerated reduction in maternal deaths will contribute towards the fulfillment of sustainable development goals. Since Zambia has failed to meet the Millennium Development Goal Five and now the SDGs which will supersede the Millennium Development Goals (MDGs) when they expire this year are in offing; global representatives have agreed on a global target for a maternal mortality ratio (MMR) of less than 70/100,000 live births by 2030 and to less than 50 per 100,000 live births by 2035 (USAID, 2015;Bustreo et al., 2013).

Health facility routine data, may assist provide useful information on trends over time and in geographic regions, and on the relative importance of different diseases and causes of death if enhanced. Routine data from health facilities can be used for monitoring and program implementation if the HMIS covers all facilities (inclusive private) and adjustment made for underreporting; all facility deaths on all wards are captured and assessment of quality of HMIS reporting on maternal health indicators is enhanced.

Conflict of interests:

The author declares no conflict of interests.

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