



Republic of Botswana

MINISTRY OF HEALTH AND WELLNESS

# 3-YEAR MATERNAL MORTALITY REPORT

(2012-2014)

Exploring Causes of  
Maternal Mortality

National Maternal Mortality Audit Committee  
Ministry of Health and Wellness



# **3-YEAR MATERNAL MORTALITY REPORT**

(2012-2014)

Exploring Causes of  
Maternal Mortality



Foreword .....	iv
Acknowledgements .....	vi
List of Abbreviations .....	vii
Definition of Terms .....	viii
List of tables.....	ix
List of figures .....	x
Executive Summary .....	xi
1.0 Introduction .....	1
2.0 Methodology .....	4
3.0 Findings.....	6
3.1 Geographical distribution .....	6
3.2 Demographic characteristics.....	8
3.3 Admission .....	10
3.4 Antenatal Care .....	11
3.5 Risks in pregnancy and management .....	13
3.6 Delivery, Peurperium and Neonatal .....	15
3.7 Causes of death .....	17
3.9 Trend analysis .....	25
4.0 Discussions.....	28
4.1 Geographical distribution .....	28
4.2 Demographic factors.....	28
4.3 Admission .....	29
4.4 Antenatal Care .....	30
4.5 Risks in pregnancy and management .....	30
4.6 Delivery, Peurperium and Neonatal .....	31
4.7 Causes of death .....	31
4.8 Standard of Maternal care.....	33
5.0 Conclusion .....	36

6.0 Recommendations.....	37
7.0 References .....	41
8.0 Appendices .....	47

## Foreword

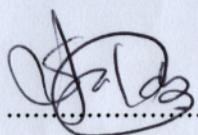
Maternal mortality information serves many different purposes globally and locally. The information helps to improve awareness in local communities, it contributes to global monitoring of progress towards MDG-5. Botswana has made tremendous progress in improving maternal death surveillance and has moved from the use of periodic estimates to real time reporting on MDG 5. The reporting which has been enacted through the public health act is linked to maternal death audits.

Despite challenges that are being encountered the Ministry of Health and Wellness (MoHW) remains committed to providing feedback to all stakeholders and to civil society and the media by publication of reports on a regular basis to strengthen collaboration that would play a major role in the reduction of maternal death. A combination of continuous political commitment, stakeholder collaboration, the right policies, financing, quality service delivery will make rapid progress in the reduction of maternal deaths. The departure of major donor funds in Botswana has created a financial dent but evidence has shown that a large proportion of maternal deaths can be averted at moderate cost through highly effective interventions. Post 2015 MDGs is the right time to implement the resolution of the UN Commission on the status of Women calling for elimination of obstetric maternal deaths and collectively develop sound public health strategies and plan to eliminate this scourge. This report is aimed at enhancing the knowledge of health care providers by appreciating the contributing factors to maternal deaths, so as to improve the quality of care in maternal and newborn health.

Completion of the National Maternal Mortality Audit Report (2012-2014), is a great achievement towards informing the healthcare system including policy makers, decision makers, stakeholders and other partners on characteristics of maternal deaths, causes of deaths and possible preventive measures. The report is

a part of continuous efforts to reduce maternal mortality by ensuring that all players identify and play their respective roles in preventing obstetric complications and maternal deaths.

It challenges us as a health system to effectively respond to women's needs during pregnancy, labour and delivery and the puerperium, to ensure delivery of quality obstetric services. In successfully producing the second Maternal Mortality Report, the National Maternal Mortality Audit Committee and all its stakeholders have done a creditable task and for that I personally applaud them. It is my belief that the Ministry of Health and Wellness (MoHW) would critical review the recommendations outlined in this report and act upon them as they provide an opportunity for decision making and accountability for women and children's health.



.....

S. El-Halabi

Permanent Secretary

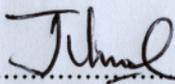
Ministry of Health and Wellness

## Acknowledgements

This report is the second Maternal Mortality Report to be produced by the National Maternal Mortality Audit Committee, the production of the report was made possible through the financial and technical support by WHO Country office during the data extraction and report writing. The Ministry of Health and Wellness would like to thank the European Union Delegation for supporting and engaging a consultant to work with the National Maternal Mortality Audit Committee to produce this report. Special thanks go to the following group who worked tirelessly to make sure that this report is produced, namely: Dr Ponatshego Gaolebale, Ms Gaopotlake Letsholathebe, Ms Boitumelo Thipe, Dr Ipuseng Sentlabane, Ms Pamela Lebodi, Ms Julia Moagi, Ms Tswelelo Kahiya, Ms Jessica Mafa-Setswalo, Ms Mabole Masweu, Ms Eva Lephirimile, Ms Bunda Morapedi, Ms Nkidi Moritshane, Dr Suzzie Saviour Anderson, Ms Lucy S. Maribe, Ms Yonnie Otukile, Dr Mothusi Mogatle, Ms Onteletse C. Kula, Ms Cecilia Chikunyane and Dr Tshenolo Kealeboga.

We would like to thank all those who, in one way or the other contributed in various ways to the realisation of this report and whose names were not mentioned. The work could have not been completed without the support of Ms. V. M. Leburu, Acting Director- Department of Public Health and Ms. B.S. Thipe, Manager Maternal and Newborn Health.

Thank you



.....  
Dr H B Jibril

Deputy Permanent Secretary

Preventive Health Services-Ministry of Health and Wellness

## List of Abbreviations

ANC	Ante-Natal Care
ART	Anti-Retroviral Therapy
BID	Brought in Dead
BDHS	Botswana Demographic and Health Survey
CDC/BOTUSA	Centre for Disease Control Botswana United State of America
DHMT	District Health Management Team
DIC	Disseminated Intravascular Coagulopathy
CPR	Contraceptive Prevalence Rate
CPAC	Comprehensive Post Abortion Care
CEMD	Confidential enquiries into Maternal Deaths
EmONC	Emergency Obstetric and Neonatal Care
HCT	HIV Counselling and Testing
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immuno-Deficiency Syndrome
HMIS	Health Management Information Systems
HELLP	Haemolysis Elevated Liver Enzymes Low Platelets
HDP	Hypertensive Disorders of Pregnancy
PIH	Pregnancy Induced Hypertension
FANC	Focused Antenatal Care
I.H.S	Institute of Health Sciences
ICD- 10	International Classifications of Diseases 10 <sup>th</sup> Edition
ICPD	International Conference on Population and Development
IMMAC	Institutional Maternal Mortality Audit Committee
IEC	Information, Education and Communication
M&E	Monitoring and Evaluation
MO	Medical Officer
MDGs	Millennium Development Goal
MoHW	Ministry of Health and Wellness
NACP	National AIDS and STI Control Program
NGO	Non-Governmental Organization
NHP	National Health Policy
PPH	Post Partum Hemorrhage
PCP	Pneumocystis Carina Pneumonia
PTB	Pulmonary Tuberculosis
PNC	Post Natal Care
PEP	Post-Exposure Prophylaxis
PMTCT	Prevention of Mother to Child Transmission
NMMAC	National Maternal Mortality Audit Committee
SBA	Skilled Birth Attendant
STI	Sexually Transmitted Infection
UNDP	United Nations Development Programme
UNFPA	United Nations Fund for Population Fund
WHO	World Health Organization

## **Definition of Terms**

### **Maternal death**

A maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Maternal deaths are subdivided into two groups:

### **Direct obstetric deaths**

Direct obstetric deaths are those resulting from obstetric complications of the pregnancy state (pregnancy, labour and the puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.

### **Indirect obstetric deaths**

Indirect obstetric deaths are those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by physiologic effects of pregnancy.

### **Coincidental**

Deaths from unrelated causes which happened to have occurred in pregnancy or puerperium

### **Unknown**

Deaths during pregnancy or the puerperium where an underlying cause is not identified

### **Substandard care**

Substandard care in this report was defined as all care factors (patient, administrative or health worker) that may have resulted in low standards of care and which had a negative influence on the chain of events leading directly or indirectly to maternal death.

## **List of tables**

Table 1: Botswana Maternal Mortality Ratio 2008 – 2011 (Statistics Botswana 2011)

Table 2: Distribution of maternal deaths in Botswana health districts according to year

Table 3: Demographic characteristics of maternal deaths

Table 4: The number of maternal deaths and their status at admission

Table 5: The number of maternal deaths and their characteristics at ANC

Table 6: The number of maternal with pregnancy risks of interest

Table 7: The number of maternal deaths and their characteristics during labour and delivery

Table 8: Direct maternal causes of death classified according to WHO MM ICD codes death (2012-2014)

Table 9: Indirect causes of maternal death classified according to WHO MM ICD codes (2012-2014)

Table 10: Distribution of maternal deaths according to the factors of sub-standard of care

## List of figures

Figure 1: Maternal mortality ratio and the MGD maternal mortality target

Figure 2: Distribution of maternal deaths according to geographical area

Figure 3: The number of HIV positive maternal deaths and their ART status

Figure 4: The number of maternal deaths with anaemia and their management

Figure 5: The number of deliveries and the management of third and fourth stage of labour

Figure 6: Distribution of maternal deaths according WHO\_ICD10 causes of deaths

Figure 7: Distribution of maternal deaths due to Post Partum Haemorrhage

Figure 8: Maternal deaths distributed according to the sub-categories of sub-standard care received

Figure 9: The trend of the three leading causes of maternal deaths over an eight-year period

Figure 10: The trend of Direct and Indirect causes of maternal deaths over an eight-year period

Figure 11: The trend of sub-standard care over an eight-year period

## **Executive Summary**

The 2015 target date for the Millennium Development Goals (MDGs) has already elapsed, however, ending preventable maternal mortality still remains an unfinished agenda and one of Botswana's most critical challenges despite significant progress over the past decade in Universal Access to Health. Although maternal deaths worldwide have decreased by 45% since 1990, women still die each day in Botswana from largely preventable causes before, during, and after the time of giving birth. The ability to count every maternal and newborn death is essential for understanding immediate and underlying causes of these deaths and developing evidence-based, context-specific programme interventions to avert future deaths. The maternal mortality ratio (MMR) in Botswana has remained relatively high with no significant reduction between 2012 and 2014.

In Botswana, more than 95% of women give birth in hospitals which is a plus for the health system since it offers an opportunity to provide obstetric emergency services to the pregnant women. Majority 191(88%) of the maternal deaths occurred within the health facility giving the health workers an opportunity to offer obstetric emergency care services. The 2012-2014 report shows that over a third of deaths were admitted in stable condition and 79% died after delivering. However, it is worrying that close to 10% of maternal women died at home. The median age (29) of the women who died is within the acceptable child bearing years. The higher proportion of maternal deaths is among single women. Close to two thirds have attained secondary education. The causes of maternal deaths still remain abortion related, obstetric haemorrhage, hypertensive disorders of pregnancy and Medical and surgical conditions. There is also sub standard care that is associated with the maternal deaths. The 2012-2014 triennial report results are not statistically significant from the previous five year report. Therefore, significant inroads in reducing maternal mortality cannot be made by only substantially increasing access to emergency obstetric care services without improving the quality of care.

The death of a mother is not just a death of an individual. It reverberates through the family, community and adversely impacts the country's human and economic development. Attention to maternal mortality and morbidity must be accompanied by improvements along the continuum of care for women and children, including commitments to sexual and reproductive health and newborn and child survival. Concrete political commitments and financial investments by the Botswana government and development partners are necessary to meet the

post 2015 targets and carry out the strategies for ending preventable maternal mortality.

The Continental Policy Framework on Sexual and Reproductive health and Rights and the Maputo Plan of Action (MPoA) for the Framework's implementation, remain key tools for Africa to attain post MDGs 4 and 5. The Campaign on Accelerated Reduction of maternal Newborn and Child Mortality in Africa (CARMMA) serves as a critical advocacy platform for improvement of Maternal Newborn and Child Health (MNCH). To keep abreast, the Government of Botswana has also established several initiatives to re-affirm its commitment towards achieving the set post Millennium Development Goals (MDGs) four (4) and Five (5). Those initiatives include capacity building through Emergency Obstetric and Neonatal Care (EmONC) training, Quality Improvement Initiative for Maternal and Newborn Mortality Reduction and establishment of the Maternal Mortality Surveillance and Response System. Despite having successfully done well in maternal death surveillance it is time to take the right step in the right direction and start implementing the response to the surveillance.

## Key Recommendations

- The Ministry of Health and Wellness should develop and implement a functional comprehensive post abortion counselling strategy and ensure that all women are discharged from a health facility with provision of contraception at the point of service.
- The Ministry of Health and Wellness should prioritize and implement high impact health interventions that will strengthen the quality of antenatal care, pre-partum and post-partum to ensure that the continuum of care leads to better health outcomes for pregnant women.
- Department of Clinical Services (DCS) should set up high risk clinics in every district to improve management of high risk pregnant women (hypertensive, diabetes and multipara etc) in a well-coordinated approach.
- Obstetrician and Gynaecologists based at the referral hospitals should be on a direct telephonic link for 24 hours to provide specialist emergency support to district and primary hospital doctors both in the south and northern part of the country.
- The Obstetrician and Gynaecologists that are based at referral hospitals should to be responsible for supervising, supporting and mentoring health care workers on maternal and newborn health care (EmONC and CPAC) within their catchment area emphasizing on ectopic pregnancy, miscarriage, resuscitation particularly the need for immediate action if the patient is in shock.
- Department of Clinical Services should develop an orientation system which focuses more on maternal and newborn health care that all health workers (Doctors and Midwives) are expected to successfully complete under the guidance of a qualified Obstetrician and Gynaecologist before they are posted either to the district or primary hospitals.
- The Department of Clinical Services should revived Domiciliary nursing and necessary resources (for example transport and human resource) be availed to improve the quality of care after delivery and reduce sepsis related infections.

- The Hospitals and DHMTs management should monitor adherence to protocols and guidelines and take disciplinary actions against all health workers who fail to adhere to protocols.

---

\*Should be the chair where Ob/Gyn is not available.

---

## **Composition of District**

### **Maternal Mortality Audit**

#### **Committee**

- Head DHMT (Co-chair)
- Head of Ob/Gyn (Co-chair)
- Hospital Superintendent / Chief Medical officer\*
- Matrons (clinics and hospitals)
- Doctors and Nurse / midwife in-charge of clinics and Hospitals.
- Representatives from all clinics and maternity and gynae units
- Head of Midwifery in I.H.S

- Maternal Mortality (Secretary)

- Focal person for abortions care

- Quality Improvement Coordinators for MMRI

- All EmONC trained

*To be invited when necessary*

- Focal person PMTCT
- Pharmacist or technician
- Laboratory personnel
- Radiologist
- Physicians
- Anaesthetist
- Private Practitioner
- Paediatrician

## **Terms of Reference of District Maternal Mortality Audit**

### **Committee**

- Verify if it is maternal death as per definition and review facility and community deaths
- Establish causes of death using ICD-10 coding

- Conduct or support verbal autopsy for all “brought in dead cases” (BID)
- Assess quality of medical care and determine modifiable factors associated with maternal death
- Provide recommendation for immediate actions at district level and incorporate recommendations in annual plans
- Compile quarterly and annual reports on districts maternal mortality and send a copy to Head of DHMT and Secretariat National Maternal Mortality Committee
- Submit weekly notifiable maternal mortality report to be reported to IDSR Unit in Disease Control Division

## **Composition of National Maternal Mortality Audit Committee**

- National Coordinator for MMRI - Chair
- UB School of Nursing
- WHO
- HIV/AIDS Dept

- I.H.S
- Midwives
- Registered Nurses
- Doctors
- Obs /Gynae
- CDC/BOTUSA
- Maternal and Newborn Health program - Secretariat National

## **Terms of Reference of NMMAC**

- To study and evaluate all confidential reports on maternal mortality from across the country.
- To conduct periodic visits to selected Health Facilities to collect additional information where necessary.
- To collate and analyse the data into usable information
- To make final report and recommendations on each reported maternal death and forward it to the institutions in order to improve service delivery
- To approve a comprehensive national annual report and share it with relevant authorities
- To periodically recommend review of the national guidelines on maternity care in a view to improve service delivery.
- To participate and facilitate in periodic, annual seminars and symposia on Safe motherhood.
- To co-opt additional members with different expertise as and when necessary

## **1.0 Introduction**

Maternal mortality is a good indicator of the overall performance of a health system. It is estimated that in 2015, about 830 women died due to complications of pregnancy and child birth every day across the world. Almost all of these deaths occurred in low-resource settings, and most could have been prevented. Of the 830 daily maternal deaths, 550 occurred in sub-Saharan Africa and 180 in Southern Asia, compared to 5 in developed countries. The major concern in developing countries, Botswana included, is that the risk of a woman dying from a maternal-related cause during her lifetime is about 33 times higher compared to a woman living in a developed country. Despite accumulation of evidence on causes of maternal deaths and interventions needed to avert them; maternal mortality still remains very high. The number of women dying due to complications during pregnancy and childbirth has decreased by 43% from an estimated 532 000 in 1990 to 303 000 in 2015. The progress is notable, but the annual rate of decline is less than half of what is needed to achieve the Millennium Development Goal (MDG) target of reducing the maternal mortality ratio by 75% between 1990 and 2015, which would require an annual decline of 5.5% in Botswana. The 44% decline since 1990 translates into an average annual decline of just 2.3%. Between 1990 and 2000, the global maternal mortality ratio decreased by 1.2% per year, while from 2000 to 2015 progress accelerated to a 3.0% decline per year.

Progress in maternal mortality is off-track: for example, between 1990 and early 2000, maternal mortality dropped from a high of 326 deaths per 100,000 live births to 135 deaths per 100,000 live births in 2005, but has since increased to 163 deaths in 2010 and 189 deaths in 2012, as shown in Figure 1. However, there was a notable progress in MDGs between 1991 and 2005, with maternal mortality ratio dropping from to 135 per 100 000 live births. However, since 2005 the ratio has been fluctuating between 140 and 190 per 100 000 births.

The MMR shows an increase from 163.0 to 188.86 per 100,000 live-births between 2010 and 2011.

Several initiatives have been adopted and implemented in Botswana and the maternal mortality still remains high. Botswana introduced the Safe Motherhood Initiatives in 2000, started EmONC trainings for both midwives and doctors in 2010. In 2013, the country introduced Maternal Mortality Reduction Initiative (MMRI) whose aim was to improve the quality of maternal health. The results from the 2007-2011 maternal report indicated that direct causes accounted for at least two thirds (65%) of death consistent with findings from several developing countries (Kongnyuy et al 2009).

**Table 1: Botswana Maternal Mortality Ratio 2008 – 2011 (Statistics Botswana 2011)**

	2007	2008	2009	2010	2011	2012	2013	2014
<b>Institutional live births</b>	44,452	44,212	45,145	49,853	44,904	49,957	49,771	47,273
<b>Non-Institutional live-births</b>	247	749	220	475	104	91	68	205
<b>Total live-births</b>	44,699	44,961	45,365	50,328	45,008	50,048	49,839	47,478
<b>Maternal Deaths</b>	82	88	86	82	85	74	91	72
<sup>1</sup> <b>Audited Deaths</b>	71	60	78	64	73	70	80	66
<b>Maternal Morality Ratio (per 100,000 live-births)</b>	183.45	195.73	189.57	163.0	188.86	147.9	182.6	151.6

The average rate of auditing has been between 87% and 92% during the period 2007-2014. The maternal mortality ratio has been fluctuating between 326 and 151.6 between 1990 and 2014.

<sup>1</sup> The rate of auditing is the percentage of audited deaths among all deaths reported in a year

The stagnancy in the decline of the maternal mortality ratio forced Botswana to introduce the confidential enquiry of maternal deaths in 2005. It was not until 2013 that the first comprehensive report into maternal deaths in Botswana was completed and published in 2014, and dealt in detail with maternal deaths occurring during 2007-2011 (Ministry of Health 2012). This report described the magnitude of the problem, the pattern of disease causing maternal deaths, the modifiable factors, and the substandard care related to these deaths and made specific recommendations to decrease the number of maternal deaths.

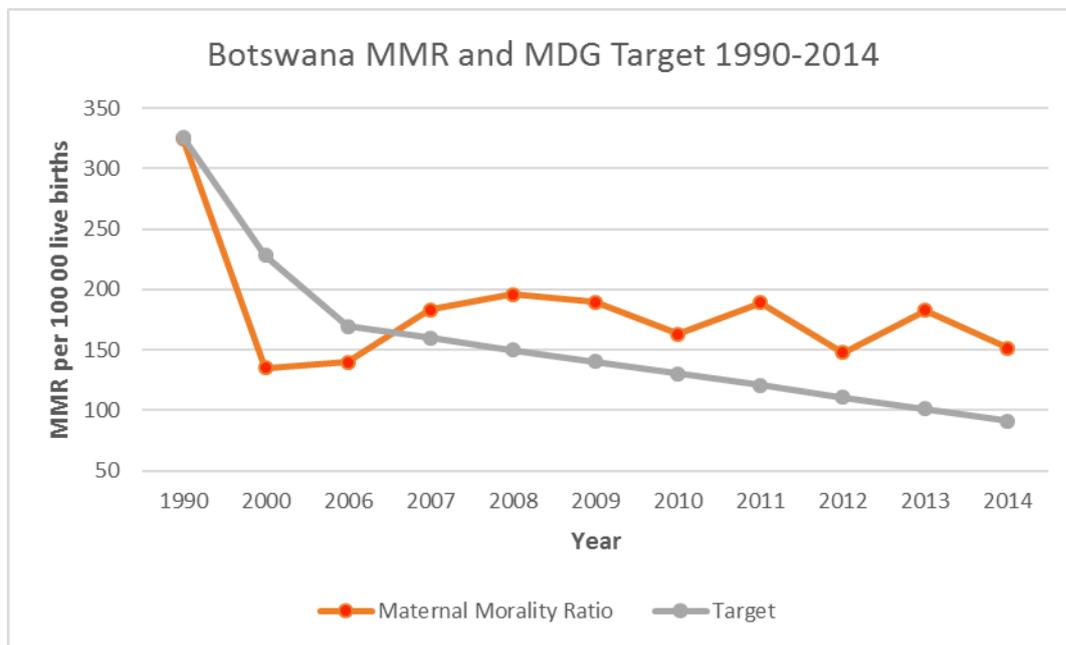


Figure 1: Maternal mortality ratio and the MDG maternal mortality target

## **2.0 Methodology**

This was a cross sectional study of women who died while pregnant or giving birth or after they had delivered within the period of January to December 2012-2014. This report utilized operational data that is collected routinely across facilities whenever a maternal death occurs. The overall objective of this report is to profile all audited maternal deaths, determine the leading causes of deaths and the contributory and modifiable factors in order to provide recommendations for improving the clinical management and safety of deliveries in health facilities in Botswana.

The official number of maternal deaths recorded in the country by Statistics Botswana was 237 for the period 2012-2014. However, the committee was only able to audit 216 (91.5%) deaths during the same period. Though the National Maternal Mortality Audit Committee (NMMAC) would have liked to audit all the maternal death cases, lack of the necessary documents dealt them a blow. Therefore, the analysis in this report was only based on the 216 maternal deaths that were audited. The remaining 21 unaudited maternal deaths were due to various reasons ranging from lost records to non-institutional deaths that do not have a verbal autopsy. However, the calculation of the national MMR, released annually by Statistics Botswana utilize all the maternal deaths that occurred in the country. Botswana Maternal Mortality Ratio for the period 1990 to 2014 is given in Table 1.

## **Data Collection**

In preparation for the development of 2012-2014 Maternal Mortality Report, a data extraction tool was developed to extract information from the patients' files and audit reports. The tool was pilot tested (to measure reliability) before use and all the committee members who were involved in data extraction were trained on the use of the tool. Data extracted included demographic characteristics such as age, sex, education and marital status, parity and gravidity; pregnancy status at death, HIV history as well as Anti-Retroviral Therapy (ART) status. A form which shows the data that was extracted is attached, with details of variables that were collected in the appendix.

Apart from demographic characteristics, the study also extracted information on time and date of death, history of antenatal attendance and history of pregnancy related risks. This study will not have information on treatment outcomes. Such information would require a longitudinal data from the clinical records.

## **Data management and analysis**

Members of the NMMAC with a medical background were trained on the use of the data extraction sheet. The members extracted data from patients' records using the developed data collection tool. Data was double entered into EPI INFO database that was pilot tested before use and modified before the data extraction. The data was cleaned and analyzed using STATA. The analysis includes descriptive analysis of the study population. Frequency tables of demographic and clinical factors were also produced, including causes of maternal death.

### 3.0 Findings

#### 3.1 Geographical distribution

For the 3-year reporting period (2012-2014), there were 216 maternal deaths that were audited nationally. Majority of deaths occurred in the eastern margin of the country where population is more densely distributed and there is a higher concentration of health facilities. These findings are consistent with results from the 2007-2011 report. The map below depicts the geographical distribution of the maternal deaths.

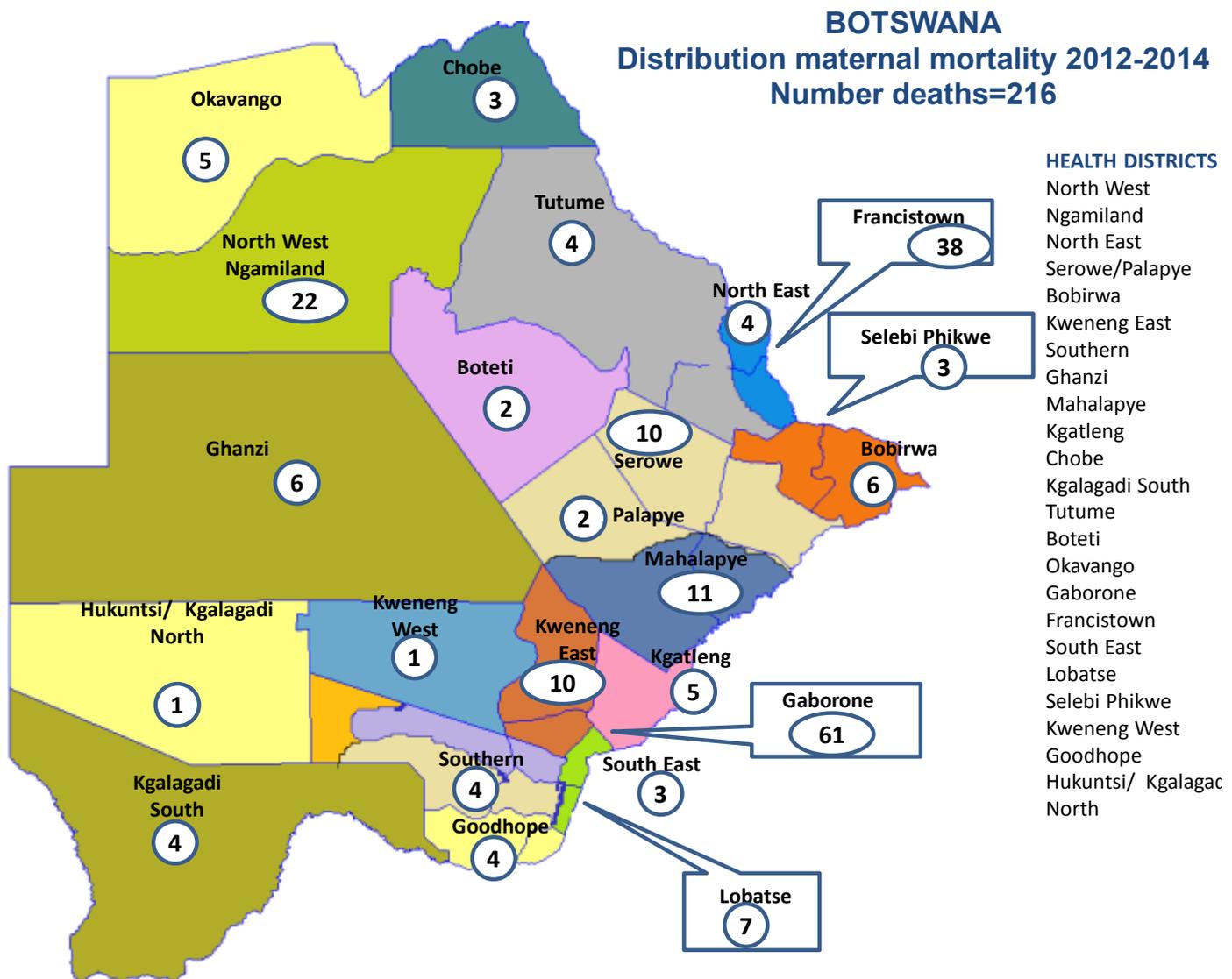


Figure 2: Distribution of maternal deaths according to geographical area

**Table 2: Distribution of maternal deaths in Botswana health districts according to year**

District	2012	2013	2014	Total	%
Gaborone	15	28	18	61	28%
Francistown	10	13	15	38	18%
Ngami	8	7	7	22	10%
Mahalapye	4	4	3	11	5%
Serowe	3	3	4	10	5%
Kweneng East	4	2	2	8	4%
Lobatse	1	5	1	7	3%
Bobirwa	3	0	3	6	3%
Ghanzi	3	2	0	5	2%
Kgatleng	0	0	5	5	2%
Okavango	2	2	1	5	2%
Southern	2	1	1	5	2%
Goodhope	2	2	0	4	2%
Kgalagadi South	3	1	0	4	2%
North East	3	1	0	4	2%
Tutume	1	3	0	4	2%
Chobe	0	1	2	3	1%
Selibe Phikwe	1	1	1	3	1%
South East	3	0	0	3	1%
Boteti	1	1	0	2	1%
Palapye	0	2	0	2	1%
Kgalagadi North	1	0	0	1	0%
Kweneng West	0	1	0	1	0%
<b>Total</b>	<b>70</b>	<b>80</b>	<b>66</b>	<b>216</b>	<b>100%</b>

Similarly to what was observed in the 2007-2011 report, the trend in the distribution of maternal deaths in the first seven districts in the current report remains unchanged. The seven districts altogether contributed more than two thirds of all the maternal deaths over all the entire period. The Gaborone and

Francistown districts that are host to the two major referral hospitals for the southern and northern regions respectively take up 46% of the deaths. The table above illustrates the total number of maternal deaths (216) from 2012 to 2014 as reported from the facilities within the districts. The maternal deaths in 2012 were 70(20.5%), 80(37.0%) in 2013 and 66(30.6%) in 2014. Noticeable change in the distribution of maternal deaths are found in Francistown district where there was a rise from 14% in 2012 to 23% in 2014. However, Gaborone district experienced differential results over the three-year period. The other four three districts namely: Ngamiland, Mahalapye, Serowe and Kweneng East have remained more stable between 2012 and 2014.

### **3.2 Demographic characteristics**

The median age for the maternal deaths is 31 years with an inter quartile range of 26-36 years. The median age for 2012-2014 is very close to 29 years which is an estimate from the previous report. However, the age had a higher variability with a standard deviation of 6.60 years. More than two thirds of the women who died were aged 25-39 years old. Table 2 below shows that the majority 103[47.7%] of the maternal deaths occurred among women who had attained secondary education. Similar results were obtained from the 2007-2011 analysis. However, 56 (25.9%) cases had missing information on educational status compared with 35% in the previous report. As it was observed in the previous report, close to two thirds of the women who died were single. Fifty-nine (59%) of the women who died were between para<sup>2</sup> one and three while for gravidity<sup>3</sup> that figure is lower at 57%. These results do not differ significantly with observations from the previous 5-year report. The number of non-citizen women who died has reduced to 18 (8.3%) compared with 36 (10%) in 2007-2011 findings.

---

<sup>2</sup> Para, indicates the number of pregnancies reaching viable gestational age (including livebirths and still births)

<sup>3</sup> Gravidity, indicates the number of times a woman is or has been pregnant regardless of the outcome.

**Table 3: Demographic characteristics of maternal deaths**

		<b>Number (%)</b>
<b>Variable</b>		
<b>Age group</b>	15-19 years	9 (4.2)
	20-24 years	35(16.2)
	25-29 years	45(20.8)
	30-34 years	62(28.7)
	35-39 years	45(20.8)
	40-44 years	19(8.8)
	45-49 years	1(0.5)
<b>Educational status</b>	None	9(4.2)
	Primary	23(10.7)
	Secondary	103(47.7)
	Tertiary	25(11.6)
<b>Variable</b>		<b>Number (%)</b>
	Unknown	56(25.9)
<b>Parity</b>	Nil	29(13.4)
	1 <sup>st</sup> child	40(18.5)
	2 <sup>nd</sup> child	51(23.6)
	3 <sup>rd</sup> child	37(17.1)
	4 <sup>th</sup> child	20(9.3)
	5 <sup>th</sup> or more	34(15.7)
	Unknown	5(2.3)
<b>Gravidity</b>		
	1 <sup>st</sup> pregnancy	38(17.6)
	2 <sup>nd</sup> pregnancy	37(17.1)
	3 <sup>rd</sup> pregnancy	50(23.2)
	4 <sup>th</sup> pregnancy	32(14.8)
	5 <sup>th</sup> or more	54(25.0)
	Unknown	5(2.3)
<b>Marital status</b>	Divorced	9(4.2)
	Married	33(15.3)
	Single	139(64.4)

	Widowed	1(0.5)
	Unknown	34(15.7)
<b>Nationality</b>	Citizens	196(90.7)
	Non-citizens	18(8.3)
	Unknown	2(1.0)

The median parity was 2 with an interquartile range (1-4). About a quarter of the maternal deaths were among multiparous women.

### 3.3 Admission

**Table 4: The number of maternal deaths and their status at admission**

		Number (%)
<b>Variable</b>		
<b>Status at Admission</b>	Stable	98(45.4)
	Critical	92(42.6)
	Dead	25(11.6)
	Unknown	1 (0.4)
<b>Pregnancy status at death</b>	Delivered	125(57.9)
	Pregnant	37(17.1)
	Abortion	54(25.0)
<b>Referral</b>	Yes	104(48.1)
	No	112(51.9)

Table 3.2 illustrates that out of the total 216 maternal deaths 25(11.6%) were admitted in hospital already deceased (brought in dead). Those who were admitted either critical or stable make up more than three quarters. More than half of the women died after delivery. The referral cases were more than a third of all the cases. Of all the 104 that were referred, 97(93.3%) were

appropriately referred for higher level care 95(97.9%) and 2(2.1%) because of lack of supplies.

### 3.4 Antenatal Care

Table 5: The number of maternal deaths and their characteristics at ANC

Variable		Number (%)
<b>Attended ANC</b>	Yes	140(64.8)
	No	69(31.9)
	Unknown	7(3.3)
<b>Number of ANC visits</b>	1-3 visits	49(35.0)
	4 visits	13(9.3)
	5 or more visits	69(49.3)
	Unknown	9(6.4)
<b>Trimester</b>	One	32(14.8)
	Two	44(20.4)
	Three	133(61.6)
	Unknown	7(3.2)
<b>HIV status</b>	Positive	103(47.7)
	Negative	84(38.9)
	Unknown	29(13.4)

At least 60% of the women who died attended had Antenatal Care (ANC). Although Botswana is not practicing Focused Antenatal Care (FANC), more than two third of the women attended ANC four times or more, with a median of five antenatal visits and the highest number of visit standing at 14. Accordingly, WHO (Focused Antenatal Care (FANC)) recommends that pregnant women should attend ANC at least four (4) times unless if there are any other risks identified. However, Botswana has adopted a FANC with six (6) scheduled visits (Ministry of Health 2015). This may explain why women attended 4 or more visits. The number of pregnant women who had abortion

make up more than half 35(50.7%) of all those who didn't attend ANC. The above results show that patients who had four and more visits are the ones who died most as compared to those who have one to three visits. The median gestational age at registration was 19 weeks with interquartile range of (9-23).

The majority of women 133(61.6%) die in the third trimester and this is consistent with results that showed that most deaths took place after delivery. Similar to the 2007-2011 report, 213 (62%) of deaths occurred during the third trimester. The unknown are likely to included abortions and brought in dead. The third trimester deaths indicate that the majority of pregnancies are carried to term which gives health care system enough opportunity for risk identification and appropriate interventions. HIV status was known for 187(87%) of the maternal deaths and 29(13%) were unknown.

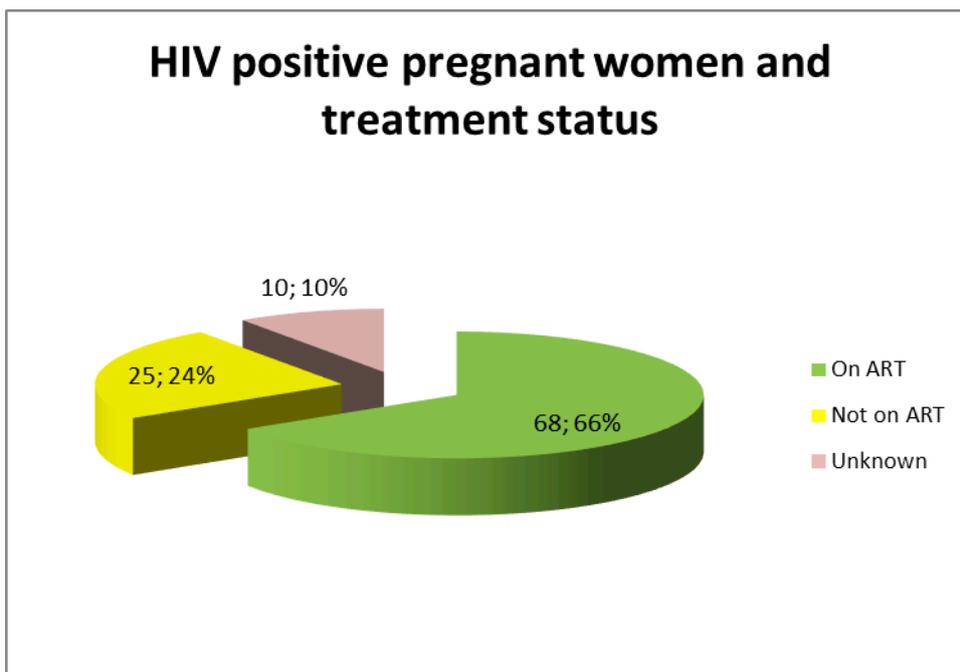


Figure 3: The number of HIV positive maternal deaths and their ART status

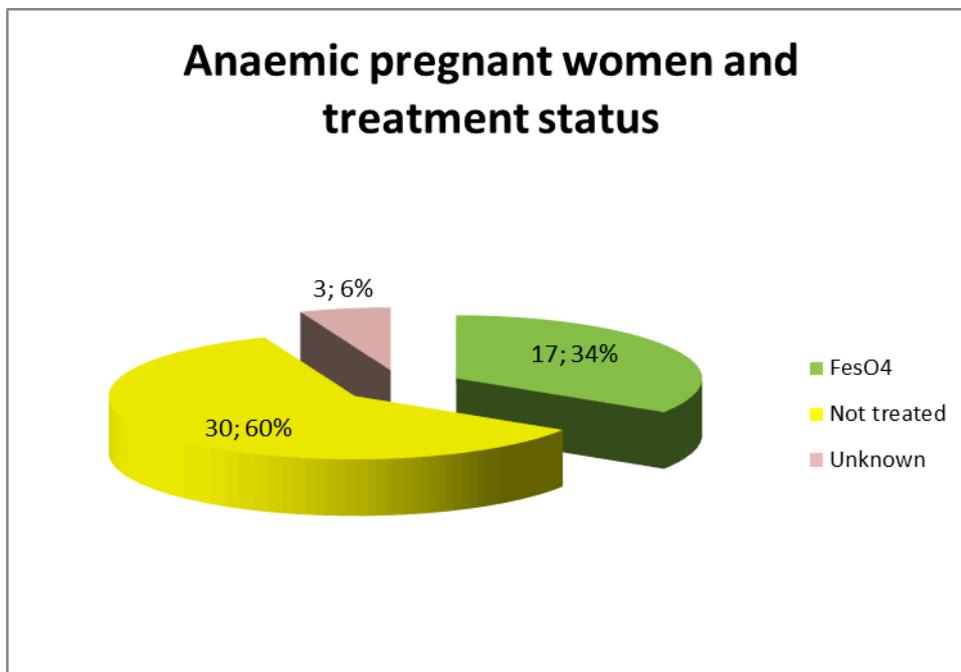
Of those 187 whose HIV status was known, 84(45%) were HIV negative while 103 (55%) were positive. These estimates are inconsistent with what was observed in the previous report: 80% had known HIV status and 72% were HIV positive. Botswana PMTCT guidelines were revised in 2011 hence all the 103 HIV positive pregnant women were eligible for antiretroviral therapy (ART) regardless of CD4 count. Despite that, only 68(66%) of the HIV positive pregnant women who died were initiated on ART and in contrast, this estimate was 47% in the 2007-2011 report. However, that was expected to be so since during that period the eligibility was based on CD4 count. That time the eligibility evolved from <250 to 350 cells/mm<sup>3</sup>. Among, the 103 that were HIV positive there were five (5) non-citizens, two of those were receiving ART most likely in the private sector.

### 3.5 Risks in pregnancy and management

Table 6: The number of maternal with pregnancy risks of interest

Variable		Number (%)
Previous two caesarean section	Yes	13(6.0)
	No	202 (93.5)
	Unknown	6(0.5)
Severe Pre-Eclampsia	Yes	45(20.8)
	No	171 (79.8)
Mild Pre-Eclampsia	Yes	6(2.8)
	No	210(97.2)
Anaemia	Yes	50(23.2)
	No	158(73.1)
	Unknown	8(3.7)

The most common risk in pregnancy among women who died was anaemia followed by severe pre-eclampsia and previous two caesarean sections. The type of analysis was not conducted in the 2007-2011 report. Eleven cases (22.0%) of all the anaemia cases were among obstetric Heamorrhage causes of death and nine were associated with Post Partum Heamorrhage (PPH). There were 31(68.9%) pregnant women who had severe pre-eclampsia who eventually died from hypertensive disorders of pregnancy (HDP) related causes. Women who had mild pre-eclampsia during pregnancy and died from HDP related causes were 1(16.7%).



**Figure 4: The number of maternal deaths with anaemia and their management**

The appropriate treatment of anaemia during data extraction was characterized by provision of Folic acid (FesO<sub>4</sub>). Out of the 50 cases of anaemia only 17(34.0%) were appropriately treated. The figure on treatment of anaemia also shows that more than half of all the anaemia cases 30(60.0%) were not appropriately treated. There were 13 maternal deaths with two previous caesarean sections. More than a quarter of those women 4(30.8%),

were managed through elective caesarean section after 37 completed weeks of gestation. None of the 13 women had Emergency caesarean section performed and 8(61.5%) women were not managed appropriately. There was one 1(7.1%) woman who had no evidence of any form of management.

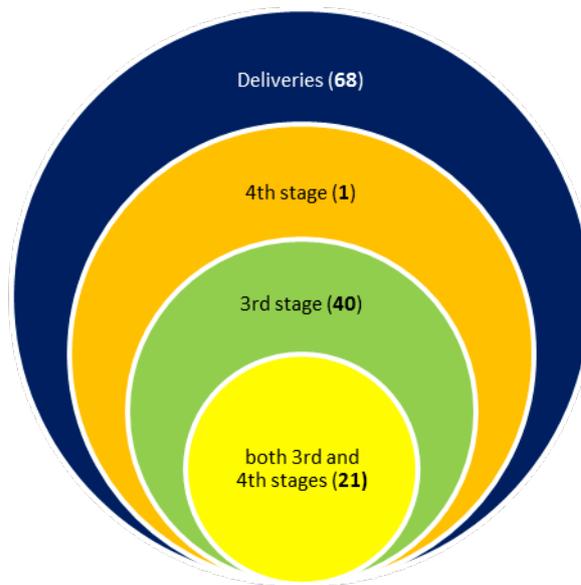
Women who had severe pre-eclampsia were managed as follows; 10(22.2%) were delivered within 6 hours, 19(42.2%) received no management for their severe pre-eclampsia and 16(35.6%) had no documentation. There was 1(16.7%) woman with mild pre-eclampsia who was given Magnesium Sulphate (MgSO<sub>4</sub>) and 2(33.3%) delivered after 37 completed weeks of gestation. Another 2(33.3%) were both administered MgSO<sub>4</sub> and delivered after 37 completed weeks of gestation. One women 1(16.7%) had no documentation for management of mild pre-eclampsia.

### 3.6 Delivery, Peurperium and Neonatal

Table 7: The number of maternal deaths and their characteristics during labour and delivery

Variable		Number (%)
Did labour occur	Yes	90 (41.7)
	No	126 (58.3)
Mode of delivery	SVD	65 (52.0)
	Caesarean Section	55 (44.0)
	Breech	2 (1.6)
	Vacuum extraction	1 (0.8)
	Unknown	3 (2.4)
Delivery outcome	Alive	93 (74.4)
	Fresh stillbirth	22 (17.6)
	Macerated stillbirth	5 (4.0)
	Neonatal death	2 (1.6)
	Unknown	3 (2.4)

There were 126 women who were reported to have died after delivery and 90 (41.7%) had experienced labour. From the 126 who didn't experience labour; 37 (29.4%) died whilst pregnant, 54 (42.9%) had abortion. Close to more than a third 65 (52.4%) of all the deliveries were spontaneous vertex delivery (SVD) and caesarean sections accounted for 44.0%. Majority 93 (74.4%) of all the deliveries were live births and fresh still births were more than one tenth 22(17.6%).



**Figure 5: The number of deliveres and the management of third and fourth stage of labour**

The above figure indicates a total 129 deliveries. However, only 68 (who according to protocol are supposed to be monitored at both third and four stage of labour) were analysed and these included SVD, breech and vacuum extraction deliveries. The management of either third stage or fourth stage was performed in 61 (89.7%) of the deliveries. Less than half 21 (30.9%) of those deliveries were monitored for both third and fourth stage of labour. Pregnant women who were managed only at third stage were more than half (89.7%) of the 68 deliveries, however, the management of fourth stage only was very low 1 (1.5%). The partogram was used with 40(58.8%) of the 68 deliveries analysed (Refer to figure 5).

### 3.7 Causes of death

The causes of death were classified using the WHO Maternal Mortality (MM) International Classification of Disease (ICD) codes. The main categories that were used are: Obstetric Haemorrhage (OH), Hypertensive disorders of Pregnancy (HDP), Pregnancy with abortive outcome, Pregnancy related infections, Other Obstetric Complications, Unanticipated complications of management, non-obstetric complications (further split into HIV related and medical and surgical conditions) and unknown/undetermined causes of maternal death.

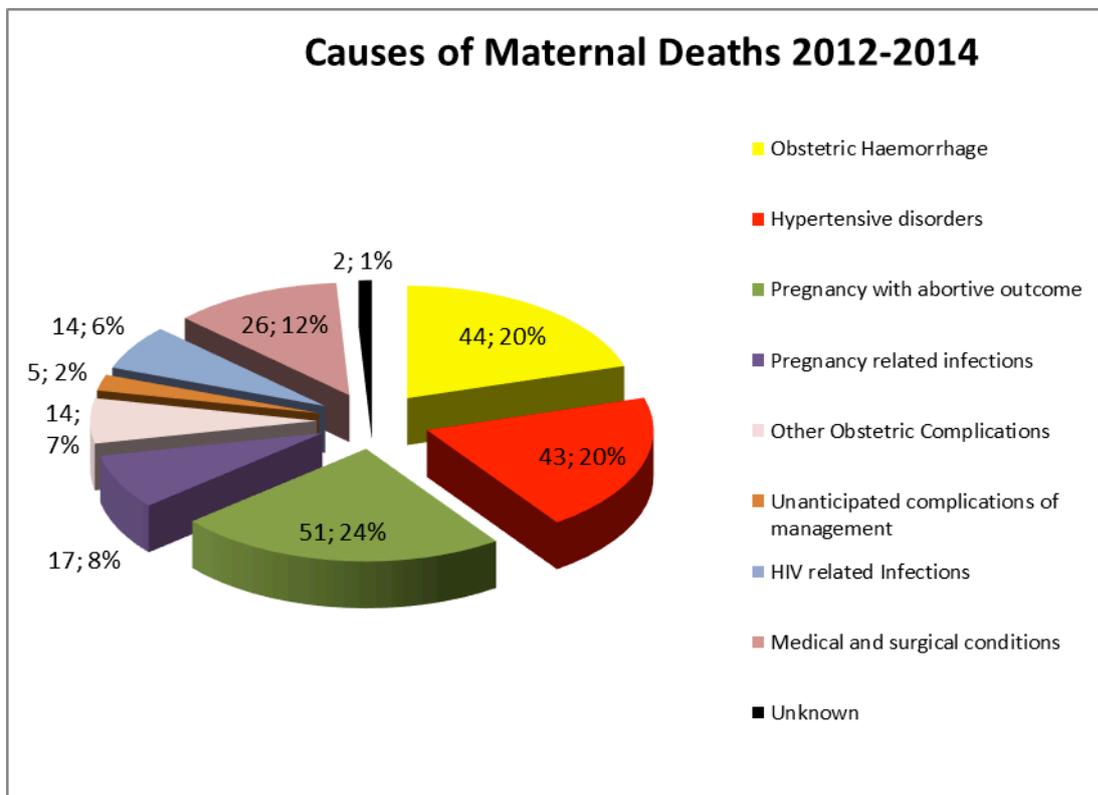


Figure 6: Distribution of maternal deaths according WHO\_ICD10 causes of deaths

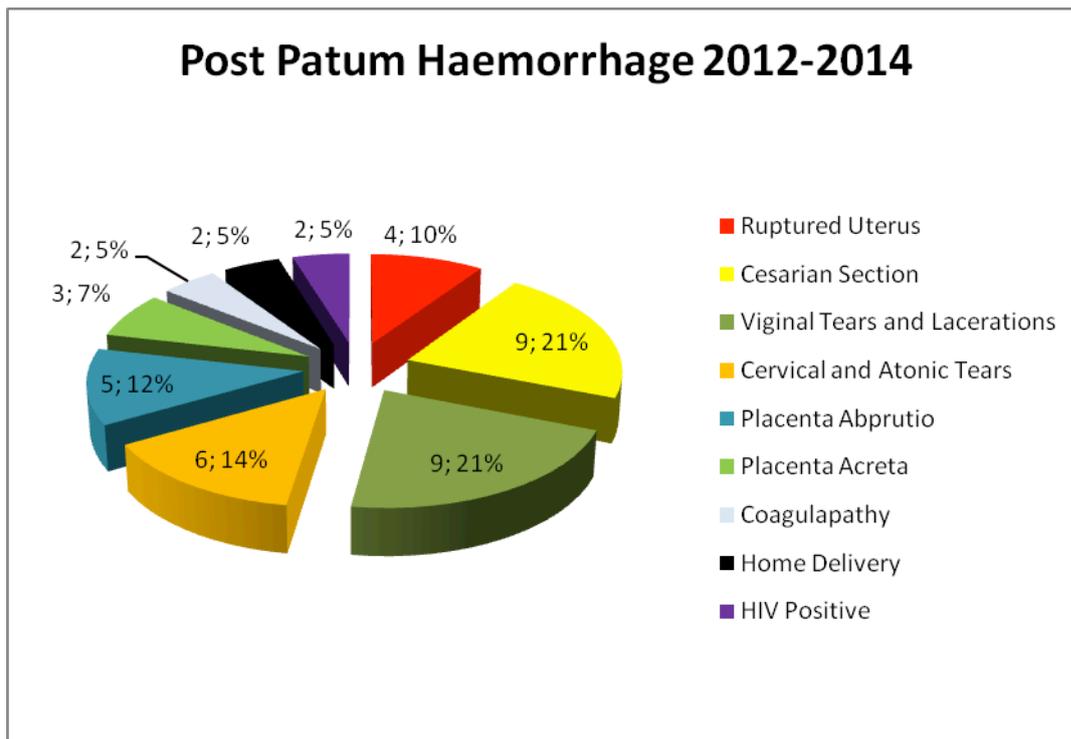
Over the three-year period the direct causes of death have remained the major leading causes of death at 174 (80.6%). There were only 2 (0.9%) maternal deaths that were not assigned a cause of death.

Table 8: Direct maternal causes of death classified according to WHO MM ICD codes death (2012-2014)

Causes of Death	Number of Deaths N=174 (80.6%)	
Obstetric Haemorrhage	44(20.4%)	Obstetric Haemorrhage Causes
Post-Partum Haemorrhage		43(97.7%)
Thrombocytopenia		1(2.3%)
Hypertensive Disorders	43(19.9%)	Hypertensive disorders Causes
Eclampsia		22(51.2%)
Pulmonary Oedema		8(16.8%)
Pre-eclampsia		7(16.3%)
Post Partum Eclampsia		4(9.3%)
HELLP syndrome		2(4.7%)
Pregnancy with Abortive Outcome	51(23.6%)	Pregnancy with Abortive outcome Causes
Septic abortion		39(78.0%)
Ruptured Ectopic		6(11.8%)
Incomplete Abortion		5(9.8%)
Molar pregnancy		1(2.0%)
Pregnancy Related Infections	17(7.9%)	Pregnancy Related Infections Causes
Puerperal sepsis		14(82.4%)
Sepsis		3(17.7%)
Other Obstetric Complications	14(6.5%)	Other Obstetric Complications Causes
Pulmonary Embolism		4(28.6%)

Hyperemesis Gravidarum		3(21.4%)
Post Partum Cardiomyopathy		1(7.1%)
Peripartum Cardiomyopathy		2(14.3%)
Peripartum Cardiomyopathy		1(7.1%)
Cardiomyopathy		1(7.1%)
Amniotic Embolism		1(7.1%)
Thrombo embolism		1(7.1%)
Unanticipated Complications of Management	5(2.3%)	Unanticipated Complications of Management Causes
Anaesthesia		5(100.0%)

Among the 174 direct maternal deaths, the leading causes of death are Pregnancy with abortive outcome 51 (23.6%), Obstetric Haemorrhage at 44 (20.4%), followed by hypertensive disorders of pregnancy 43 (19.9%) and Non-obstetric complications 40 (18.5%) each. There were only 2 (0.9%) maternal deaths that couldn't be assigned a cause of death due to insufficient documentation from the patient files. The leading causes of death have remained similar to the findings from 2007-2011 maternal report and the only change is the order of the top four. 15 (34.9%) of the abortion related maternal deaths were among the 25-29-year-old but overall the clustering was between 25-44 years. Gravida three had the highest 14 (29.2%) number of abortion cases while parity two had 12 (25.0%). More than a half 25 (52.1%) of all the abortion cases were HIV positive.



**Figure 7: Distribution of maternal deaths due to Post Partum Haemorrhage**

The Obstetric Haemorrhage causes are predominately due to PPH which accounted for more than three quarters 42 (95.4%) in that category. Of the 42 PPH cases, 23 (54.8%) were HIV positive slightly above the results from the five-year report. Proportion of PPH among para two and three women was 17 (40.5%) while four and five was not significantly different with 15 (35.7%). Half 22(51.2%) of the HDP cases are due to Eclampsia which is either mild or severe. Septic abortion 39 (76.5%) was the leading cause of death among the women with abortive outcomes. Pregnancy related infections among women who died were mainly due to Puerperal sepsis 14 (82.4%). The results observed in this analysis mirror the findings from the 2007-2011 report with evidence of an increasing trend for PPH for the period 2012-2014.

Table 9: Indirect causes of maternal death classified according to WHO MM ICD codes (2012-2014)

Causes of Death		Number of deaths N=40(18.5 %)
HIV Related Infections	14(6.5%)	<b>HIV Related Infections Causes</b>
Gastroenteritis		5(35.7%)
Pulmonary tuberculosis		4(28.6%)
Milliary tuberculosis		2(14.3%)
Meningitis		2(14.3%)
Kaposi's sarcoma		1(7.1%)
Medical and Surgical Conditions	26(12.0%)	<b>Medical and Surgical Conditions Causes</b>
Cardiac disease		5(19.2%)
Pneumocystis Carina Pneumonia		3(11.5%)
Diabetic Coma		3(11.5%)
Diabetic ketoacidosis		2(7.7%)
Asthma		1(3.9%)
Disseminated Encelomyelitis		1(3.9%)
Drug induced Hepatatis		1(3.9%)
Guillain Barre Syndrome		1(3.9%)
Heart Disease		1(3.9%)
Hodgkin's Lymphoma		1(3.9%)
Meningitis		1(3.9%)
Myeloid Leukomia		1(3.9%)
Peptic Ulcer		1(3.9%)
Ruptured Aneurysm		1(3.9%)
Tuberculosis Meningitis		1(3.9%)
Thyroid Storm		1(3.9%)
Traditional drug intoxication		1(3.9%)
<b>Total</b>		

The indirect causes of maternal death were less than one fifth 40 (18.5%) of all the deaths. The 2012-2014 indirect causes statistics depicted a decline from the 25% that was found in the five-year report. 14 (35.0%) out of all the 40 indirect causes were HIV related infections with Gastroenteritis and Pulmonary tuberculosis (PTB) being the most common conditions. PTB was also a leading cause of death among HIV positive pregnant women in 2007-2011 report. During the five year report the HIV related infections were more than two thirds of all the indirect causes, however, there is evidence of a major decline in the current analysis.

### 3.8 Standard of maternal care

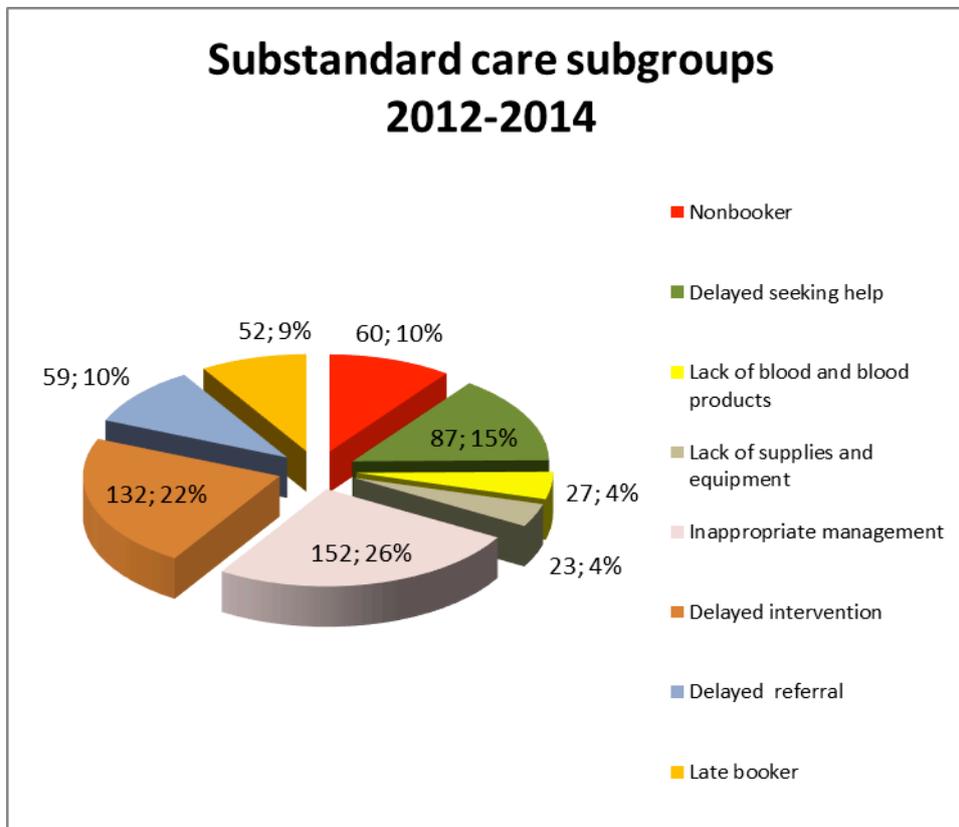
The 2012-2014 analysis shows that 193 (89.4%) of the 216 maternal deaths, there was evidence of substandard care whilst only 23 (10.6%) received standard care. The results from the current report represents a 10% increase in sub-standard care compared with the 79% from the 2007-2011 report. Each of the three factors of sub-standard care had several domains and one maternal death could be classified in one or more than one of the factors. Moreover, one maternal death could also be classified under one or more than one domain within a sub-standard care factor.

**Table 10: Distribution of maternal deaths according to the factors of sub-standard of care**

Variable		Number and (%)
<b>Patient factors</b>	Yes	107 (49.0)
	No	107 (49.0)
	Unknown	2 (0.9)
<b>Administrative factors</b>	Yes	43 (19.9)
	No	171 (79.2)
	Unknown	2 (0.9)
<b>Health worker related factors</b>	Yes	172 (79.6)
	No	40 (18.5)
	Unknown	4 (1.9)

<b>Post Mortem done</b>	Yes	63 (29.2)
	No	153 (70.8)

The health worker related sub-standard care was by far the leading factor in the maternal deaths and involved in 172 (79.6%) of the cases. This shows an increase compared to the findings from the 2007-2011 report. The domain of patient factors has also showed an increase from 35(10.1%) in 2007-2011 report. 32(40.0%) out of those 80 maternal deaths were abortion cases. The coverage for post mortem was less than one third 63(29.2) while in the five year report it was quarter (25%).



**Figure 8: Maternal deaths distributed according to the sub-categories of sub-standard care received<sup>4</sup>**

<sup>4</sup> The above data shows n=592 more than the rest of the report as one patient may be affected by more than one sub-standard factor and thus be counted more than once

The three domains that were examined under health worker related factors were, delayed intervention, delayed referral and inappropriate management. 152 (70.4%) cases out of the 216 maternal deaths were inappropriately managed either during outpatient or admission. This represents a slight increase of 17% in inappropriate management of maternal deaths in comparison to the previous five-year report. However, when the number of occurrences of sub-standard care are used (n=592) then the contribution of inappropriate management was 26% indicating no significant difference from 2007-2011 analysis.

Within the administrative factors; lack of blood and blood products was identified in 27(12.5%) cases. In contrast, 32(9.2%) were observed from the five-year report. When the episodes of sub-standard care were used as the denominator there was no statistical significant difference with the 5% that was observed in the previous 5 year report.

There was more than a third 87(15.0%) of episodes of sub-standard care that was associated with delay in seeking medical help. Compared to the 5% that was observed in the 2007-2011 report this represent an increase of 10% within that domain.

### 3.9 Trend analysis

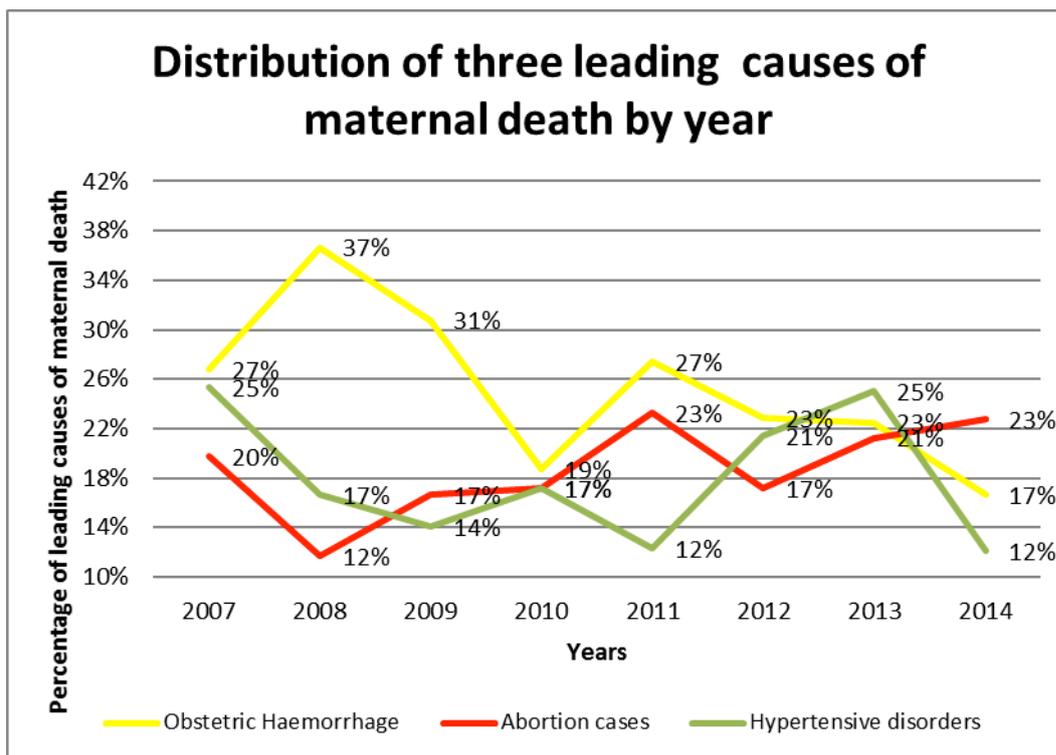
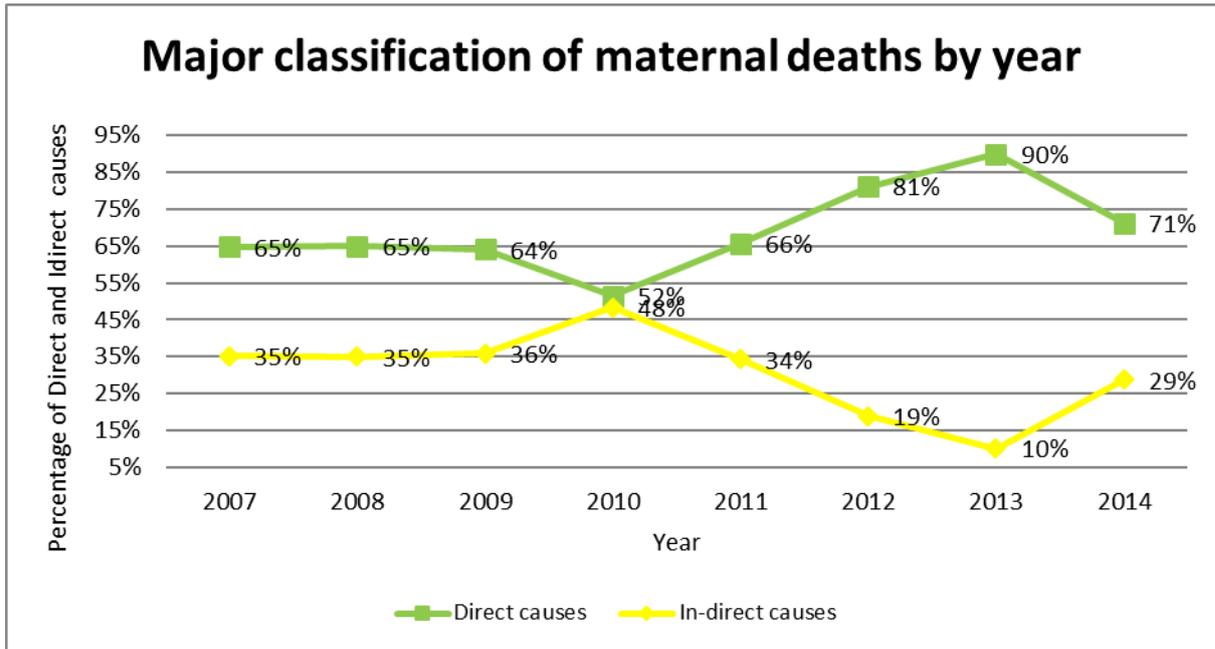


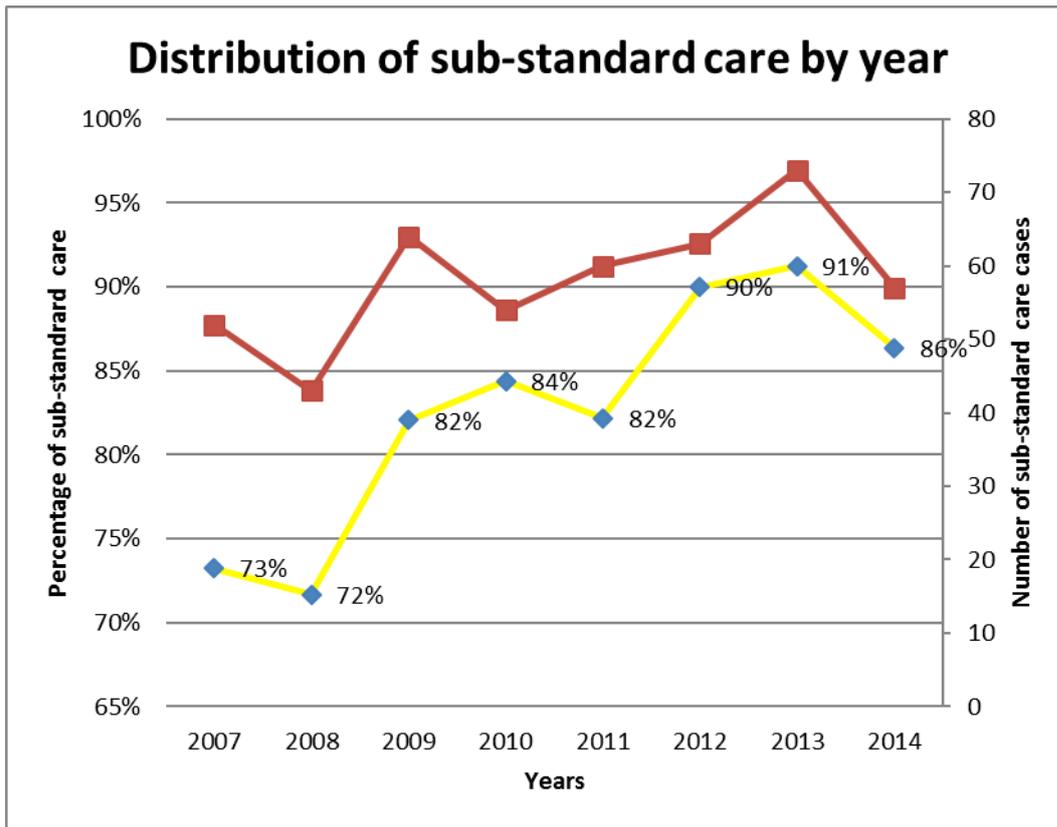
Figure 9: The trend of the three leading causes of maternal deaths over an eight-year period

Over the eight-year period there was evidence of declining trend for PPH which fell from 37% in 2008 to 17% in 2014. The HDP have shown evidence of decline from 27% in 2007 to 17% in 2009 and remained stable until 2011., however, there was an indication of an upward trend from 2011 (12%) to 2013 (25%). The abortion proportion has remained fluctuating between 10% and 25% during 2007-2014. There was evidence of increasing trend between 2009 and 2014 though it appeared not very significant.



**Figure 10: The trend of Direct and Indirect causes of maternal deaths over an eight-year period**

The above bar graph shows the trend of direct and indirect causes of death for period 2007 to 2014. As illustrated, the indirect causes remained at an average of 35% over the first three-year period (2007-2009), a decrease of up to 10% in 2013 and a sharp increase up to 29% in 2014. In contrast, there was a significant increase in direct causes of death in 2010 from 52% to 90% in 2013 and a significant decrease in 2014.



**Figure 11: The trend of sub-standard care over an eight-year period**

Since 2007, the level of sub-standard care has risen from 73% to 91% in 2013 and dropped to 86% in 2014. However, there on average over the eight-year period there is an upward trend for sub-standard care.

## **4.0 Discussions**

### **4.1 Geographical distribution**

The six districts that are host to three thirds of all deaths include two of the major referral centers and four district hospitals that serve as referral facilities for their catchment areas. A high proportion of admissions are likely to be of women with obstetric complications. Similar findings were reported in Kenya where higher number of maternal deaths were found in major teaching and referral hospitals (Yego et al 2013). Geographical variation in distributions has also been reported in different settings such as South Africa (Bomela 2015), China (Liang et.al 2011) and Uganda (Mbonye et al 2007) with different reasons advanced for the variations. However, some of the socio-economic, demographic and environmental features that have been proposed to explain the differences may not be applicable in Botswana given her unique setting of universal access to ANC services.

### **4.2 Demographic factors**

Maternal deaths that occurred in 2012-2014 were within the reproductive age group. The age distribution observed is similar to results from maternal deaths in Malawi (Vink et al 2013), however, Bomela 2015 showed an age range of (10-50). The majority of maternal deaths were in the 25–29 age group (Bomela 2015) and in contrast this report found more 30-34 years olds. Of the women who died, more than a third of them 70.0% had received formal education. The findings are inconsistent with other studies which showed an increased risk of maternal death among illiterate women (Maro et al 2016, Yego et al 2014, NBS 2014). This shows that though education play a role in increasing access to health information and services as well as in making appropriate health decisions there are other factors in Botswana that also have a major influence in maternal death.

In this report, the mean age of maternal deaths was 31, with 4.2% of deaths occurring among women below 20 years of age just a third of the results from

a review in Tanzania (Maro et al 2016). A high proportion (49.5%) of women who died were in the age group of 25–35 years and these findings correspond to other studies in the African settings (Yego et al 2013, Maro et al 2016). However, these studies also had a higher proportion of multigravida women something that was not established in this report. Single women made up the highest (64.4%) proportion negating other studies that showed that married women had a significantly higher risk of death (Asamoah et al 2011). The median parity was 2 with interquartile range of (1-4) and this correlates well with the declining fertility rates that were reported in the 2011 Botswana Housing and population census. Conversely, literature elsewhere indicates most maternal deaths occurred amongst multiparous women (Yego et al 2013).

One of the contributing factors may be that single women usually have inadequate support (emotional, physical, financial, etc). Given that abortion is a significant cause of maternal death across most variables, single women may have resorted to abortion due to the above mentioned factors. Evidence indicates that unmarried women are more likely to resort to abortion compared to their single counter parts (Norris et al 2011).

### **4.3 Admission**

The proportion of maternal deaths that were admitted and died in hospital is 88.9%. Bomela 2015 also found that a large proportion of deaths in South Africa occurred in a health care facility. Like in many other settings, published evidence shows that a large proportion of all maternal deaths takes place in hospitals (Liang et al 2011). This proportion includes three main types of cases: women who arrive in a moribund state too late to benefit from emergency care, women who arrive with complications who could have been saved if they had received timely and effective interventions, and women admitted for normal delivery who subsequently develop serious complications— either naturally or through atrogenic factors—and die with or without having received emergency care. In contrast, more than 90% of women in Botswana deliver in hospitals and also die after having been admitted or during admission. But findings from other settings, suggest that

most of the women deliver at home attended by inadequately trained family members or relatives (Liang et al 2004). More than a third (40.3%) of the women were admitted in a critical condition. However, Kongnyuy et. al 2009 reported four fifths of women were critically ill at the time of admission. This links well with standard of care, there may have been delays in patients presenting at the health facility. The other reasons could be that when women presented at the facility they were not profiled on time so that if they need to be referred for high level care that could be done promptly.

#### **4.4 Antenatal Care**

In this report most maternal deaths occurred during the third trimester and this has been the results in other studies (Clark et al 2008). The argument is that most women who are classified as being at low risk for death at the beginning of pregnancy may be missed as their pregnancies progressed. Though women remain at risk of death for a considerable amount of time after birth, most maternal deaths seem to occur between the third trimester and the first week after the end of pregnancy (Campbell and Graham 1990, Li et al 1996). Mortality can be extremely high on the first and second days after birth. Lack of antenatal care attendance during pregnancy has been associated with increased risk of maternal mortality (Yego et al 2014) and in other studies. In the 2012-2014 report more than half (64.8%) of the maternal deaths had attended ANC at least once, a finding which may raise questions about the quality of ANC services offered in Botswana. Close to half of those who attended ANC came for 5 or more visits may be that they did so because they may have developed pregnancy related risks and complications which they were constantly bringing to the health facility but not being adequately addressed.

#### **4.5 Risks in pregnancy and management**

## **4.6 Delivery, Puerperium and Neonatal**

There was more than a third (46.3%) of women who delivered through SVD slightly higher than results observed in Tanzania (Maro et al 2016).

## **4.7 Causes of death**

More than three quarters of maternal deaths in the 2012-2014 report were due to direct causes mainly, abortive related, obstetric haemorrhage and hypertensive disorders of pregnancy. Globally, evidence suggests that the direct consequences of pregnancy and childbirth continue to account for most maternal deaths in developing countries. In a systematic review of studies of maternal mortality by WHO, obstetric haemorrhage, hypertensive diseases, and infections were the dominant causes (Khan et. al 2006). It is estimated that half of all the cases of haemorrhage recorded globally are found in Sub-Saharan Africa (Loudon 1992) where woman needlessly die due to lack of common skills that every midwife and practitioner should possess. Whether or not a woman dies from bleeding during or after childbirth depends largely on access to timely and competent obstetric care. Hypertensive disorders of pregnancy are a leading cause of death in developing countries particularly in the Sub Saharan Africa region (Moodley 2004) as opposed to the developed world.

Evidence from Latin America and the Caribbean is that maternal mortality is mainly due to direct obstetric causes such as haemorrhage, hypertensive diseases, infection and puerperal complications (Castelazo-Morales 2013). Moreover, a study by Kahn et.al 2006 suggested that the four (4) major causes of maternal death in low-income countries are postpartum haemorrhage, sepsis, hypertensive disorders and complications of abortion confirming findings from this report. Even though this evidence cannot be established in this report, studies have indicated rising rates of obesity (raised body mass index) may impact on the incidence of PPH (Robinson et. al 2005, Sabire et .al 2001).

The results of this report are also consistent with studies from other settings (Bomela 2015) which identified pregnancy with abortive outcome as a major (23.6%) cause of death of maternal death. A study of 12 hospitals in Benin, Côte d'Ivoire, and Senegal, showed almost all deaths in early pregnancy were due to induced abortion, and a third of all maternal deaths were due to unsafe abortion (Thonneau et.al 2002). Mortality rates have been found to be very (word missing here) especially high after an abortion or stillbirth (Hurt and Ronsmans 2002, Høj etl.al 2003). In Bangladesh, for example, pregnancies ending as abortions or stillbirths accounted for more than half of maternal deaths within the first week after the end of the pregnancy, and 50% within the first 6 weeks (Hurt and Ronsmans 2002).

Literature reports show that the proportion of direct maternal deaths varies worldwide, namely, 37% in Japan (Nagaya et al 2000), 40% in the United States (Berg et .al 2005), 44.4% in South Australia (De Lange et al 2008), 70.2% in Nigeria (Ozumba and Nwogu-Ikojo 2008), and as high as 90% in Brazil (Alves 2007). This study indicated that the proportion (87%) of direct maternal deaths in Botswana between 2012 and 2014 was not compatible with those in developing countries. Moreover, maternal deaths due to obstetric haemorrhage in developed countries have been reduced to an extremely low level, and haemorrhage has been replaced by embolism, cardiac disorders, and other modifiable factors as the leading cause of maternal mortality (Bodker et al 2009).

Results from this report are not in concurrence with studies that concluded that the risk of abortion-related deaths was greater among women under age 25 (Asamoah et.al 2011, Warriner and Shah 2006). Hypertensive disorders in pregnancy remain the leading causes of maternal mortality worldwide, and one of the keys to reducing mortality is in controlling blood pressures in the severe range ( $\geq 160/110$ ). More recently, a WHO survey of delivery care in more than 300 health facilities in 29 countries highlighted that, even if coverage of magnesium sulphate is high in cases where coverage is needed, the overall mortality due to eclampsia was not reduced, highlighting the fact that

more attention to other elements of quality of care is also needed (Souza et al 2013).

In countries most severely affected by HIV, such as the Southern African sub-continent, the AIDS epidemic is thought to have reversed previous gains in maternal mortality (Fawcus, van Coeverden de Groot and Isaacs 2005, Bicego, Boerma and Ronsmans 2002). HIV has also been found to affect pregnant women in several ways: HIV infection in pregnancy increases the risk of obstetric complications (Maiques-Montesinos et.al 1999, Bjorklund et.al 2005). HIV-related illness such as anaemia or tuberculosis might be aggravated by pregnancy. Moreover, some indirect causes are highly preventable or treatable, for example, tuberculosis and anaemia and necessitate strengthening of integration between disease-control and maternal-health programmes.

Direct causes of death depict an increasing trend for the current report while in South Africa that is true for indirect causes (Bomela 20015). In addition, this study found that infectious diseases accounted for a higher proportion of maternal deaths than the direct obstetric causes.

#### **4.8 Standard of Maternal care**

More than 80% of the maternal deaths received sub-standard care. There have been limited studies in Botswana that examined the contribution of sub standard care in maternal deaths. A root cause analysis by Madzibamuto et al 2014 of maternal deaths in Botswana revealed organization or management, personnel, or barriers to access and engagement were more frequent than factors relating to the environment or technology and equipment. Seventy one percent (39) of the maternal deaths were associated with delay in seeking help. The lack of knowledge and skills of staff was evident in 37(67%) maternal deaths cases. The investigation also revealed that in 29 (53%) cases of maternal deaths the health workers failed to offer or follow recommendation guidelines and protocols. The factor that ranked highest in the administrative related factors was lack of or failure to implement policies, protocols or guidelines. The root cause analysis also showed that there was a

weak link (within system) between the ANC and IDCC services which contributed more to indirect causes of death. There was no differential in the management of both obstetric direct and indirect causes which demonstrate sub standard care even if deaths were not modifiable Madzimbamuto et al 2014. The other literature review from Botswana also shows that only 30% of health workers used the recommended dose of oxytocin during cesarean section (Tsimba, Madzimbamuto and Mash 2013). Moreover, national guidelines on initiation of treatment for tuberculosis were found to be followed only in less than half (47%) of the cases (Tafuma and Burnett 2014). The high level of substandard care is not unique to Botswana. Some studies in South Africa and Uganda have shown that delays in recognition and treatment of life-threatening complications, as well as sub-standard practises contribute directly to maternal deaths ( NCCE 2002, NCCE 2006, Mbonye et.al 2007 ). The administrative related factors contributed to about 20.4% of maternal deaths from 20012-2014. These findings are consistent with what was reported in previous study in Tanzania (Maro et al 2016). Other studies in Tanzania showed that 69% of maternal deaths were related to sub standard care (Nyamtema et al 2010). The major reasons reported for this delay were delay in the diagnosis and lack of supplies and equipment needed for emergency interventions such as blood and blood products. Maro et al 20016 reported delayed referral from another lower facility at 36.6% but that was not observed in this report. And delay in seeking medical help was 23.3% (Maro et al 2016) and slightly higher estimates in the 2012-2014 report. This shows the need to enhance capacity of providers to educate pregnant women and communities about benefits of early risk detection and intervention.

Confidential enquiries into maternal deaths in other areas, together with findings from clinical audits, suggest that the proportion for which substandard care played a substantial role was often more than a third (Macfarlane 2001). The cases in which women arrived in a moribund state give different insights; sometimes into problems with the referral chain between facilities, and sometimes into barriers in the community—which

might be physical, cultural, or financial—to accessing care (McCarthy and Maine 1992).

The existence of high mortality levels in some areas irrespective of the development such as Botswana suggests that other mechanisms such as the poor quality of emergency obstetric care in hospitals might be an important factor (Bomela 2015, Cairo: Ministry of Health Egypt, 2001). This may suggest high levels of prevalence of abortion (Thonneau et.al 2002) or the condition of the health system. The quality of care received by women who are known to be HIV-positive might also be worse than that received by other women (Van der Paal et.al 2002). A study in Malawi indicates that delays in seeking care accounted to 55.3% of maternal deaths while women who did not recognize the danger signs of pregnancy contributed 6.32% (Vink at el 2013). Still in Malawi, a maternity service' audit found that poor documentation, delays in recognizing the severity of the clinical condition, delays in intervention, an preoperative resuscitation with delays in referral contributed to sub-standard care (Van den et al 2009 ). Delays in provision of adequate care occurred in 58.6% cases of maternal deaths (Vink at el 2013). In a study done in Jordan (2007-2008) it was found that substandard care accounted for 52.6% of deaths (Okour, Khader and Amarin 2008).

The women who seek medical attention and later died during admission raise concerns about the quality of care in health facilities, and numerous studies have shown that delays in recognition and treatment of life-threatening complications, as well as substandard practices, contribute directly to maternal deaths (Cairo: Ministry of Health, 1994, Harrison1997).

Though Botswana has responded positively to the challenges of substandard care by introducing different in service trainings. However, most papers on the effectiveness of training in EmONC describe positive reactions, increased knowledge and skills, and improved behavior after training but fail to show improved maternal outcomes (Jamieson et al 2006).

## **5.0 Conclusion**

In general, much work still needs to be done to reduce direct causes of maternal deaths in Botswana, as there is still a large proportion of deaths due to substandard care, modifiable factors and missed opportunities. There are several cases of delayed intervention, inappropriate management and delayed referral which may be a combination of lack of skilled human resources with the necessary skills. These findings show that the observed constant high maternal mortality which calls for further strengthening of continuous quality improvement of emergency obstetric care to reduce direct obstetric causes of maternal deaths. Advocacy and training are also critical for changes in the health workers' attitude towards service delivery. The findings about causes of maternal death are similar to previous findings that direct causes account for more than two thirds of causes of death (Kongnyuy et al 2009). Strengthening maternal death surveillance and response system through collaboration of stakeholders, improved quality of data collected and the responsible sharing of information between users, institutional committees and national committee is critical in the reduction of deaths.

Substantial constraints exist on the availability and quality of information to confidently describe the problem, and interpretation of the evidence must be informed by awareness of these constraints surrounding the routine reporting systems of maternal reporting. Maternal deaths in Botswana like in many other areas of sub-Saharan Africa (Sahcs and Mc Arthur 2005) are not uniformly distributed, and obstetric risk is highest by far in referral centres. The substantial achievements that have been registered so far in obstetric care are thought to be due to a combination of factors including: long-term investment in midwifery training and referral hospitals; free care and a supportive system with regulation, control, and supervision of the medical and midwifery profession (Seneviratne and Rajapaksa 2000, Liljestrand and Pathmanathan 2004).

This report is a clear indication that analysing the causes of maternal death can help health policy makers and implementers to adjust programs such as EmoNC, CPAC and interventions to improve the quality of care within health facilities. Importantly this report provides a platform for identifying a range of issues that can be addressed in future efforts to reduce maternal deaths. The detailed facility level data analysis has raised possible hypothesis that can be further tested with possible influences on facility policies, practices and procedures that may ultimately reduce maternal mortality. These results may also be possible explanations to some of the reasons for Botswana's lack of progress towards achieving MDG 5. The strength of the report is that it is generalizable at national level since it covered all the districts and the review team comprises of experienced qualified health workers of multi disciplines. The limitation to note is that a high proportion of medical records collected for the report were incomplete or had missing data. The report did not analyse factors that may be contributing to the results obtained. Though there has been a considerable improvement compared to the five year report, it is still not known to what extent the missing data may have biased the results.

Further research is needed in order to understand the main factors that are associated with quality of care both at the community and health facility level. The large proportion of deaths attributed to indirect causes cannot be ignored. Separation of indirect obstetric deaths from direct causes is important because of the implications for intervention strategies that may be high impact and contribute to quicker gains in preventing maternal deaths. As direct maternal deaths decrease because of targeted interventions, efforts to reduce maternal mortality will have to be refocused on reduction of indirect causes. Though Botswana started capacity building of midwives and doctors through EmONC in 2011, its impact may take time before it is translated into reduction of maternal mortality.

## **6.0 Recommendations**

Whilst the NMMAC identified that some contributory factors were related to patients, key factors were mainly due to delays within the health system.

Therefore, the recommendations have been tailored to address the gaps within the health system. The recommendations are as follows:

1. All facilities offering maternal health services should promote family planning services including emergency contraception and permanent methods in all communities and increase accessibility in order to reach all those who are eligible and would benefit from them through community education.
2. The Ministry of Health and Wellness should prioritize the reduction of direct causes of maternal death and take bold steps towards implementation of cost effective interventions such as AMSTL and integration of SRH/HIV into women's care.
3. The public should be educated on "booking early for antenatal care", recognising and acting promptly on danger signs in early pregnancy.
4. The Ministry of Health and Wellness should develop a policy that would enforce mandatory use of obstetric records (that are retained by clients) for all pregnant women including those monitored during ANC at the private facilities.
5. The Ministry of Health and Wellness should develop and implement a functional comprehensive post abortion counselling strategy and ensure that all women are discharged from a health facility with provision of contraception at the point of service.
6. The Ministry of Health and Wellness should prioritize and implement high impact health interventions that will strengthen the quality of antenatal care, prepartum and post partum to ensure that the continuum of care leads to better health outcomes for pregnant women..
7. Department of Clinical Services (DCS) should set up high risk clinics in every district to improve management of high risk pregnant women

(hypertensive, diabetes and multipara etc) in a well coordinated approach.

8. Profiling of pregnant women who are at high risk (for example pre-eclampsia) should continue from onset of pregnancy until six (6) weeks post delivery to improve monitoring and outcomes for patients beyond delivery.
9. Obstetrician and Gynaecologists based at the referral hospitals should be on a direct telephonic link for 24 hours to provide specialist emergency support to district and primary hospital doctors both in the south and northern part of the country.
10. The Obstetrician and Gynaecologists that are based at referral hospitals should to be responsible for supervising, supporting and mentoring health care workers on maternal and newborn health care (EmONC and CPAC) within their catchment area emphasizing on ectopic pregnancy, miscarriage, resuscitation particularly the need for immediate action if the patient is in shock.
11. Department of Clinical Services should develop an orientation system which focuses more on maternal and newborn health care that all health workers (Doctors and Midwives) are expected to successfully complete under the guidance of a qualified Obstetrician and Gynaecologist before they are posted either to the district or primary hospitals.
12. The Department of Public Health (DPH) should revived Domiciliary nursing and necessary resources (for example transport and human resource) be availed to improve the quality of care after delivery and reduce sepsis related infections.
13. The Ministry of Health and Wellness should make it mandatory that all facilities build team work, improve communication through regular inclusive clinical morning discussions and ward rounds that focus on improving quality of care for all pregnant women.

14. The Ministry of Health and Wellness should prioritize post mortem provision for maternal deaths and educate the public on the importance of the procedure not only to the family members but to the community and country at large.
15. The in-service trainings on maternal health should also focus on problem recognition and skills development of both doctors and midwives providing surgery and anaesthetics for obstetric patients at district hospitals
16. The Ministry of Health and Wellness should develop a system that monitors adherence to protocols and guidelines and empower institutional audit committees to take disciplinary actions against all health workers who fail to adhere to protocols.
17. The Ministry of Health and Wellness should develop guidelines that create a conducive forum for communication, collaboration and data sharing between public and private to improve patient continuum of care.

## 7.0 References

1. Ministry of Health. Botswana Safe Motherhood Initiative: National Maternal Mortality Audit Committee 2007-2011 Report: Exploring Causes of Maternal Mortality. Ministry of Health Gaborone; 2012
2. National Bureau of Statistics (NBS) [Tanzania], ICF Macro. Tanzania demographic and health survey 2014. Dar es Salaam, Tanzania: NBS and ICF Macro. 2014. [Online]. Available from: <http://www.nbs.go.tz/>. [Accessed June, 2016].
3. Clark SL , Belfort MA, Dildy GA, Herbst MA, Meyers JA, Hankins GD. Maternal death in the 21st century: causes, prevention, and relationship to cesarean delivery. *Am J Obstet Gynecol* 2008;199:36.
4. Yego F, D'Este C, Byles J, Williams JS, Nyongesa P. Risk factors for maternal mortality in a Tertiary Hospital in Kenya: a case control study. *BMC Pregnancy Childbirth* 2014; 14: 38.
5. Maro EW, Mosha NR, Mahande MJ, Obure J, Masenga G. Ten years trend in maternal mortality at Kilimanjaro Christian Medical Center Tanzania, 2003–2012:
6. A descriptive retrospective tertiary hospital based study. *Asian Pacific Journal of Reproduction* 2016; 5(3): 214–220
7. Bodker B, Hvidman L, Weber T, Moller M, Aarre A, Nielsen KM, Sorensen JL: Maternal deaths in Denmark 2002-2006. *Acta Obstet Gynecol Scand* 2009, 88:556-562.
8. Liang J, Wang YP, Wu YQ, Zhou GX, Zhun J, Dai L, Miao L: Maternal mortality in rural areas in China. *Journal of Sichuan University (Medical Science Edition)* 2004, 35:258-60, [In Chinese]
9. Mbonye AK, Mutabazi MG, Asimwe JB, Sentumbwe O, Kabarangira J. Declining maternal mortality ratio in Uganda: priority interventions to achieve the millennium development goal. *Int J Gynaecol Obstet.* 2007;98 (3):285–90.

10. Norris A, Bessett D, Steinberg JR, Kavanaugh ML, De Zordo S, Becker D, Abortion Stigma: A Reconceptualization of Constituents, Causes, and Consequences. *Women's Health Issues*. 2011;21(3 ):S49-54.
11. Liang J, Dai L, Zhu J, Li X, Zeng W, Wang H, Qi Li1, Li M, Zhou R and Wang Y. Preventable maternal mortality: Geographic/rural urban differences and associated factors from the population-based maternal mortality surveillance system in China. *BMC Public Health*. 2011;11(243):1-9.
12. Bomela N. A cross-sectional analysis of the geographic distribution and causes of maternal mortality in South Africa: 2002-2006. *BMC Public Health*. 2015;15(273):1-12.
13. Nagaya K, Fetters MD, Ishikawa M, Kabo T, Koyanagi T, Saito Y: Causes of maternal mortality in Japan. *JAMA* 2000, 283:2661-2667.
14. Berg CJ, Harper MA, Atkinson SM, Bell EA, Brown HL, Hage ML, Mitra AG, Moise KJ, Callaghan WM: Preventability of pregnancy-related deaths, results of a state-wide review. *Obstet Gynecol* 2005, 106:1228-1234.
15. De Lange TE, Budde MP, Heard AR, Tucker G, Kennare R, Dekker GA: Avoidable risk factors in perinatal deaths: A perinatal audit in South Australia. *Aust N Z J Obstet Gynaecol* 2008, 48:50-57.
16. Ozumba BC, Nwogu-Ikojo EE: Avoidable maternal mortality in Enugu, Nigeria. *Public Health* 2008, 122:354-360.
17. Alves SV: Maternal mortality in pernambuco, Brazil: what has changed in ten years? *Reprod Health Matters* 2007, 15:134-144
18. Sachs JD, McArthur JW. The Millennium Project: a plan for meeting the Millennium Development. *Lancet* 2005; 365: 347-53.
19. Seneviratne HR, Rajapaksa LC. Safe motherhood in Sri Lanka: a 100-year march. *Int J Gynaecol Obstet* 2000; 70: 113-24.

20. Liljestrand J, Pathmanathan I. Reducing maternal mortality: can we derive policy guidance from developing country experiences? *J Public Health Policy* 2004; 25: 299–314.
21. Høj L, da Silva D, Hedegaard K, Sandstrom A, Aaby P. Maternal mortality: only 42 days? *Br J Obstet Gynaecol* 2003; 110: 995–1000
22. Ministry of Health and Population, Egypt. Egypt national maternal mortality study 2000: Directorate of Maternal and Child Health Care. Cairo: Ministry of Health Egypt, 2001.
23. Ministry of Health, Botswana. Maternal and Neonatal Health: Synthesis Thematic Report As Part of Botswana RMNCAH & PMTCT Joint Review: Ministry of Health Botswana, 2015.
24. McCarthy J, Maine D. A framework for analyzing the determinants of maternal mortality. *Stud Fam Plann* 1992; 23: 23–33.
25. Ministry of Health, Egypt. National maternal mortality study: findings and conclusions. Cairo: Ministry of Health, 1994.
26. Harrison KA. Maternal mortality in Nigeria: the real issues. *Afr J Reprod Health* 1997; 1: 7–13.
27. Macfarlane A. Enquiries into maternal deaths during the 20<sup>th</sup> century. In: Lewis G (ed). *Why mothers die 1997–1999. The confidential enquiries into maternal deaths in the United Kingdom*. London: Royal College of Obstetrics and Gynaecology Press; 2001. 346–57.
28. Tsima BM, Madzimbamuto FD and Mash B. Use of oxytocin during Caesarean section at Princess Marina Hospital, Botswana: An audit of clinical practice. *Afr J Prim Health Care Fam Med*. 2013; 5(1): 418
29. Madzimbamuto FD, Ray SC, Mogobe KD, Ramogola-Masire D, Phillips R, Haverkamp M, Mokotedi M and Motana M. A root-cause analysis of maternal deaths in Botswana: towards developing a culture

of patient safety and quality improvement. *BMC Pregnancy and Childbirth* 2014;14:231

30. Thonneau P, Goyaux N, Goufodji S, Sundby J. Abortion and maternal mortality in Africa. *N Engl J Med* 2002; 347: 24.
31. Maiques-Montesinos V, Cervera-Sanchez J, Bellver-Pradas J, Abad-Carrascosa A, Serra-Serra V. Post-cesarean section morbidity in HIV-positive women. *Acta Obstet Gynecol Scand* 1999; 78: 789-92.
32. Bjorklund K, Mutyaba T, Nabunya E, Mirembe F. Incidence of postcesarean infections in relation to HIV status in a setting with limited resources. *Acta Obstet Gynecol Scand* 2005; 84: 927-28.
33. Van der Paal LVF, Muwonge R, Mayanja B, Whitworth JAG. Effect of pregnancy on HIV disease progression and survival from seroconversion among women in rural Uganda. XIVth International AIDS Conference 2002; Barcelona, Spain.
34. Kongnyuy EJ, Mlava G, van den Broek N, (2009). Facility based maternal death review in the three districts in the central region of Malawi: an analysis of causes and characteristics of maternal deaths. *Women's Health Issues*, vol 19:14-20.
35. Yego F, Williams JS, Byles J, Nyongesa P, Arusa W, D'Este C (2013). A retrospective analysis of maternal and neonatal mortality at a teaching and referral hospital in Kenya. *Reproductive Health*, vol 10:1-10.
36. Vink NM, de Jonge HCC, Ter Haar R, Chizimba EM, Stekelenburg J (2013). Maternal death reviews at a rural hospital in Malawi. *International Journal of Gynecology and Obstetrics*, vol 120:74-77.
37. Fawcus SR, van Coeverden de Groot HA, Isaacs S. A 50-year audit of maternal mortality in the Peninsula Maternal and Neonatal Service, Cape Town (1953-2002). *Br J Obstet Gynaecol* 2005; 112: 1257-63.

38. Bicego G, Boerma JT, Ronsmans C. The effect of AIDS on maternal mortality in Malawi and Zimbabwe. *Aids* 2002; 16: 1078-81.
39. Loudon I. Death in childbirth. An international study of maternal care and maternal mortality 1800-1950. Oxford: Oxford University Press; 1992.
40. Tafuma TA, Burnett RJ. National guidelines not always followed when diagnosing smear-negative pulmonary tuberculosis in patients with HIV in Botswana. *PLoS One*. 2014;9(2):88654
41. Asamoah BO, Moussa KM, Stafstrom M, Musinguzi G: Distribution of causes of maternal mortality among different socio-demographic groups in Ghana: a descriptive study. *BMC Public Health*. 2011;11(159)
42. Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look P. WHO systematic review of causes of maternal deaths. *Lancet* 2006; 367: 1066-74.
43. Moodley J, Maternal deaths associated with hypertensive disorders of pregnancy: a population-based study, *Hypertens Pregnancy*. 2004;23(3):247-56
44. Castelazo-Morales E (2013). Why are mothers still dying in Latin and the Caribbean. *International Journal of Gynecology and Obstetrics*, vol 122: 183-184.
45. Sebire NJ, Jolly M, Harris JP, Wadsworth J and Joffe et.al. Maternal obesity and pregnancy outcome: a study of 287, 213 pregnancies in London. *International Obstetric Related metabolic Disorders*. 2001;25(8):1175-1182.
46. Hurt LS, Ronsmans C. Time since pregnancy and mortality in women of reproductive age in Matlab, Bangladesh. Paper presented at the British Society for Population Studies; December 2002; London, UK.

47. Campbell OMR, Graham WJ. Measuring maternal mortality and morbidity: levels and trends. Maternal and Child Epidemiology Unit Publication No2. London: London School of Hygiene and Tropical Medicine; 1990.
48. Warriner IK and Shah IH, eds., Preventing Unsafe Abortion and its Consequences: Priorities for Research and Action, New York: Guttmacher Institute, 2006.
49. Nyamtema AS, Urassa DP, Pember AB, Kisanga F, van Roosmalen J. Factors for change in maternal and perinatal audit systems in Dar es Salaam hospitals, Tanzania. BMC Pregnancy Childbirth. 2010;10:29.
50. Van den Akker T, Mwangomba B, Irlamb J, van Roosmalen J. Using audits to reduce the incidence of uterine rupture in a Malawian district hospital. Int J Gyn Obst. 2009;107:289-294
51. Jamieson DJ, Theiler RN and Rasmussen SA. Emerging Infections and Pregnancy. Emerging Infectious Diseases. 2006;12(11):1638-1648
52. Souza JP, Gulmezoglu AM, Vogel J, et al. Moving beyond essential interventions for reduction of maternal mortality (the WHO Multicountry Survey on Maternal and Newborn Health): a cross-sectional study. Lancet 2013; 381: 1747-55.

## 8.0 Appendices

Questionnaire No: 

--	--	--

  
MH 2000 B Review 2012

Ministry of Health

Revised Assessors Monitoring Tool

**1. FACILITY WHERE DEATH OCCURRED**

Case No:

Health District

Name of Facility/Place

Type of Facility      Clinic       Hospital       Home       Other

**2. DEMOGRAPHICS**

Age

Educational level      None       Secondary

                                 Primary       Tertiary

Marital Status      Single       Divorced

                                 Married       Widowed

Employment Status      Employed       Unemployed

Nationality

Gravida

Parity

Gestation at death (if died while pregnant)

**3. ADMISSION AT INSTITUTION WHERE DEATH OCCURRED OR FROM WHERE IT WAS REPORTED**

Date of Admission      Day        Month        Year

Time of Admission      Hrs        Mins

State on Admission      Stable       Critical       Dead

Provisional diagnosis On admission

Final Diagnosis

Date of death      Day        Month        Year

Time of death      Hrs        Mins

Died before delivery      Yes       Gestation at Delivery

                                 No       (fill appropriate)

Days post delivery      Gestation at death

(If less than a day state number of hours or minutes)

Referral from another facility	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Referral diagnosis	<input type="text"/>	
Reason(s) for referral	Supplies <input type="checkbox"/>	Higher level care <input type="checkbox"/> Other <input type="checkbox"/>
Duration of referral	Days <input type="checkbox"/> <input type="checkbox"/>	Hours <input type="checkbox"/> <input type="checkbox"/> Minutes <input type="checkbox"/> <input type="checkbox"/>
Was referral appropriate	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Please specify	<input type="text"/>	

**4. ANTENATAL CARE (ANC)**

Attended ANC	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Gestational age at registration	<input type="text"/> <input type="text"/>	
Total number of ANC visits	<input type="text"/> <input type="text"/>	
HIV status	Positive <input type="checkbox"/>	Negative <input type="checkbox"/> Unknown <input type="checkbox"/> Declined <input type="checkbox"/>
Eligible for ART	Yes <input type="checkbox"/>	No <input type="checkbox"/> Unknown <input type="checkbox"/>
Enrolled on ART ( <i>if eligible</i> )	Yes <input type="checkbox"/>	No <input type="checkbox"/> Unknown <input type="checkbox"/>
Defaulter ( <i>If on ART</i> )	Yes <input type="checkbox"/>	No <input type="checkbox"/> Unknown <input type="checkbox"/>
PMTCT	Yes <input type="checkbox"/>	No <input type="checkbox"/> Unknown <input type="checkbox"/> Declined <input type="checkbox"/>

**Risks in Pregnancy :( Tick appropriate)**

<b>Risk/Condition</b>	<b>Yes</b>	<b>No</b>	<b>Management</b>
<b>OBSTETRIC</b>			
Previous two CS			Emergency CS: <input type="checkbox"/> Yes <input type="checkbox"/> No  Elective CS at 37 completed weeks <input type="checkbox"/> Yes <input type="checkbox"/> No
Severe Pre-Eclampsia			Elective CS at 37 completed weeks <input type="checkbox"/> Yes <input type="checkbox"/> No  Administered antihypertensive <input type="checkbox"/> Yes <input type="checkbox"/> No  Delivered within 6 hours <input type="checkbox"/> Yes <input type="checkbox"/> No
Mild Pre-Eclampsia			Delivered at 37 completed weeks <input type="checkbox"/> Yes <input type="checkbox"/> No
Anemia			
<b>MEDICAL</b>			
Hypertension			
Cardiac condition			
Diabetes			
Tuberculosis			
Pneumonia			
Meningitis			
Other			

**5. DELIVERIES, PUERPERIUM AND NEONATAL INFORMATION**

Did labour Occur      **Yes**       **No**

Partogram used      **Yes**       **No**

Appropriately *(If Yes)*

Duration of labour in      **Hours**        **Minutes**

hours

Appropriate Management      **Yes**       **No**

of 3rd Stage

Appropriate Management      **Yes**       **No**

of 4th Stage

Mode of Delivery     

Baby      Birthweight      **Grams**

Apgar Score      **1min**        **5min**        **10min**

Outcome *(tick appropriate)*      **Alive**       **Macerated Stillborn**       **Fresh Stillborn**

**Neonatal death**            

**6. CAUSES OF DEATH**

Cause of death     

Contributory causes of death     

System related contributory factors     

Type of cause      **Direct cause**       **Indirect cause**

Post mortem done      **Yes**       **No**

Diagnosis *(If Yes)*     

Reason why post mortem not done *(If No)*      **Not offered**       **Relatives declined**

**7. Were any of these factors present? (Tick Correct answer)**

<b>Factors</b>	<b>Yes</b>	<b>No</b>	<b>Examples</b>	<b>Yes</b>	<b>No</b>	<b>Specify-Reason</b>
Patient factors	<input type="checkbox"/>	<input type="checkbox"/>	Delay in seeking help	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>		Non-booker	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>		Late-booker	<input type="checkbox"/>	<input type="checkbox"/>	
Administrative factors	<input type="checkbox"/>	<input type="checkbox"/>	Shortage of transport	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>		Lack of blood and blood products	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>		Lack of supplies and equipment	<input type="checkbox"/>	<input type="checkbox"/>	
Health worker related factors	<input type="checkbox"/>	<input type="checkbox"/>	Inappropriate management	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>		Delayed intervention	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>		Delayed referral	<input type="checkbox"/>	<input type="checkbox"/>	