

The confidential enquiry into maternal deaths in South Africa: a case study

J Moodley,^a RC Pattinson,^b S Fawcus,^c MG Schoon,^d N Moran,^e PM Shweni,^f on behalf of the National Committee on Confidential Enquiries into Maternal Deaths in South Africa

^a Women's Health and HIV Research Group, Department of Obstetrics and Gynaecology, University of KwaZulu-Natal, Durban, South Africa

^b SA MRC Maternal and Infant Health Care Strategies Unit, Department of Obstetrics and Gynaecology, University of Pretoria, Pretoria, South Africa ^c Department of Obstetrics and Gynaecology, University of Cape Town, Cape Town, South Africa ^d Free State Province, Department of Health, Bloemfontein, South Africa ^e Kwa Zulu-Natal Province Department of Health, Pietermaritzburg, South Africa ^f Eastern Cape Provincial Department of Health, Bisho, South Africa

Correspondence: Prof J Moodley, Women's Health and HIV Research Unit, Nelson R Mandela School of Medicine, Private Bag 7, Congella, 4013, South Africa. Email jmog@ukzn.ac.za

The Confidential Enquiry into Maternal Deaths (CEMD) in South Africa has been operational for 15 years. This case study describes the process of notification and independent assessment of maternal deaths, predominantly in facilities. In the earlier years of the Enquiry, institutional maternal mortality ratio increased and was 176.2 per 100 000 live births in the 2008–10 triennium; thereafter it decreased to 146.7 in the 2011/12 period. The slow progress was due to the significant contribution of HIV/AIDS to maternal mortality and challenges in implementing the recommendations that were devised from the findings of the

Enquiry. Nevertheless, the CEMD process has been maintained and strengthened so it is currently able to perform routine maternal death surveillance at both national and district levels, identify deficiencies within the health system, generate reports and also provide early warning about alarming trends such as the increasing numbers of deaths due to caesarean-section-associated haemorrhage.

Keywords Confidential enquiries, maternal deaths, South Africa.

Introduction

This case study will present the process, findings and impact of the Confidential Enquiry into Maternal Deaths (CEMD) in South Africa, which has been operational since 1998 and is ongoing. South Africa has a population of approximately 50 million. It is classified as a middle- to low-income country but has major inequalities in income distribution.¹ This to a large extent is a legacy of violent repression and unequal development from the apartheid years. The first democratically elected government was installed in 1994. Currently, health expenditure accounts for 4.6% of the Gross Domestic Product.

Since 1994 there have been several important policies developed and laws enacted which are beneficial for promoting maternal health:

- 1994: Free health care for pregnant women and children under 6 years
- 1997: *Choice of Termination of Pregnancy Act* (1996)

- 1998: Maternal deaths notifiable by law (1997) and the National Committee for Confidential Enquiry into Maternal Deaths (NCCEMD) was initiated.

The coverage of key maternal health interventions in South Africa is good when compared with other countries in sub-Saharan Africa with 92% of women attending at least once for antenatal care and 91% having a facility birth with a skilled birth attendant. There is a 21% national caesarean section (CS) rate.^{2,3} This can be seen as an indirect indicator for access to emergency obstetric care. However, average coverage rates may obscure inequities in access between different social groups and geographical areas and also coverage statistics do not inform about the quality of health care.

Description of the process of the CEMD in South Africa

The NCCEMD is a ministerial committee of experienced personnel representing obstetrics, midwifery, anaesthesia

and the nine different provinces, with Department of Health administrative and financial support. Its terms of reference were to make recommendations based on an analysis of the maternal deaths reported such that their implementation would result in a reduction in the maternal mortality ratio (MMR).⁴

The NCCEMD process was modelled on the UK CEMD process which has been operational since 1952 and advisors from the UK committee assisted South Africa in developing its enquiry process. This process has evolved over the years and the current enquiry process is shown in Figure 1.

Figure 1 shows that there are essentially two audit loops recommended in the process. First, there is discussion at the facility where the death occurred, so that avoidable factors can be immediately identified and remedied at local level. The second audit loop is the CEMD process, which is as follows. The maternal death is notified to the provincial maternal and child health coordinator ('Provincial MCWH' in Figure 1), who will allocate it a unique number. A purpose-designed Maternal Death Notification Form (MDNF) is completed and together with a photocopy of all clinical records, is sent to the coordinator from where it is assessed by teams of independent provincial assessors, which include obstetricians, medical officers, midwives and anaesthetists when indicated.

Assessors work as a pair usually a midwife and obstetrician or experienced medical officer to overcome inherent

biases. All deaths where the woman underwent an anaesthetic are assessed by an anaesthetist as well. Assessors are appointed by the provinces based on their knowledge of the subject and standing in their profession. Assessors are not remunerated for their activities because audit is accepted as one of the professional duties of a doctor or midwife. Assessors' costs are covered for travel when going to national assessors' meetings and in some provinces for local travel.

These assessors identify Causes and Avoidable Factors using a structured assessor's form, data from which are entered into the electronic data collection system the Maternal Morbidity and Mortality Audit System (MAMMAS), which then collates the information from all the provinces. There is a quality control component at provincial level to ensure that assessments are as accurate as possible. At national level, the MAMMAS data are used to generate tables and the information is collated into reports. These reports, called Saving Mothers Reports, are produced as annual interim reports and more comprehensive triennial reports that include chapters on each of the major conditions that cause death. Before the reports are published there are national and provincial stakeholder discussion meetings to identify the key recommendations that arise from the data; which must be implemented in order to reduce the MMR in South Africa. Reports are disseminated together with educational sessions on the key

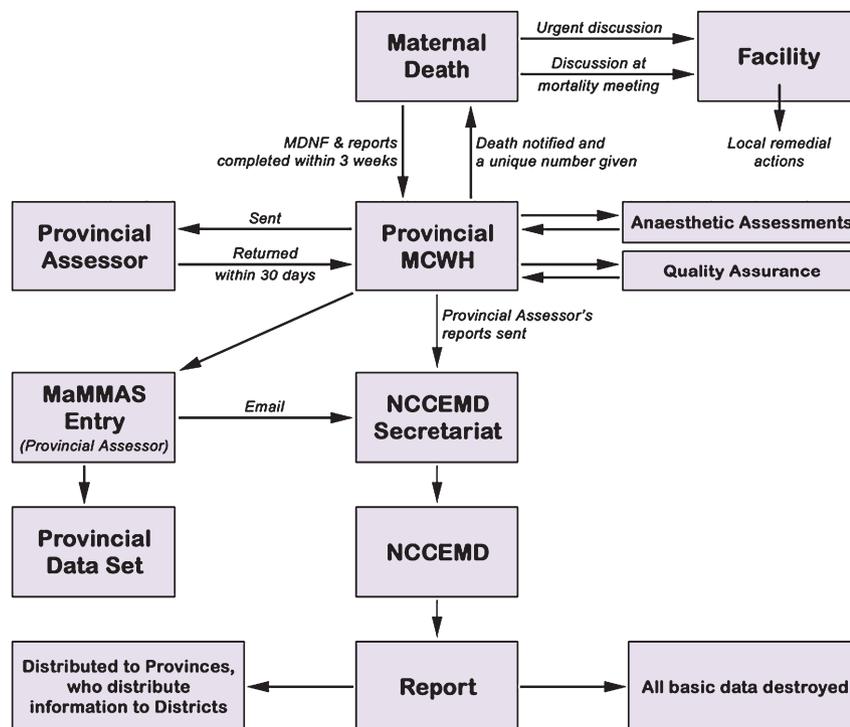


Figure 1. The process of the CEMD in South Africa.

recommendations to provinces, districts and academic institutions.

The process is confidential and all copies of case notes are destroyed after publication of the reports. The data collected by the enquiry and the specific notification forms are for use by the CEMD process only and cannot be used for medico-legal or disciplinary processes which, when they occur, are completely separate and parallel processes. This has been ratified by relevant judicial bodies.

Details of the CEMD process can be found in the Saving Mothers comprehensive reports and the Guidelines for completion of the MDNF.^{5,6}

Description of the findings of the CEMD

These data are all derived from the annual and triennial Saving Mothers reports.^{5,7}

Numbers and rates of maternal deaths

Figure 2 shows the numbers of maternal deaths reported annually from 1999 to 2012.

The increasing numbers of maternal deaths in the early years of the enquiry were probably the result of increases in reporting as the enquiry became more widely understood. From the 2000s it is likely that there was a real increase in numbers. There has been a decline in total numbers since 2010 and this will be discussed in more detail later.

The enquiry is facility-based with no system currently for routinely identifying deaths in the community. This means that the majority of deaths reported occurred in institutions where 91% of all deliveries in South Africa occur.

In terms of the MMR, accurate data on the total number of live births only became available from the District Health Information System in 2005; so national and pro-

vincial MMRs could only be calculated from then. The term iMMR is used and refers to ‘institutional MMR’.

Figure 3 gives the iMMR in South Africa from 2005 to 2012.

Despite South Africa being a signatory to the United Nations Millennium Development Goals, the national iMMR increased from 2005 (Figure 3). However, from 2010, there has been a significant decrease. The iMMR for 2008–10 was 176.2 per 100 000 live births but in 2011 it was 159.1 per 100 000 live births. This represents a decrease of 13%. A further decrease to 146.7 was noted in 2012.⁷

Considering progress towards Millennium Development Goal 5, there was no real-time assessment of MMR in South Africa in 1990, which makes assessment of progress problematic. Estimates published in 2012 by the World Health Organization (WHO), United National Population Fund (UNFPA), United Nations Children’s Fund (UNICEF) and the World Bank are shown in Figure 4. They also show that MMR increased after 1990 but is stabilising in 2010.⁸

These estimates agree with estimates from the Health Data Advisory and Coordinating Committee (HDACC) monitoring group in South Africa, which suggested that MMR was 310 in 2008.⁹ Partial explanations for the WHO and HDACC estimates being greater than the CEMD ones may be that the latter does not measure home deaths and there may be under-reporting, particularly from nonobstetric facilities. However, the discrepancy is greater than expected and these estimates need further investigation.

Analysis of maternal deaths, 2008–10

The MAMMAS programme allows further analysis of maternal deaths according to:

- Province
- District

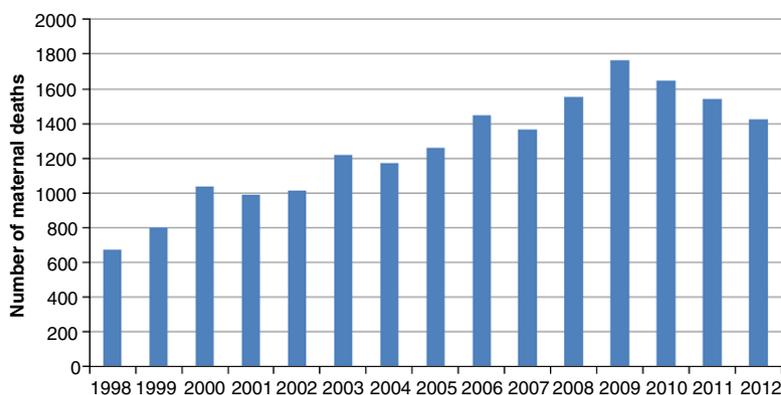


Figure 2. Numbers of maternal deaths reported to the NCCEMD 1999–2012.

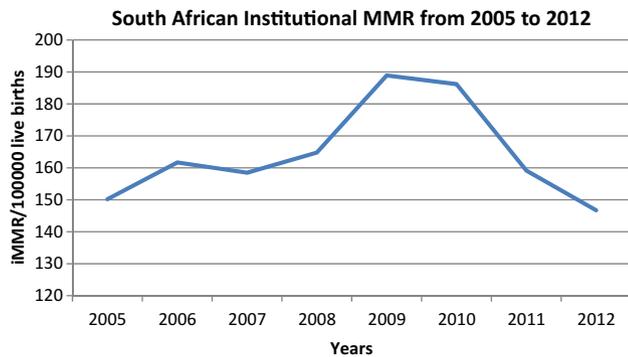


Figure 3. iMMR in South Africa 2005–12.

Year	1990	2000	2010
MMR	250	330	300

Figure 4. WHO estimates for South Africa: MMR 1990–2010.

- Level of care (clinic, district hospital, regional hospital)
- Maternal age
- HIV status
- Mode of delivery
- Cause of death
- Avoidable factors

Figure 5 illustrates the institutional MMR per province for the period 2008–10. The middle horizontal line represents the iMMR for South Africa; the higher line an iMMR 15% above the national rate and the lower line an iMMR 15% below the national rate.

For 2008–10, the Free State, North West and Northern Cape are the provinces that had iMMRs >15% above the national average, whereas the iMMRs of Western Cape and Gauteng were >15% below. Despite having the highest iMMR in the 2008–10 triennium, the Free State has shown a remarkable decline in iMMR since; this is shown in Figure 6 but will be discussed later. Trends in MMR for each province for 2005–12 are shown in Figure 6.

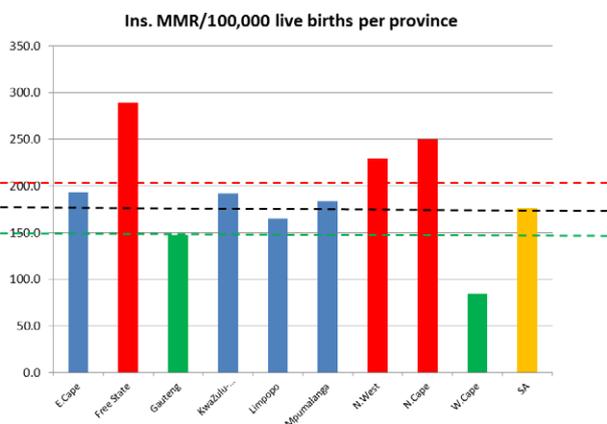


Figure 5. Institutional MMR per province 2008–10.

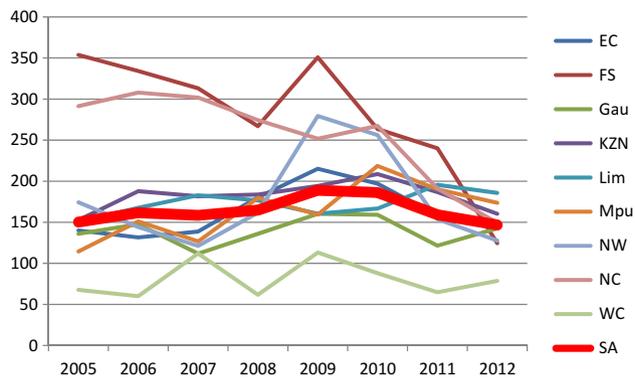


Figure 6. Trends in iMMR per province 2005–12.

Figure 6 but will be discussed later. Trends in MMR for each province for 2005–12 are shown in Figure 6.

Major causes of maternal death, 2008–10

The five most frequent causes of death were:

- Nonpregnancy-related infections/AIDS: 40.5%
- Obstetric haemorrhage: 14.1%
- Hypertensive disorders: 14.0%
- Medical and surgical disorders: 8.8%
- Pregnancy-related sepsis: 5.3%

Figure 7 shows trends in the iMMRs from different causes over time. The nonpregnancy-related infection/AIDS group increased dramatically but has recently declined. It is of concern that the major direct causes of maternal death—notably hypertensive disorders and haemorrhage—have not shown a decline, with the haemorrhage-related iMMR actually increasing.

Eclampsia and the associated problems of cerebral haemorrhage and pulmonary oedema accounted for the majority of deaths due to hypertensive disorder. The biggest subcategory of the haemorrhage deaths (26.2%) was ‘bleeding at or after caesarean section’, but ruptured uterus, placental abruption, uterine atony after vaginal delivery and retained placenta were also common causes. Prolonged obstructed labour was a common underlying factor for more than one-quarter of the haemorrhage deaths. It is notable that termination of pregnancy sepsis does not figure as a major cause of death in South Africa. This is largely due to the Choice on Termination of Pregnancy Act which allows legal termination of pregnancy by request of the woman up to 12 weeks and for specified criteria, including adverse socio-economic circumstances, up to 20 weeks of gestation. However, there are still deaths from this cause and ongoing concern about inequities in coverage of termination of pregnancy services within and between different provinces; as well as deficiencies in contraceptive programmes.

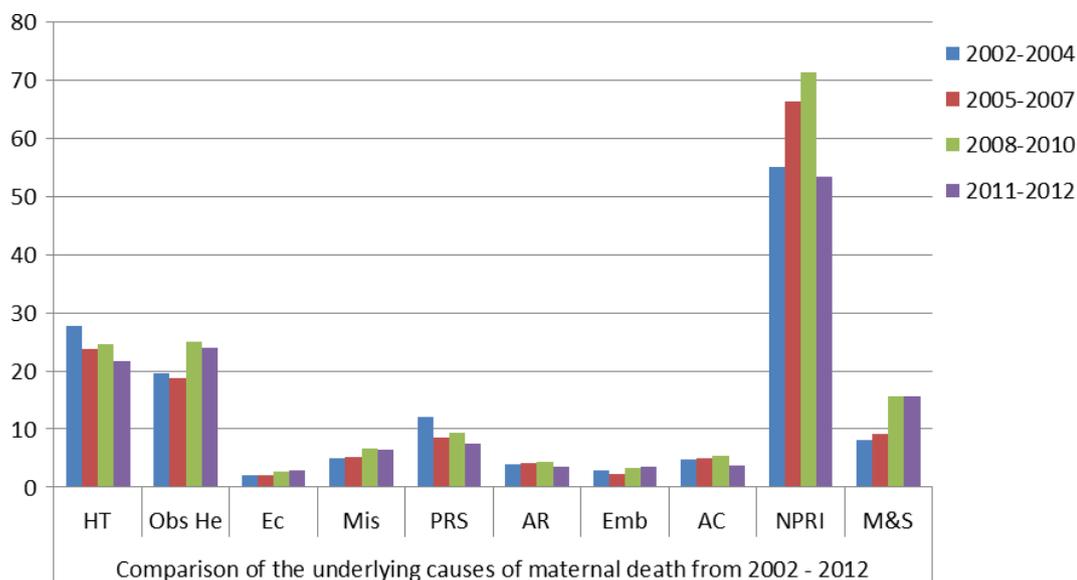


Figure 7. Trends in underlying causes of maternal deaths 2002–12.

Deaths due to nonpregnancy-related infections

This is by far the largest contributor to iMMR in South Africa. It includes predominantly deaths from tuberculosis, pneumonia and other opportunistic infections, the majority (90% in 2011 and 2012) occurring in women with HIV infection. Since 1990, the national HIV seroprevalence in antenatal clinics increased to a maximum of 30% by 2005;¹⁰ and in the early years of the epidemic there was no treatment available for women.

In 2008–10 the iMMR in HIV-positive women was 430.4, compared with 75.5 deaths per 100 000 live births in HIV-negative women. This shows the impact of the HIV epidemic on iMMR in South Africa. However, the decline in iMMR noted in South Africa from 2010 is due to a 22% decrease in nonpregnancy-related infection-related maternal mortality. This is due to important improvements in clinical management of HIV-positive people, including pregnant women, and to the success of the new HIV strategy implemented in 2010.

Early detection of alarming trends

Deaths from complications of anti-retroviral therapy trebled in 2010 and 2011, when the highly active anti-retroviral treatment (HAART) regimen was extended to women with CD4 counts >200 cells/mm² and the first-line HAART regimen for pregnant women included nevirapine. There were 60 such deaths in 2011 and they were mostly due to liver failure and Stevens–Johnson syndrome secondary to nevirapine when used as part of HAART.¹¹ As a result of this finding, the national

HAART protocol replaced nevirapine with efavirenz. (It must be noted that nevirapine given to the mother as a single dose in labour and to the newborn for prevention of mother-to-child transmission of HIV has not been found to cause complications.)

Deaths from bleeding associated with CS increased from 26.2% of all the deaths due to obstetric haemorrhage in 2008–10; to 27.6% in 2011 and 35% in 2012. This would constitute 4.9% of total maternal deaths from all causes in 2011 and 2012 combined.

Currently, the data are not available to provide enough detail about this group so we do not have answers to important questions, such as whether the CS were performed ‘too late’ in the presence of infection and obstruction, or in fact had been unnecessary. There is concern in South Africa that the national instrumental delivery rate is less than 1% and it is possible that lack of skill at assisted delivery may be one of the drivers for increasing CS rates in the second stage of labour, which are more complicated. Also, it is not known what the composite CS-related mortality is, especially if deaths from other causes such as thromboembolism, pregnancy-related sepsis, placenta praevia and placental abruption are added to this group when a CS was performed. This alarming trend has given impetus to a focus in the next report on CS-associated mortality with the aim of quantifying it more accurately and gaining a better understanding of the background factors for the women who died from bleeding associated with CS.

Multiple strategies have been developed to reduce deaths from this cause; and are ongoing. One province, the Free State, has shown a remarkable decline in this problem as the result of a three-pronged strategy that involved improving inter-facility ambulance transport, intensive district

training on postpartum haemorrhage, and re-alignment of district hospitals that perform CS.¹²

Anaemia was documented antenatally in 43% of all the maternal deaths. Anaemia was defined as a haemoglobin <10 g/dl and the reading used was the last one performed in the antenatal period. This reflects the importance of having adequate equipment for point of care testing of haemoglobin, the need to repeat it in pregnancy/labour and the need for availability of iron and folate for pregnant women. Addressing this problem is also ongoing.

Beyond the numbers: the stories

The narrative reports or 'stories' of each maternal death are important to illustrate the human tragedy of the MMR problem. They are included as anonymised vignettes in the comprehensive reports and are often the best way to illustrate problems of poor access to care, inadequacies in functioning of the health system and quality of care problems. In the comprehensive reports several summary vignettes are given for each of the common causes of death. They are useful tools not only for education and discussion among health workers, but also for advocacy.

Avoidable factors, missed opportunities and substandard care

The provincial assessors, after reviewing the submitted MDNF and photocopied case notes for cause of death, then assess them for avoidable factors, missed opportunities and substandard care. Consistency of assessment is assisted by discussions among groups of assessors, provincial quality assessment and national training workshops for assessors. The framework involves subdividing avoidable factors into those factors that occurred at the patient/community level and were outside the health facility; those that involved problems with the administrative aspects of the health service and those that involved problems with the management provided (or omitted) by the healthcare provider. The institutional nature of the enquiry means that it does not explore the patient/community-related factors adequately. However, the process enables a reasonably thorough assessment of the health service factors involved in the care of the woman who died.

In 2008–10, patient-related problems were identified in 49% of maternal deaths. These included delays in seeking care, problems with transport to facilities, and also some women who accessed unsafe termination of pregnancy by unregistered providers.

Administrative problems occurred in 35% of maternal deaths. This included problems with transport between facilities; access to intensive care units; availability of blood and inadequate staff numbers/competence.

Healthcare provider problems occurred in 14–38% of maternal deaths with more episodes at district and regional hospitals than tertiary. This included not assessing patients properly, delays in referral, failure to recognise the problem; not following standard protocols and poor monitoring. These healthcare provider-related factors are described in detail in the comprehensive triennial reports in the chapters that describe the deaths from each condition.

Avoidable factors and substandard care can be further analysed for each level of care, and for each of the major conditions that cause death.

The NCCEMD chose the approach of classifying avoidable factors according to Patient/Community-related, Administrative and Healthcare Provider problems. This classification has been used for many years by the Perinatal Problem Identification Programme used to audit perinatal deaths in South Africa.¹³ This is a different classification to the three delays model first suggested by Thaddeus and Maine.¹⁴ However, there is considerable overlap in the two approaches with each having some advantages.

The three delays model by separating 'delay in the decision to seek care' from 'delay in accessing the facility' enables an exploration of the patient/community-related factors in more detail than the category provided for in the NCCEMD approach. However, the healthcare provider category is better explored in the NCCEMD approach because it subdivides the third delay, 'delay in receiving adequate care', into problems related to health service administration and those related to quality of care provided by health personnel. This latter subdivision is very useful for devising specific recommendations about service improvements; and is very relevant for South Africa where the majority of deliveries are institutional and the third delay is a major problem.

Description of responses to CEMD findings

The response to the findings of the CEMD is to identify key recommendations; which must be implemented by the appropriate role players for MMR to be reduced. This is the most important, but also most challenging, aspect of a confidential enquiry. From 1999, national and provincial consultative meetings with key stakeholders have been held with each triennial report to identify key recommendations.

Ten recommendations from the Saving Mothers' Lives reports 1998 to 2007

Although there have been minor modifications, the ten recommendations elaborated from the reports remained very

similar for 1998, 1999–2001, 2002–04 and 2005–07. They were:

- Provision of clinical guidelines
- Training in emergency obstetric care
- Screening and treatment for HIV and tuberculosis
- Postnatal care must be strengthened
- Referral routes to be established and emergency transport made available
- Staffing and equipment norms
- Availability of blood
- Access to contraception
- Access to safe termination of pregnancy
- Empowerment of women and communities.

The Saving Mothers' Lives reports included description of these recommendations and guidelines for managing the common conditions and they were disseminated nationally, regionally and at district level.

Concern was raised that despite these recommendations; up to 2009, iMMR continued to increase; and the fact that the recommendations remained similar reflected poor implementation.

This can be seen as an example of the 'Know-Do' gap. In other words, the recommendations were initially being made with no implementation strategy, indicators or targets; and there was lack of clarity about whose responsibility it was to implement the recommendations.

NCCEMD Recommendations: 2008–10 report

In the most recent triennial report a different approach was taken. There was to be more focus on priority problems and priority districts. From an analysis of avoidable factors according to causes of death, it is clear that the largest contributors to avoidable deaths are nonpregnancy-related infections, haemorrhage and hypertension (Figure 8).

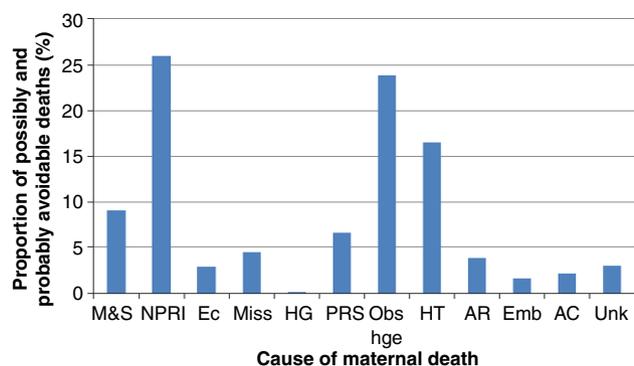


Figure 8. Underlying causes of maternal deaths.

In summary, the new recommendations of the NCCEMD are the 5 Hs:

Reduce deaths due to	HIV/AIDS
Reduce deaths due to	Haemorrhage
Reduce deaths due to	Hypertension
Improve	Health worker training
Strengthen	Health system

There are also specifications for each recommendation, concerning who are the key role players and who is responsible for which aspects.

Summary: strengths, weaknesses and opportunities of CEMD in South Africa

Strengths and achievements

Reporting system in place

The current reporting mechanism allows iMMR data per district to be available within 6 months of the end of the year, so allowing trends to be established promptly. It has become an effective maternal death surveillance system as well as reporting on the quality of care.

Production of five comprehensive reports

- Pathological causes of maternal deaths are identified
- Health system causes of maternal deaths are identified.

Publication of national guidelines

- Maternity care guidelines for district hospitals and community clinics
- Management of common causes of maternal death
- Monographs on *Management of postpartum haemorrhage* and *Management of caesarean sections*. The latter aims to ensure that CS are done for appropriate indications and safely.

Incorporation of District Health Information System data (from 2005)

- Enables assessment of functioning of different levels of care
- Enables calculation of iMMRs
- Enables presentation of iMMR data per province and per district.

Initiation of Essential Steps in Managing Obstetric Emergencies (ESMOE/EOST) training programme

This programme aims to equip doctors and nurses with practical skills to manage and prevent obstetric emergencies. This would include training in instrumental delivery.

Reduction in iMMR

- Decrease in deaths due to HIV

- Decrease in Free State province MMR due to improved transport

Identification of serious emerging problems

- Detection of adverse effects of nevirapine-based HAART
- Detection of bleeding during or after CS as most common cause of haemorrhagic death.

Weaknesses and challenges (past and ongoing)

- Overall reduction in maternal deaths did not occur until 2011
- Persisting inequity in social indicators between and within provinces
- Incomplete assessment of health system factors:
 - bias towards clinical care factors
 - broader health systems problems may not be identified
- Incomplete implementation of recommendations:
 - recommendations were similar from 1998 to 2007
 - inadequate implementation strategy at provincial level
 - advocacy role failure
 - failure to act on HIV/AIDS (1998–2004)
- Reporting of home deaths:
 - not feasible in current system
 - at least 85–92% of all births occur in institutions
 - over 40% deaths have community level avoidable factor

Opportunities

There are favourable factors for further decrease in MMR in the coming years. South Africa has adopted HIV treatment option B, which means that all pregnant women will receive HAART; and there is strong political will to reduce HIV morbidity and mortality. Also, there is a national programme to re-engineer primary health care with a focus on community-based services. In addition, the district care focus involves the appointment of district specialist teams (consisting of an obstetrician, paediatrician, anaesthetist, family physician, advanced midwife, paediatric nurse and primary health care nurse) to provide clinical governance and supportive clinical care and leadership for maternal, newborn and child health services at district level.

The vision of the South Africa CEMD is well illustrated by South Africa's slogan for being part of CARMMA; the African Union Campaign for Accelerated Reduction of Maternal Mortality in Africa: 'South Africa Cares: No Woman Should Die While Giving Life'.

Disclosure of interests

The authors report that there are no conflicts of interest.

Contribution to authorship

SF was involved in the planning/conception, analysis of data and write-up; JM and RCP were involved in the analysis of data and the write-up; MGS, NM, PMS contributed advice and comments on the data analysis and write-up.

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