

Maternal mortality in Western Cape 2014-2016; data from Confidential Enquiry reporting system. Dr G.Petro with W Cape maternal death assessors group

Key recommendations for the Western Cape
Conduct Safe caesarean delivery audit at health facilities performing Caesarean delivery
Focus attention on chronic medical disorders and implications of obesity: medical obstetric clinics at tertiary level and teaching within ESMOE
Implement strategies to increase postpartum and post abortion contraception; and contraceptive provision for women attending general medical clinics
Improve gynaecological management of early pregnancy at primary care level focusing on improved detection of ectopic pregnancy
Continue widespread HAART initiation and improve TB detection rates
ESMOE/EOST for all MOU, CHCs, Districts and Higher education schools providing maternity care
Implement postnatal care policy with involvement of community based workers

SUMMARY: WESTERN CAPE 2014-2016:

Total population (2016 mid-year)	6 293 200
Total deliveries	296 756
Total caesarean sections	83 353
Caesarean section rate	28.09%
Total maternal deaths	216 (Including 21 coincidental deaths)
Maternal Mortality Ratio	68.3 per 100 000 live births
Top 5 Causes	<ol style="list-style-type: none"> 1. Non Pregnancy Related Infections 2. Medical and Surgical 3. Hypertension 4. Haemorrhage 5. Pregnancy Related Sepsis
Areas requiring increased attention	<ul style="list-style-type: none"> Ectopic pregnancy Obstetric Haemorrhage Embolism Resuscitation

The Western Cape population is estimated at 6 293 200 people, or 11.3% of the total South African population (according to the 2016 mid-year population estimate by Statistics South Africa). This is a similar number of people to the Eastern Cape, with only Gauteng and

KwaZulu Natal having larger populations. The Western Cape and Gauteng were the only provinces who had an increase in population over the past 10 years.

Within the Western Cape, there is a well-developed four-tiered system of maternity care with most deliveries taking place in district health facilities (district hospitals and midwife obstetric units). A package of care for the different levels (refined from existing national documents) as well as the skills needed to render the service and the equipment needed for each level of care was developed as a provincial policy document. In rural areas, the district hospitals do all deliveries and refer their specialist referrals to one of the three rural regional hospitals situated in Paarl, Worcester or George. All three of these hospitals have well developed outreach programs with monthly visits to all the district hospitals that include morbidity and mortality meetings (PPIP), high risk obstetric clinics, specialist gynaecology clinics, and ESMOE training. In addition, roving ultrasonographers visit most of the rural areas at least once a month for routine scanning and supervise local ultrasound providers and there has been an increase in employment of ultrasonographers in rural districts. The province has an official policy for routine ultrasound for all pregnant women to increase the quality of screening at the booking visits. Antenatal clinics refer complicated pregnancies, e.g. twins, anomalies and other severe problems in time to one of the two tertiary fetal medicine units, i.e. Groote Schuur or Tygerberg Hospitals. The province has adopted a health indicator for antenatal booking before 14 weeks' gestation.

In the metropolitan area of Cape Town, where two thirds of all the province's deliveries take place, 35% of all deliveries take place in midwife-only supported units (MOUs). The metro has four large district hospitals that provide maternity care (Karl Bremer, Helderberg, Khayelitsha and Mitchell's Plain Hospitals). A further 40% of deliveries take place at this level of care. The large metro district hospitals manage mainly referrals for poor progress in labour or suspected fetal distress from their respective MOUs, in addition to providing a district level package of care for gynaecology including emergency gynaecology.

The metro has three specialist hospitals (Mowbray, New Somerset, and Tygerberg Hospitals) which manage a further 20% of all deliveries at general specialist level and the remaining 5% of pregnancies with severe complications are referred to the tertiary/highly specialised units within the two central hospitals, Groote Schuur and Tygerberg. These hospitals are linked to two academic institutions, the University of Cape Town and Stellenbosch University respectively. Due to there being fewer district hospitals in the metro west area, New Somerset and Mowbray Maternity Hospitals also manage district level referrals from their MOUs and provide district level care to their surrounding areas.

There are 6 health districts in the Western Cape (Cape Town metro, West Coast, Cape Winelands, Overberg, Eden and Central Karoo), but Cape Winelands has two regional hospitals, one on either side of the Limietberg mountains, and the geographical area of drainage therefore differs from the district boundaries. Paarl Hospital Geographical Service Delivery Area (GSA) drains the West Coast and Winelands West and Worcester Hospital GSA drains the Winelands East and Overberg areas. In addition, Saldanha Bay local municipality, although part of the West Coast sub-district, drains to New Somerset Hospital in the metro. Thus, for planning purposes there are five GSAs (George, Paarl, Worcester, Metro East, Metro West), each with a regional referral hospital and a clinical specialist as Head of General Specialist Services who is based at the regional hospital but provides clinical governance oversight, outreach and support for the whole GSA.

Each of the five geographical service delivery areas in the province works towards planning the maternity service and in the metro two technical teams (one in the GSH drainage/Metro West and one in the TBH drainage/Metro East) plan and implement the district health maternal and neonatal service (now also working on women's and child health) and address issues in service delivery. These technical teams are referred to as Service Coordinating Working Groups.

Clinical governance for maternity and neonatal care is provided by a Provincial Clinical Guidance Committee (PCGC) comprised of the two Academic heads of department, the five provincial heads of general specialist services (three rural and two metropolitan, one of which chairs the meeting on a rotational basis), the NCCEMD facilitator, Maternal-Fetal, Reproductive Medicine and Oncology sub-specialists, a family physician and nursing representative, the MCWH deputy director and a senior manager that serves as link with the executive committee of the department of health.

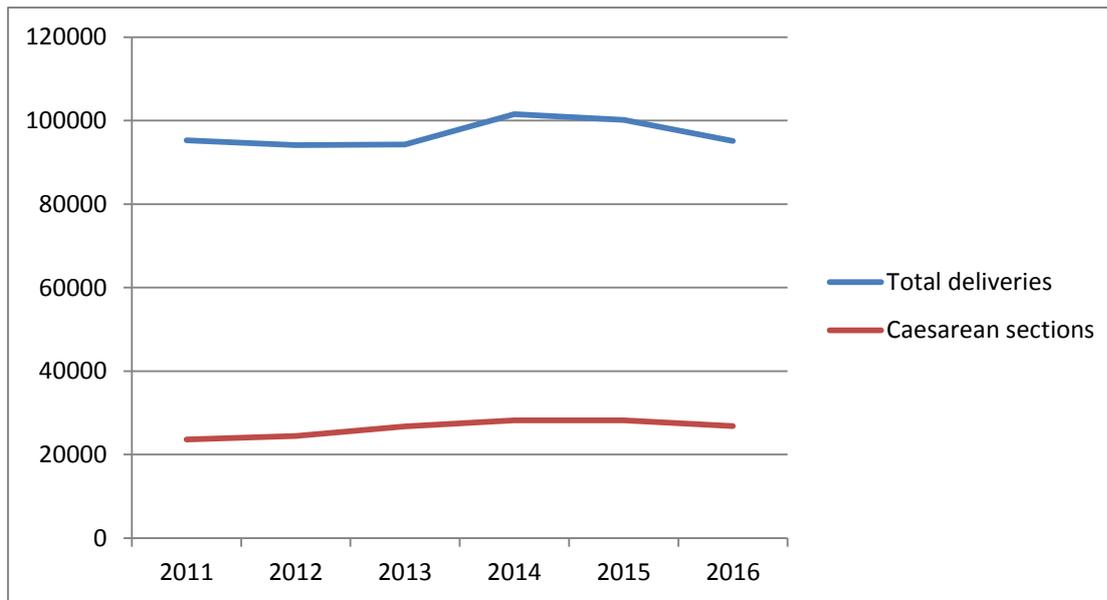
Five district specialist obstetricians have been appointed but as yet there are no functioning DCST teams. Saturation training for ESMOE/EOST is in process and needs to be sustained. ESMOE training has been incorporated into undergraduate medical training and is in the process of being aligned with nursing training.

TableXa.1: Deliveries and Caesarean Sections over the last two triennia (Public sector only)

	2011	2012	2013	2014	2015	2016
Total deliveries	95288	94142	94270	101502	100152	95102

Caesarean sections	23604	24440	26784	28237	28245	26871
CS rates	24.77%	25.96%	28.41%	27.82%	28.20%	28.25%

Figure Xa.1: Graphic presentation of deliveries and Caesarean sections over the two triennia (2011-2016)



The number of deliveries and caesarean sections in the previous two triennia are presented in table 1 and figure 1. Of note is that the caesarean section rate has increased over the last 3 reporting periods from 20,6% (2008-2010) to 26,3% (2011-2013) and 28,1% (2014-2016).

During 2014-2016, the total number of maternal deaths reported in the Western Cape was 216. The number of institutional deaths was 182. In addition 26 deaths occurred outside of public sector health facilities and eight deaths were reported from private hospitals. The Western Cape deaths accounted for 5.2% of all maternal deaths in South Africa

Table Xa.2: Cases reported per year and percent of deaths in SA

Year	Number reported	% of deaths in SA
1998	34	5
1999-2001	126	4.4
2002-2004	207	6.1
2005-2007	187	4.6

2008-2010	252	5
2011-2013	214	4.8
2014-2016	216	5.2

Total cases (private and public facilities) reported per year in the Western Cape. There were 8 deaths reported from private hospitals in the last triennium (2014-2016)

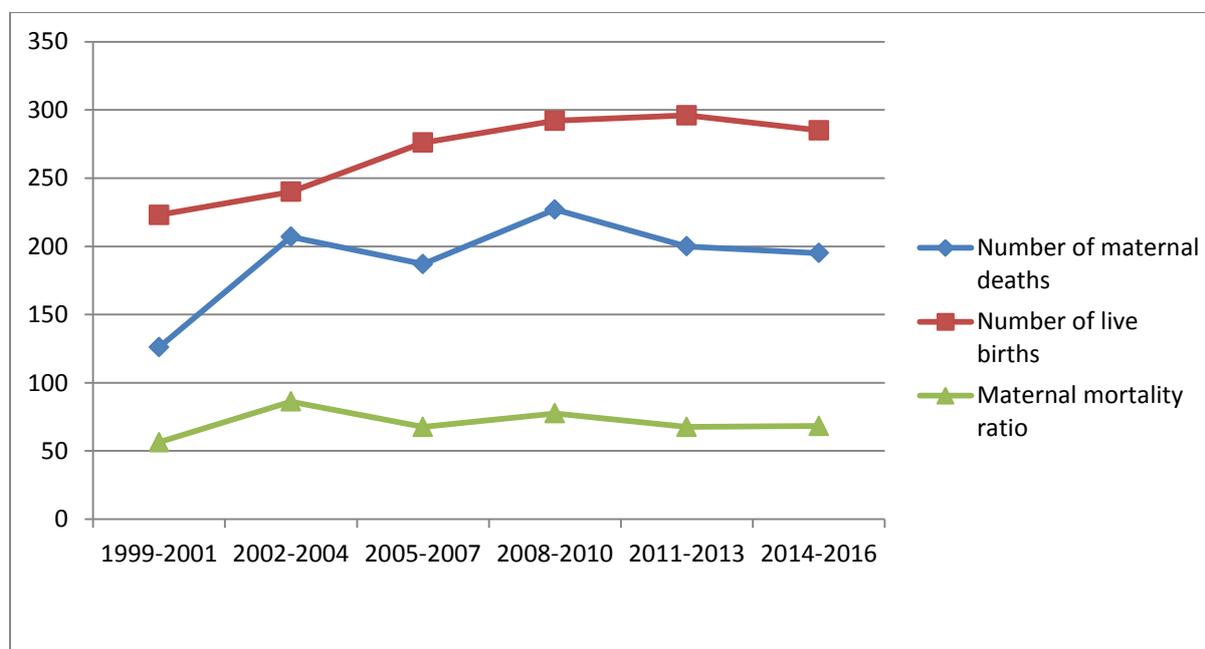
Since numbers are small, it is more valuable to compare triennia. There were 214 maternal deaths during 2011-2013, 252 during 2008-2010, 187 during 2005-2007, 207 during 2002-2004 and 126 during 1999-2001.

Table Xa.3: Institutional Maternal mortality ratio: comparison of triennia

TRIENNIA	Number of maternal deaths	Number of live births	Maternal mortality ratio
1999-2001	126	223 420	56.4
2002-2004	207	240 651	86.2
2005-2007	187	276 808	67.6
2008-2010	227	292 632	77.6
2011-2013	200	296 066	67.55
2014-2016	195*	285 507	68.3

*216 Maternal deaths minus the 21 deaths due to coincidental causes (excluded from the MMR)

Figure Xa.2: Graphic representation of data in table Xa.3



Births are total number x 1000: It can be seen that, the Western Cape MMR has remained unchanged in the 2014-2016 triennium.

Table Xa.4 represents the district of residence in the Western Cape for all maternal deaths. Overall the numbers of maternal deaths in the Western Cape have remained fairly constant over the last two triennia. There is a definite change in the area of residence of women who

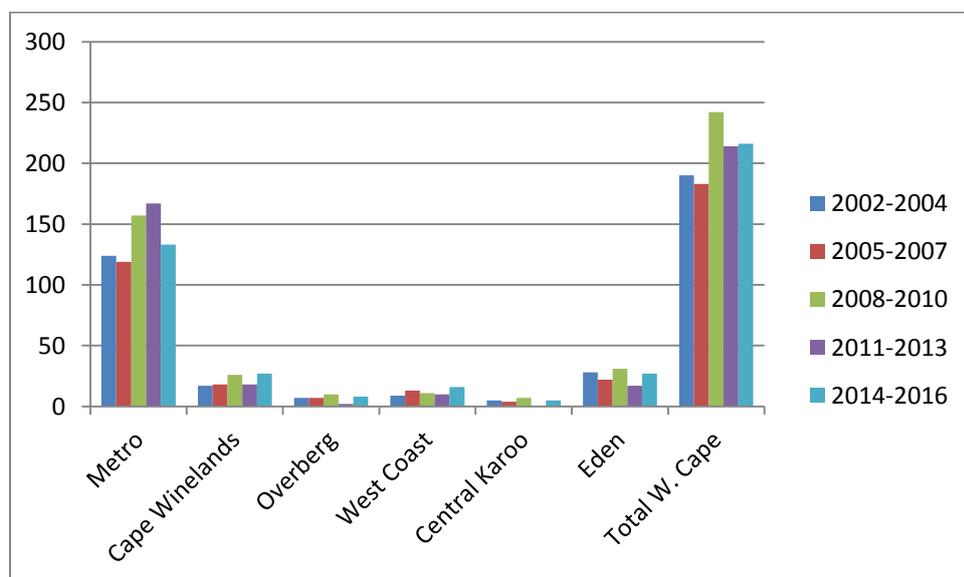
died over the triennia recorded in the table, i.e. 2002-2016. There has been a decrease in the number of deaths in the Cape Metro Health District. Cape Winelands, West Coast, and Eden Districts have all experienced a 50% increase in the number of maternal deaths since the previous triennium (2011-2013). The numbers of maternal deaths in the Overberg District have remained fairly constant over the 15-year period.

The trend towards more maternal deaths occurring outside of the Metro District is important as the causes and avoidable factors may differ, as indeed may be the strategies to address this important observation.

Table Xa.4: Number of maternal deaths per district by residence of the mother

DISTRICT	2002-2004	2005-2007	2008-2010	2011-2013	2014-2016
Metro	124	119	157	167	133
Cape Winelands	17	18	26	18	27
Overberg	7	7	10	2	8
West Coast	9	13	11	10	16
Central Karoo	5	4	7	0	5
Eden	28	22	31	17	27
Total W. Cape	190	183	242	214	216

Figure Xa.3: Number of maternal deaths per district by residence of the mother



All midwife obstetric units and district hospitals in the metro are in close proximity to a regional or central hospital (the furthest is Wesfleur Hospital in Atlantis at 51 kilometres) and

it could be expected that complicated cases could be referred in a reasonable time. It is therefore not surprising to see that the reasons for death at district level were mostly non-pregnancy related problems (NPR infection (9), suicide, assault) or acute conditions: cardiac disease (5); acute collapse (1); pre-eclampsia/eclampsia (5), sepsis (3); and PPH (7).

The forensic pathologists in the Western Cape are well aware of the confidential enquiry and complete a maternal death notification form and report all outside deaths in pregnant or postpartum women to the provincial office; these patients are then traced to their respective hospital (if they were recently discharged) to look for avoidable factors. This vigilance, together with a public health surveillance project of death certificates, enhances the reporting of maternal deaths in the province. While most of these deaths have co-incidental causes, some are pregnancy related, e.g. undiagnosed ectopic pregnancy. This reporting by forensic pathologists will also contribute significantly in future to the information about late maternal deaths. Nevertheless, of the 26 women who died outside of an institution while pregnant or postpartum, there were 7 coincidental deaths and in 4 cases the cause was unknown. Nineteen cases were pregnancy-related, an increase from the 5 in the previous triennium. The causes of death in these 19 cases were 5 medical and surgical disorders (4 of which were cardiac), 2 non-pregnancy related infections, 2 haemorrhage deaths, 4 due to embolism, 2 cases of acute collapse, and the 4 unknown causes.

Maternal mortality ratio

There were 285 507 live births in the public sector during 2014-2016. Using this denominator, the Maternal Mortality Ratio (MMR) for public sector institutional deliveries in the Western Cape in this triennium was 68.3 maternal deaths per 100,000 live births. Since there is data on the number of live births per district it is possible to calculate the MMR per district.

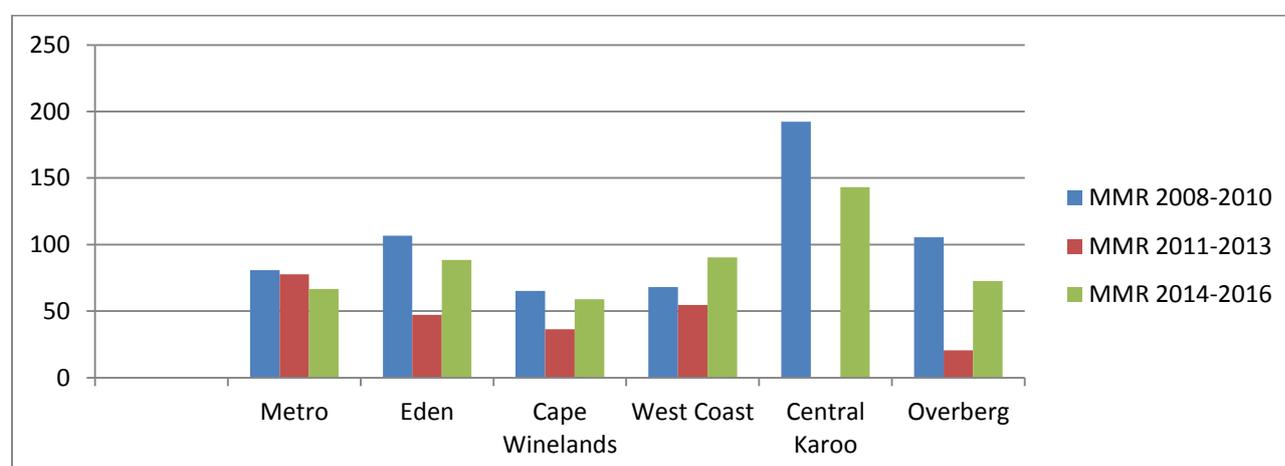
Table Xa.5: Maternal Mortality Rates (MMR) per district 2008-2016, according to residence of mother (private hospital deaths excluded)

<u>DISTRICT</u>	<u>No. Maternal deaths 2014-2016</u>	<u>No. Live births 2014-2016</u>	<u>MMR 2008-2010</u> <u>Deaths per 100,000 live births within the drainage</u>	<u>MMR 2011-2013</u> <u>Deaths per 100,000 live births within the drainage</u>	<u>MMR 2014-2016</u> <u>Deaths per 100,000 live births within the drainage</u>
Metro	133	199 529	80.8	77.73	66.66
Eden	27	30 491	106.7	47.3	88.55
Cape Winelands	27	45 781	65.2	36.5	58.98

West Coast	16	17 683	68.2	54.7	90.48
Central Karoo	5	3 493	192.3	0	143.14
Overberg	8	11 028	105.6	20.6	72.54

Although the numbers of maternal deaths are small, it is significant that there has been a steady decline in the MMR in the Cape Metro District. This has not been the case in the rural districts. It is of concern that the significant reductions in MMR in the Eden and Central Karoo districts in the previous triennium have not been sustained. There has been an increase in MMR in all the rural districts, most notably Central Karoo and Overberg districts.

Figure Xa.4: Maternal Mortality Rates (MMR) per district 2008-2016, according to residence of mother (private hospital deaths excluded)



Since the geographical service delivery areas (GSA) are different, a comparison was also made for the GSA drainage.

Table Xa.6: Maternal deaths according to the GSA

<u>Geographic Service Area</u>	<u>NO. Maternal deaths occurring in the GSA (previous triennium in brackets)</u>	<u>No. Live births (previous triennium in brackets)</u>	<u>MMR 2011-2013</u> <u>Deaths per 100,000 live births within the hospital drainage</u>	<u>MMR 2014-2016</u> <u>Deaths per 100,000 live births within the hospital drainage</u>
Metro West (Groote Schuur Hospital metro drainage)	58 (74)	103 962 (108 554)	68.16	55.79
Metro East (Tygerberg Hospital metro drainage)	67 (72)	94 586 (89 942)	80	70.63

Worcester Hospital drainage	16 (13)	30 889 (30 535)	42.56	51.8
Paarl Hospital drainage	17 (16)	34 613 (33 919)	47	49.11
George Hospital drainage	29 (17)	32 436 (33 116)	51.3	89.41

Births are all live births in public facilities only, as recorded by the facilities. Deaths are maternal deaths per hospital where it took place- for example a women living in Stellenbosch (Paarl Hospital drainage for secondary level care, Tygerberg drainage for tertiary level care) but referred to and dying in Tygerberg Hospital will be recorded in the TBH drainage. Private deaths and deaths occurring outside of the institution were excluded.

Demographic data

Table Xa.7: Comparison of death by age and parity in the two triennia 2011-2013 and 2014-2016

Age	2011-2013 Number	2011-2013 %	2014-2016 Number	2014-2016 %
<20	10	4.7	14	6.5
20-24	43	20.1	42	19.4
25-29	76	35.5	61	28.2
30-34	44	20.6	59	27.3
35-39	30	14	35	16.2
40-44	11	5.1	4	1.9
45+	0	0	0	0
Unknown	0	0	1	0.5

Parity	2008-2010 Number	2008-2010 %	2011-2013 Number	2011-2013 %
0	58	27.1	55	25.5
1	64	29.9	64	29.6
2	48	22.4	51	23.6
3	15	7	20	9.3
4	7	3.3	5	2.3
5	4	1.9	3	1.4
6+	1	0.5	0	0
Unknown	17	7.9	18	8.3

Compared to the previous triennium, there was little change in this demographic. Although the numbers are small, there were fewer deaths in aged 40 and above.

Table Xa.8: Comparison of levels of care where maternal death occurred between 2008 and 2016

Level	2008-2010		2011-2013		2014-2016	
	N	%	N	%	N	%
Home	12	4.8	19	8.9	26	12
CHC or MOU	15	6	9	4.2	9	4.2
Level 1 (district)	45	17.8	36	16.8	43	19.9
Level 2 (regional)	46	18.2	34	15.9	36	16.7

Level 3 (Central)	124	49.2	112	52.3	94	43.6
Private	10	4	4	1.9	8	3.7

The proportion of women dying outside of the institution or at home has increased steadily over the past 9 years, and the number of deaths at CHC/MOU level has remained constant, but as already discussed, the former are mostly fortuitous deaths. The proportion of women dying in district hospitals has increased over the last 9 years, and accounts for nearly 20% of maternal deaths. The proportion of deaths in regional hospitals remains unchanged.

The highest proportion of deaths (43.6%) continue to occur at the central hospitals, but for the first time this is significantly less than 50%. This reflects an effective referral system for complicated cases. However, the relatively high number of deaths at district level needs to be put into perspective, as most (almost 75%) of deliveries occur at this level. The increase in the proportion of deaths outside of the metro also warrants attention.

Figure Xa.5: Distribution of maternal deaths by level of care

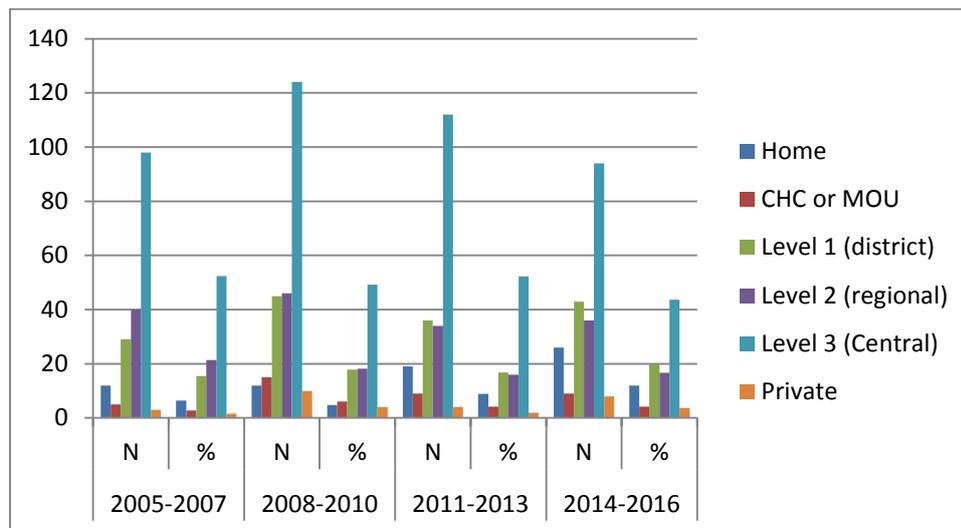


Table Xa.9: Comparison of HIV status between 2008-2010, 2011-2013 and 2014-2016

HIV Status	2008-2010		2011-2013		2014-2016	
	N	%	N	%	N	%
Positive	103	40.9	86	40.2	66	30.6
Negative	106	42.1	96	44.9	118	54.6
Unknown	43	17.1	32	15	32	14.8

The percentage of deaths with unknown HIV status has remained unchanged despite the availability of HIV testing. There is a continued increase in the proportion of maternal deaths in women with negative HIV status. This is most likely due to the increase in HIV testing, universal ARV therapy, and surveillance for opportunistic and associated conditions, e.g. TB. It is also a reflection of the increased impact of chronic diseases and diseases of life-style on maternal mortality.

Despite this decrease, the proportion of maternal deaths known to be HIV positive is still more than double the antenatal HIV prevalence for the general Western Cape obstetric population.

Table Xa.10: Antenatal care attendance from 2008-2016

	2008-2010		2011-2013		2014-2016	
	N	%	N	%	N	%
ANC						
Attended	188	74.6	145	67.8	157	72.7
Not Attended	34	13.5	42	19.6	35	16.2
Unknown	30	12	27	13	24	11.1

The percentage of unbooked mothers at time of death has decreased, but still remains higher than the 2008-2010 triennium. This is despite concerted efforts to encourage early booking and a national initiative to enrol women in Mom-Connect.

Table Xa.11: Comparison of route of delivery of maternal deaths from 2008-2016

Route of delivery	2008-2010		2011-2013		2014-2016	
	N	%	N	%	N	%
Vaginal	87	37.2	57	28.3	51	23.6
Assisted	7	2.9	2	1	7	3.2
Caesarean sections	79	33.8	73	36.3	74	34.3
Undelivered	61	26.1	69	34.4	84	38.9

During 2014-2016, in 4 cases, the route of delivery was not regarded as applicable; percentages shown are for applicable cases only.

There is an increasing trend in the proportion of patients who are undelivered at the time of death. This is possibly a reflection of incidental causes, e.g. patients found to be pregnant and reported by forensic pathology. There may also be an impact of fewer peri-mortem caesarean deliveries.

The increase in CS rate over the past years is reflected in the increase in number of women who died who had a CS as the route of delivery. The CS rate for maternal deaths (in those patients that did deliver) was 56.1%.

In 2014-2016, anaesthesia was administered in 87 of women who had maternal deaths. There were 4 deaths attributed to anaesthetic complications. All of these patients had a spinal anaesthetic. Table Xa.11 shows the level of care at which the anaesthetics were given.

Table Xa.12: Comparison of anaesthesia between 2011-2013 and 2014-2016

Level	2011-2013			2014-2016		
	N	% of anaesthetic performed	% of total deaths occurring at this level	N	% of anaesthetic performed	% of total deaths occurring at this level
Level 1	19	20.4	52.7	25	28.7	58.1
Level 2	23	24.7	67.6	20	23	55.6
Level 3	42	45.2	36.8	37	42.5	39.4
Private	3	3.2	75	5	2.3	62.5

The majority of anaesthetics (65.5%) occurred at specialist hospitals but the proportion at level one increased from 20.4% in the previous triennium to 28.7%. This trend needs to be factored into service design and training. At level-one hospitals, anaesthesia was provided in 58.1% of the total deaths at this level, more than in the previous triennium (52.7%). Overall the percentage of deaths where an anaesthetic was administered has increased and the number of deaths attributable to the anaesthetic has also increased. This needs further investigation and recommendations.

Causes of Maternal Deaths

Table Xa.13: Comparison of primary obstetric causes of death from 2008-2016

	2008-2010		2011-2013		2014-2016	
	N	%	N	%	N	%
Direct	117	46.5	90	42.8	91	42.1
Hypertension	41	16.3	36	16.8	26	12
Haemorrhage	21	8.3	14	6.5	21	9.7
Ectopic pregnancy	4	1.6	1	0.5	6	2.8
Miscarriage	5	2	5	2.3	4	1.9
Preg. Related Sepsis	14	5.6	16	7.5	13	6
Anaesthetic related	3	1.2	1	0.5	4	1.9
Embolism	14	5.6	10	4.7	13	6

Acute collapse	15	6	7	3.3	4	1.9
Indirect	121	48	106	50.7	91	42.1
Non pregnancy-related Infection	91	36.1	67	31.3	46	21.3
Pre-existing Medical Disease	30	11.9	39	18.2	45	20.8
Unknown/Coincidental	14	5.4	14	6.5	34	15.8
Total	252	100	210	100	216	100

Table Xa.13 shows the primary causes of maternal death in the Western Cape in 2014-2016. The proportion of direct maternal deaths and indirect maternal deaths are now the same (42.1%). The proportion of direct maternal deaths has steadily decreased in the Western Cape since 2002 and the proportion of indirect deaths and co-incident has increased. The top 5 causes of maternal deaths in the Western Cape in 2014-2016 were Non-pregnancy related sepsis (21.3%), Medical and surgical disorders (20.8%), Hypertension (12%), Haemorrhage (9.7%), and Pregnancy related sepsis (6%). Of note is that coincidental deaths now equal haemorrhage deaths at 9.7%.

Considering individual causes of death; the leading cause of maternal death in 2014-2016 was still Non Pregnancy Related Infections, which accounted for 46 maternal deaths (down from 91 and 67 in the two previous triennia); the percentage of cases has steadily decreased over the years; a reflection of the very active Western Cape HIV programme. There is a steady increase in deaths relating to pre-existing medical disorders, now classified as medical and surgical disorders and this continues to surpass hypertensive deaths as the second most common cause of death. (Hypertension was 4th leading cause of death in the triennium 2005-2007, and the 3rd most common in the triennium 2008-2010). It may be a reflection of the perceived increase in pathology seen in the maternity services in the Western Cape, possibly due to patients with known disease accessing the service in this province. There were 6 deaths attributed to cancer and 21 to pre-existing cardiac disease amongst this group.

Hypertensive disorders accounted for 26 maternal deaths (12%), and continue to be lower in actual numbers than previously; it is now the third most common cause of death. The fourth most common cause is now haemorrhage, which is steadily increasing (50% increase from the previous triennium); of which 13 were directly related to a CS (4 bleeding during and 9 bleeding after the CS). This is more than double the number in the previous triennium. Pregnancy related sepsis (fifth most common cause of death) continues to decrease and now only accounted for 13 maternal deaths, most likely related to the increase in CS rate (8

cases of sepsis post CS and 5 following NVD). Acute collapse and death due to embolism decrease slightly but is still the sixth most common cause of death.

In the NPRI infection group there were 22 mothers (up from 19) who died from complications of tuberculosis; still more than those dying from sepsis or bleeding, but less than the previous triennia. If this is an effect of the increased vigilance towards TB screening in pregnancy (advocated as a recommendation in previous Western Cape reports) it may be important to evaluate and ensure universal coverage for HIV positive pregnant women.

In order to compare trends in causes of death with the 2008-2010 and 2011-2013 triennia, it is more helpful to focus on specific cause related MMRs rather than proportions. This is shown in Table Xa.14 and in figure Xa.6.

**Table Xa.14: A comparison of Cause specific MMRs from 2008-2016
(Deaths outside of institutions included)**

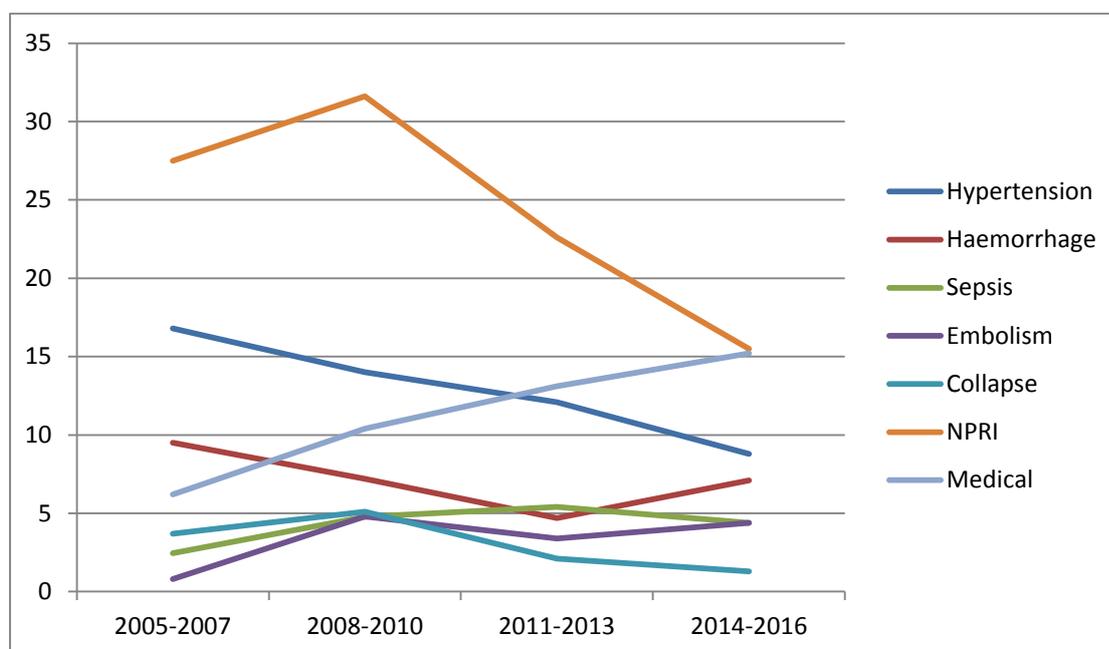
YEAR	2008-2010		2011-2013		2014-2016	
TOTAL NUMBER of Live Births	292632		296 066		296 756	
	N	MMR	N	MMR	N	MMR
DIRECT	117	40	90	30.4	91	30.7
Hypertension	41	14	36	12.1	26	8.8
Haemorrhage	21	7.17	14	4.7	21	7.1
Ectopic Pregnancy	4	1.36	1	0.3	6	2.0
Miscarriage	5	1.7	5	1.7	4	1.3
Pregnancy Related Sepsis	14	4.78	16	5.4	13	4.4
Anaesthetic Related	3	1	1	0.3	4	1.3
Embolism	14	4.78	10	3.4	13	4.4
Acute Collapse	15	5.12	7	2.1	4	1.3
INDIRECT	121	41.34	106	35.8	91	30.7
Non Pregnant Infection	91	31.65	67	22.6	46	15.5

Medical and surgical disorders	30	10.43	39	13.1	45	15.2
Unknown	6	2.09	14	4.72	8	2.7
OTHER					5	1.7
COINC					21	7.1
TOTAL	252	84.87	210	70.9	216	72.8

The table has been amended to reflect the newer coding of primary causes of maternal deaths. Other includes miscellaneous causes. Coincidental causes are presented separately as they account for a significant proportion of maternal deaths, the same as haemorrhage

The results show, again, reducing MMRs due to HIV, hypertension and haemorrhage but increases related to pregnancy related sepsis, and medical and surgical disorders. The data is represented graphically in Figure Xa.6

Figure Xa.6: A comparison of Cause specific MMRs from 2005 – 2016



The overall trend in MMR for the main causes of maternal deaths has been reassuringly downward since the previous triennium. However, the total number of maternal deaths over the triennia has remained unchanged. While Non-pregnancy Related Infections remains the top cause of maternal mortality the medical and surgical disorders account for nearly the same number of maternal deaths. Comparing the last two triennia, the most noticeable increases in maternal mortality are due to ectopic pregnancy and anaesthetic complications. Deaths due to obstetric haemorrhage have also increased by 50% compared to the triennium from 2011-2013.

In the new classification Acute Fatty Liver of Pregnancy has been moved from the Hypertension category to Miscellaneous. Also in the Miscellaneous category is Hyperemesis Gravidarum. Adverse drug reactions are now classified separately, whereas previously if the drug reaction was due to ARV medication the death was classified in the category NPRI. The increase in the coincidental category is most likely due to reporting from Forensic Pathology Services. Other maternal deaths, including cases of ectopic pregnancy, have also been reported from this source.

Avoidable factors, missed opportunities and substandard care

Table Xa.15: Avoidable factors, missed opportunities and substandard care

Category	Percentage of avoidable factors in assessable cases		
	2008-2010	2011-2013	2014-2016
Patient orientated	29	31.8	29.6
Administrative factors	22.5	15.4	7.4
Health worker related emergency management problems			
- Primary level	38.4	29	37.5
- Secondary level	25.6	14.5	29.3
- Tertiary level	33.3	15.4	27.8
Resuscitation	38.7	36.9	32.4

There are still a large number of resuscitation-related factors deemed avoidable by the assessors; this may possibly relate to the deaths at the CHC/MOUs where resuscitation protocols and procedures are not optimal. Resuscitation protocols are also generic and do not always take into account the specific requirements for resuscitation during pregnancy, the different causes, and the altered physiology in pregnancy. Health worker related avoidable factors have increased again in this triennium after initially showing a downward trend from 2008-2010. This increase has been particularly high at level 2 and level 3.

Table Xa.16: Classification of level of substandard care/avoidability

	Number	Percentage of deaths
No suboptimal care	114	52.8
Suboptimal care, different management would have made no difference to the outcome	16	7.4
Suboptimal care, different management might have made a difference to the outcome	45	*20.8
Suboptimal care, different management would reasonably have been expected to have made a difference to the outcome	41	*19.0

**These two categories account for the probable avoidable deaths, i.e. 39.8%*

Table Xa.17: Avoidable factors, missed opportunities and substandard care with respect to patient orientated problems for all assessable cases

Major Problems	Percentage of assessable deaths with avoidable factors		
	2008-2010	2011-2013	2014-2016
	(n=215)	(n=214)	(n=216)
No avoidable factors	71.1	53.7	57.9
No antenatal care	9.3	14.5	7.9
Infrequent antenatal care	3.2	2.8	4.2
Delay in seeking medical help	11.6	15	9.7
Unsafe abortion	0	0	0.5
Other	7.9	0.9	5.1

Patient related avoidable factors

No or infrequent uptake of antenatal care was a problem in 7.9% of deaths, a decrease from 14.5% in the previous triennium. All other patient-related avoidable factors have decreased in prevalence. To increase booking at antenatal clinics, Basic Antenatal Care (BANC) was rolled out to all rural district hospitals and clinics. A provincial policy of routine ultrasound was also introduced with the same aim (amongst others). The province also revised the termination of pregnancy policy following an assessment of current services and rolled out medical Termination of Pregnancy (MTOP) during 2010. There was one death due to unsafe abortion and none related to the TOP programme.

It must be a provincial initiative to ensure that BANC can take place at every clinic within the province. The aim is immediate booking or referral for TOP on the day that the pregnancy is confirmed.

Although routine ultrasound (apart from encouraging early booking and picking up undiagnosed ectopic pregnancies) will probably not prevent a large number of maternal deaths, it does help in the timeous referral of complicated or multiple pregnancies and may improve referral to the correct level of care for both mother and neonate. The Western Cape must ensure that adequate numbers of sonographers are trained and vacant posts filled as a priority to assist with this policy.

Administrative avoidable factors

Administrative avoidable factors were only recorded in 7.4% of cases. There was no avoidable factor in 181 cases (83.8%) and lack of information in a further 19 cases (8.8%). The small proportion of administrative avoidable factors could be due to under reporting of this category, but it is also likely to be a reflection of improvements in health care delivery in the province. The most common administrative avoidable factor was transport problems

between institutions (7 cases). This issue has received attention recently in transversal meetings of stakeholders in the metro. The second commonest was lack of trained staff (4 cases). This factor is often erroneously coded to reflect lack of staff with advanced skills at primary care level. The role out of ESMOE/EOST training to multidisciplinary teams at district level is critical to address this problem.

Access to intensive care was recorded for only one case where it was deemed probable that and ICU bed would have given rise to a different outcome. An increase in the number of high care/ICU beds for maternity care was a recommendation in the previous triennium but no great strides has been made in this case.

Lack of blood availability has decreased as a problem and was not recorded as an avoidable factor over the triennium. Of note is that interpersonal communication problems were recorded as an avoidable factor in 3 maternal deaths. This is one of the areas targeted for improvement in the provincial initiative Patient-Centred maternity Care.

Table Xa.18: Health Worker orientated problems per level of care

<u>Medical management problems</u>	<u>Level 1 Number</u>	<u>Level 2 Number</u>	<u>Level 3 Number</u>	<u>Any level Number</u>
Lack of information	17	3	3	23
No avoidable factor	110	50	67	227
Initial assessment	12	1	2	15
Problem with recognition / diagnosis	24	7	11	42
Delay in referring the patient	13	4	2	19
Managed at inappropriate level	15	11	0	26
Incorrect management (Incorrect diagnosis)	14	2	1	17
Sub-standard management (Correct diagnosis)	19	10	15	44
Not monitored / Infrequently monitored	4	2	1	7
Prolonged abnormal monitoring with no action taken	9	3	3	15

It seems as if large numbers of avoidable factors occur at primary level, but this is where 75% of all deliveries take place. Timely recognition of severe disease, sub-standard management and delay in urgent referral are all factors that need to be emphasised in rural outreach and engagements with MOUs and District Hospitals. The problem in this triennium remains smaller hospitals staffed with general practitioners who only attend emergencies when identified by the nursing personnel. The placement of community service or permanent medical officers at these hospitals must remain a priority.

It is also interesting to note that sub-standard management of cases where the diagnosis was correct was identified by the assessors in a large number of cases at all levels of care, including at the tertiary level. Rotation of registrars through the obstetrical critical care units is important and the introduction of critical care aspects into the postgraduate FCOG syllabus may further improve management.

Likewise prolonged abnormal monitoring with no action taken occurred at all levels of care. This factor is important to correct at ward rounds and debriefing sessions where the emphasis must be placed on clinical accountability by the senior doctor on call and communication across all disciplines. This aspect can be enhanced by correct use of many of the tools in the Maternity Case Record, e.g. Progress of Labour Chart, Early Warning Charts, and SBAR communication tool.

Table Xa.19: Health care provider problems with resuscitation in 2011-2013 compared with 2014-2016

Description	% of assessable deaths	Distribution of complications in resuscitation	
		2011-2013	2014-2016
Resuscitation	36.9		
Airway not secured		8	5
Circulation not corrected		7	3
Inappropriate drugs given		3	1
Incompletely investigated		0	0
Not appropriately monitored		4	0

This potential avoidable factor is very complex to analyse and it is very difficult to evaluate notes from a prolonged resuscitation attempt where the detail may get lost in a retrospective summary made at the end of an exhaustive and emotionally draining unsuccessful resuscitation. Continuous training in basic resuscitation and regular fire drills need to be part of a labour ward management plan. Medical Officers in Emergency Centres, especially at CHCs must be trained in resuscitation of obstetric patients. It seems as if a delay in starting a resuscitation (resuscitation not attempted) was the main avoidable factor identified here (65 cases), but it may have been extreme cases where resuscitation would in any case have been futile.

Summary and concluding remarks

TRIENNIAL COMPARISONS

	2011-2013	2014-2016	% Change
Total MDs	200	195	↓ 2.5%
Coincidental	14	21	↑ 50%
NPRI	67	46	↓31.3%
OH [CD]	14 (6)	21 (13)	↑ 50%
HYP	36	26	↓27.8%
M+S	39	45	↑15.4%

There has been a small reduction in the number of maternal deaths in the Western Cape Province in the triennium from 2014 to 2016. The MMR has remained unchanged. There has been a 50% increase in the reporting of coincidental deaths. Deaths due to Non-pregnancy related infections (mostly HIV-related) and Hypertension continue to decline, while the main increase in causes of deaths is in the category of Medical and Surgical Disorders. There has been resurgence in the deaths due to Obstetric Haemorrhage and this is once again mainly related to caesarean section (CD).

NCCEMD recommended setting specific targets for reducing maternal deaths from 2014 to 2016. These are presented in the table below.

TARGETS ↓ MD by 12.5% or 25% 2014 vs 2016

	2014	2016	% Change
Total MDs	60	74	↑ 23.3%
NPRI	15	15	0%
OH (CD)	3(2)	7(4)	↑133.3%
HYP	6	9	↑ 50%

The main target of reducing the total number of maternal deaths was not met. There was an increase of 23.3% over the two-year period. Although the numbers are small, this is an area that needs attention. Although the total number of deaths due to hypertension decreased compared to the previous triennia, there was an increase over the two-year period; this 50% increase is due to the very small numbers of deaths due to hypertension. The main area of concern is the increase in the deaths due to obstetric haemorrhage, as mentioned above.

Recommendations related to observations from the data:

- Conduct Safe caesarean delivery audit at health facilities performing Caesarean delivery
- Focus attention on chronic medical disorders and implications of obesity: medical obstetric clinics at tertiary level and teaching within ESMOE
- Implement strategies to increase postpartum and post abortion contraception; and contraceptive provision for women attending general medical clinics
- Improve gynaecological management of early pregnancy at primary care level focusing on improved detection of ectopic pregnancy
- Continue widespread HAART initiation and improve TB detection rates
- ESMOE/EOST for all MOU, CHCs, Districts and Higher education schools providing maternity care
- Implement postnatal care policy with involvement of community based workers

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