Annual Report for 2020

includes data for first year of the Covid -19 pandemic

SAVING MOTHERS

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NATIONAL DEPARTMENT OF HEALTH
Saving Mothers
Annual Report
2020

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Abbreviations

AR	Anaesthetic related
ART	Antiretroviral Therapy
BBA	Born before arrival
BMI	Body mass index
BP	Blood pressure
CD	Caesarean delivery
CFR	Case Fatality rate
CHC	Community Health Centre
CHW	Community health worker
CLEVER	Clinical care; Labour ward management; Eliminate barriers; Verify care; EOST on auto pilot; Respectful care
Clinic	Primary health care clinic
DCST	District Clinical Specialist Teams
DH	District hospital
DHIS	District health information system
EC	Eastern Cape province
EOST	Emergency obstetric simulation training
ESMOE	Essential Steps in Managing Obstetric Emergencies
FDC	Fixed dose combination
FRANC	First referral for antenatal care
FS	Free State province
GP	Gauteng Province
HIV	Human immune deficiency virus
HPD	Hypertensive disorders in pregnancy
iMMR	In Facility Maternal Mortality Ratio
IUCD	Intrauterine contraceptive device
KZN	KwaZulu-Natal province
LARC	Long acting reversal contraception
LP	Limpopo province
M&S	Medical and Surgical conditions
MP	Mpumalanga province
MVA	Manual vacuum aspiration
NaPeMMCo	National Perinatal Morbidity and Mortality Committee
NC	Northern Cape province
NCCEMD	National Committee for Confidential Enquiries into Maternal Deaths
NHC	National central hospital
NPRI	Non-pregnancy related infections
NW	North West province
OH	Obstetric haemorrhage
OMBU	On-site Midwife run Birthing Unit
PHC	Primary health care
PMTCT	Prevention of Mother-to-Child Transmission
PPE	Personnel Protective Equipment
PPH	Postpartum haemorrhage
PRS	Pregnancy related sepsis
RH	Regional Hospital
TB	Tuberculosis
TH	Tertiary hospital
TOP	Termination of pregnancy
WBOT	Ward based outreach teams
WC	Western Cape province

Foreword

The death of a woman during pregnancy, childbirth or the puerperium is one of the greatest possible tragedies. The right to life is everyone's constitutional right and women also deserves such. Everyone has the right to have access to health care services, including reproductive health care. All women must feel safe when faced with the need to seek care everywhere within our health system, and it's everyone's moral obligation to ascertain that safety.

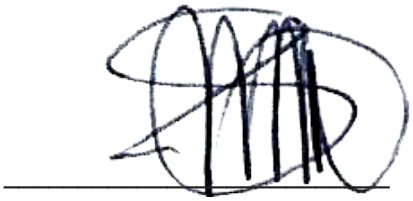
In South Africa, a system of National Confidential Enquiries into Maternal Deaths exists to review maternal deaths. This team consists of highly committed healthcare professionals who dedicated their time to the confidential assessments of individual maternal deaths in all nine provinces in South Africa, and it was led by Professor J Moodley for significant number of years. He then handed over to Professor Edgar Mhlanga (MHRSIP). This confidential enquiry identifies challenges in the health system and makes recommendations for improvement. The recommendations are produced in the form of annual and triennial reports which highlight shortcomings in the health care system, avoidable factors in individual clinical care and whether the death could have been prevented or not.

The NCCEMD works as a ministerial team, with support from the honourable Minister of health (previous Honourable Dr Z. Mkhize and now Honourable Dr J. Phaahla) and the NDOH MCWH team.

It's quite a mammoth task to bring such triennial and annual reports to fruition, and it involves tremendous effort, energy and meticulous attention to detail, and Professor Sue Fawcus (new editor) together with Professor Bob Pattinson (previous editor) and Professor Lawrence Chauke (co-editor) of the Saving Mothers' Reports needs special mention and South Africa's gratitude for these thoughtful documents and contributions that they have made to decrease maternal and newborn deaths in South Africa.

South Africa was just celebrating the fruits of implementation of these recommendations, from the latest triennial report (Saving Mothers' Reports 2017-2019) that demonstrated that the assessment of individual maternal deaths and the lessons learnt leading to recommendations does result in good news. For the first time since the initial report in 1998, the institutional maternal mortality ratio had dropped to less than 100 per 100 000 live births. This was certainly an achievement for South Africa, one of the few countries in the world which has assessment of individual deaths and which implements the recommendations. However, the unexpected happened. The Covid 19 pandemic came when we least expected it, South African women not spared and its aftermath are still evident. We also lost significant number of healthcare workers. It had both direct and indirect effects on our health system as highlighted in this interim report and hopefully great lessons learnt for the future.

Let's continue to grow South Africa together in our journey to save lives!



Dr Sylvia N. Cebekhulu: NCCEMD Acting Chairperson

Executive Summary

Introduction

The 2020 annual Saving Mothers report presents an overview of maternal mortality in 2020, with underlying causes and trends compared to previous years.
It is important to note that this report covers the first, and part of the second wave of the Covid 19 pandemic which commenced in March 2020 in South Africa and had major effect on maternal health outcomes and utilisation of maternal /reproductive health services (1).

Methods

The method used to compile this report is the same as used for all previous Annual reports (2), but the database was closed much later than in previous years, on 15th December 2021, due to delays in provincial notification and assessment processes, but also due to late submissions from Gauteng. Collection of maternal death data for the Saving Mothers report was severely hindered due to human resource and other challenges in maintaining the NCCEMD process during the pandemic. Many provincial assessors were heavily involved in managing the Covid pandemic in their places of work.
The classification of Maternal deaths used in South Africa is based on the WHO ICD 10 adaptation for maternal deaths and can be found in NCCEMD documents (3,4).
Since SARS-CoV-2 or Covid -19 was a novel infection in 2020 with specific characteristics and high mortality, it needed to be incorporated into the maternal death classification of causes, in order to be identifiable. It was thus decided by the NCCEMD to code it on MAMMAs as follows: NPRI /Other (specify Covid 19 complication).

Results

In 2020, there were 1183 deaths during pregnancy, childbirth, and the puerperium (DDPCP), reported to the NCCEMD and entered in the MAMMAs database, of which 1152 were Maternal deaths. There were 1,035,255 live births, reported to public health facilities via DHIS.
Greater numbers of deaths were reported to NCCEMD than to DHIS for most provinces, similar to in previous years. This is because NCCEMD includes deaths which happened outside health facilities and deaths at private hospitals in addition to facility deaths, whereas DHIS only includes facility deaths. However, in 2020 more deaths were reported to DHIS than NCCEMD from Eastern Cape and Gauteng provinces, both known to have had delays with submissions and reporting. Therefore, a correction was made for suspected under-reporting for these two provinces.

Main findings:

- The corrected Maternal Mortality Rate (MMR) was 126.1 which is a 26% increase from 2019 (98.8) and shows that the steep decline from 2010 had been reversed
- The increased MMR occurred in all provinces except Northern Cape which had small numbers and Limpopo which may also have underreported. There were marked increases in Eastern Cape, KwaZulu-Natal, and Western Cape, which together with Gauteng were the provinces most affected by the pandemic.
- Non-Pregnancy Related Infections (NPRI) accounted for 27.1% of deaths and have sharply increased from previous years.
- Covid -19 pneumonia and complications accounted for 40% of NPRI deaths and 10.8% of all maternal deaths.
- Obstetric haemorrhage (OH) deaths (191,16.6%) increased to become the second most common cause, except in Mpumulanga.
- There was a notable decline in deaths due to Hypertensive disorders (HYP) in all provinces except Mpumulanga where it increased.
- The majority of deaths (90%) occurred at public hospitals with an increasing number (7%) in private hospitals
- The Caesarean Delivery (CD) rate remained similar to 2019, at 28.3%, but the CD Case Fatality Rate increased to 145.7 CD associated deaths per 100,000 CDs, compared to 112.5 in 2019.
- Deaths were assessed to be possibly or probably preventable by the health system for 58% of women who died, the most avoidable being OH and HYP deaths, with lesser numbers in the NPRI group. Of note the proportion of deaths with Administrative avoidable factors increased to 57.1% from 48.1% in the previous triennium.

Discussion

Notification, submission, and assessment of maternal death data for the Saving Mothers report was severely hindered after the onset of the Covid-19 pandemic. This meant that the data is not as precise and accurate as in previous years.
An important finding of this report is the 26% increase in iMMR in 2020 compared to 2019, after correcting for under-reporting. This increase is less than the SAHR chapter estimate of a 38% increase because in 2020, the pandemic was only present for three -quarters of the year having started its impact in April 2020. The SAHR chapter review was for a financial year, April 2020 to March 2021. Other global systematic reviews have also demonstrated increases in MMR during the pandemic of 30 to 40 % (5).
Assessment of the collateral impact of Covid 19 needs further interrogation of the data, although it is likely that the increase in OH deaths and deaths with administrative avoidable factors, reflects a decline in quality of maternity care, because OH mortality reflects health system functionality.

Conclusion

The reduction in iMMR seen in 2019 and the previous triennium has been reversed in 2020, due to the Covid 19 pandemic causing maternal deaths due to Covid pneumonia, and due to the indirect effects on the management of other causes such as obstetric haemorrhage.

Recommendations

1. Continue implementation of key recommendations arising from 2017-2019 report which were set back by the Covid-19 pandemic
2. Strengthen the reporting, assessment and report writing processes of the NCCEMD so it is enabled to provide information timeously at national and provincial level.
3. Ensure consistency in coding of primary obstetric causes of maternal death by strengthening training of new assessors and Quality Assurance at provincial level.
4. Strategies to protect maternity services during future pandemics need to be devised.
5. Integration of Covid 19 management into maternity services, with upskilling of health care workers and retention of personnel in Maternity services. (This should be a prototype for future pandemics similar to the way PMTCT and ART were incorporated into Antenatal care)
6. The model of Covid Obstetric wards or areas should be promoted with relevant resources in terms of equipment (eg High-flow nasal oxygen) and human resource requirements.

1. Introduction

The 2020 annual Saving Mothers report will present an overview of maternal mortality in South Africa in 2020, underlying causes and trends compared to previous years.

It is important to note that this report covers the first, and part of the second wave of the Covid 19 pandemic which commenced in March 2020 in South Africa and had major effect on maternal health outcomes and utilisation of maternal /reproductive health services
(1).
The pandemic also adversely affected the assessment process and data analysis process of the NCCEMD since many provincial assessors were heavily involved in managing the Covid pandemic in their places of work.

In 2020 there was a change of the NCCEMD national committee, and very sadly just as the new committee was moving forward, experienced the untimely death of the new chairperson Prof Eddie Mhlanga in 2022; may his soul rest in peace. The NCCEMD would also like to acknowledge the work of the previous Chairperson, Prof J. Moodley, and previous Saving Mothers editor, Prof RC Pattinson, and the previous committee. The MRC unit headed by Prof Pattinson, continues to collate the MAMMAs data for the Saving Mothers report and the NCCEMD is grateful for Ms Cathy Bezuidenhout and Bontle Mamabolo for this contribution. Prof Pattinson is acknowledged for his important and helpful contributions to this report.
The work of the NCCEMD continues to be supported by the National Department of Health's MCWH directorate headed by Dr Manala Makua

2. Methods

The method used to compile this report is the same as has been used for all the other annual reports (2). The database was closed much later that in previous years, on 15th December 2021, due to delays in provincial notification and assessment processes, but also due to late submissions from Gauteng.
The classification of Maternal deaths used in South Africa is based on the WHO ICD 10 adaptation for maternal deaths (3).
Maternal deaths are classified by Primary Obstetric causes, for example Obstetric Haemorrhage (OH), Non pregnancy related infections (NPRI) etc. These are then subdivided into Causal Subcategories e.g. for OH: uterine atony, bleeding at Caesarean delivery (CD) etc; and for NPRI: TB, pneumonia etc. The classification can be found in NCCEMD documents (4).
Since SARS-CoV-2 or Covid -19 was a novel infection in 2020 with specific characteristics and high mortality, it needed to be incorporated into the classification in order to be identifiable. It was thus decided by the NCCEMD to code it as follows: NPRI /Other (specify Covid-19 complication). A death during pregnancy due to COVID-19 complications was thus categorised as an indirect maternal death.
There were also women who died from other primary causes e.g. OH, but whose condition was possibly exacerbated by concurrent COVID-19 infection. In such cases, the NCCEMD decided that COVID-19 infection should be included as a final or contributory cause as: Other (specify Covid-19)

3. Maternal Deaths and Mortality rates 2020

Table 1 gives the live births from the DHIS, and maternal deaths submitted to the NCCEMD and entered on the Maternal Morbidity and Mortality Audit System (MaMMAS) in 2020. It is important to note that all Deaths During Pregnancy, Childbirth, and the Puerperium (DDPCP), previously known as pregnancy related deaths, were reported. DDPCP include any woman who died during pregnancy or the puerperium, and includes coincidental deaths such as those due to motor vehicle accidents, natural disasters, and assault. The definition of a maternal death excludes these coincidental deaths.

Table 1 also compares the number of maternal deaths (MDs) submitted to the NCCEMD and entered into the MAMMAs database with the numbers reported by the District Health Information system (DHIS) signed off in July 2021. In previous reports, MAMMAs has tended to identify more maternal deaths than DHIS. This is because MAMMAs includes some deaths which happen outside health facilities and deaths at private hospitals, whereas DHIS only includes facility deaths. This pattern of more deaths reported to MAMMAs than to DHIS occurred for all provinces in SA in 2020 except GP and EC, where MAMMAs reported much fewer. Under-reporting in EC and GP in the MAMMAs database is suspected as the reason for this discrepancy. Using this information and excluding EC and GP, there is an average discrepancy for 2020 across all other provinces of 16.5% between DHIS maternal death numbers and the MAMMAs maternal death numbers. Table 2 describes trends in maternal death numbers from 2017 to 2020, and the shaded yellow numbers show that EC and GP are again the outliers in having reduced numbers in 2020, against the national trend of an increase in 2020. This further supports the assumption of under-reporting and the need for a correction. Therefore, EC and GP were corrected from DHIS using the average amount (16.5%) that the MAMMAs data was above the DHIS for the other provinces. This is probably a truer reflection of the actual situation (Table 2). This is a combination of true MD numbers from MAMMAs for all provinces except EC and GP whose MD numbers have been adjusted upwards.
The SA corrected iMMR is 126.2 deaths per 100,000 live births, which is an 26% increase in iMMR in 2020 compared to 2019.

Appendix 1 compares MAMMAs data to that reported by DHIS and how the adjustments were made for EC and Gauteng. It also provides UNCORRECTED Figures of Maternal Mortality trends.

Table 1. 2020: Births and deaths during pregnancy childbirth and puerperium (DDPCP), NCCEMD and DHIS Maternal deaths and iMMR per province. (UNCORRECTED)

Province	Live birth in facility (DHIS)	MAMMAs Deaths DDPCP	MAMMAs MD	DHIS MD 2020	DHIS iMMR	MAMMAs iMMR
ec Eastern Cape	109077	122	115	160	146,7	105,4
fs Free State	48452	94	90	70	144,5	185,8
gp Gauteng	240270	239	234	271	112,8	97,4
kz KwaZulu-Natal	214694	251	249	220	102,5	116
lp Limpopo	140542	167	166	157	111,7	118,1
mp Mpumalanga	92094	99	95	77	83,6	103,2
nw North West	62026	83	81	72	116,1	130,6
nc Northern Cape	22042	23	23	17	77,1	104,3
wc Western Cape	106058	105	99	77	72,6	93,3
South Africa	**1,035,255**	**1183**	**1152**	**1121**	**108,3**	**111,3**

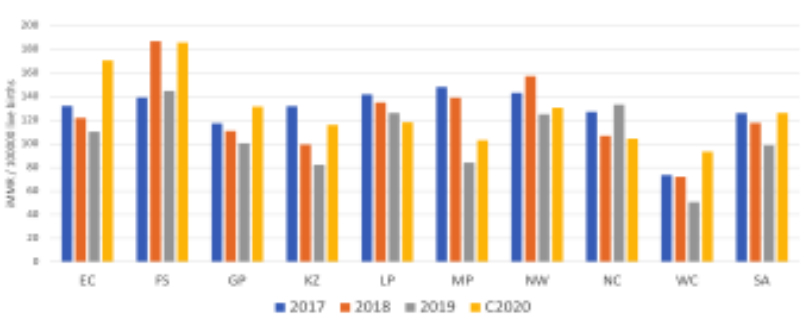
Table 2. Number DDPCP and MDs per province 2017-2020 (WITH CORRECTIONS)

Province	2017	2018	2019	2020	DHIS MD 2020	Corrected iMMR
Eastern Cape Province	142	131	131	122 (c181)	160	170,52
Free State Province	69	92	77	94	70	185,75
Gauteng Province	257	267	249	239 (c323)	271	131,52
KwaZulu-Natal Province	245	202	185	251	220	115,98
Limpopo Province	181	171	160	167	157	118,11
Mpumalanga Province	118	112	73	99	77	103,16
North West Province	84	95	81	83	17	130,59
Northern Cape Province	28	25	38	23	72	104,35
Western Cape Province	80	74	62	105	77	93,35
South Africa	**1204**	**1169**	**1056**	**1183**	**1121**	**126,06**

Table 3 and Figure 1 give the institutional Maternal Mortality Ratio (iMMR) which excludes coincidental causes for 2017-2020 (CORRECTED).

Province	2017	2018	2019	C2020
ec Eastern Cape Province	132,10	121,94	110,32	170,52
fs Free State Province	139,14	186,78	144,83	185,75
gp Gauteng Province	117,23	110,86	100,54	131,52
kz KwaZulu-Natal Province	131,81	99,41	82,22	115,98
lp Limpopo Province	141,82	134,97	126,20	118,11
mp Mpumalanga Province	148,11	139,09	84,07	103,16
nw North West Province	143,07	157,31	124,98	130,59
nc Northern Cape Province	126,98	106,83	133,13	104,35
wc Western Cape Province	73,52	72,09	50,77	93,35
South Africa	**125,89**	**117,69**	**98,82**	**126,06**

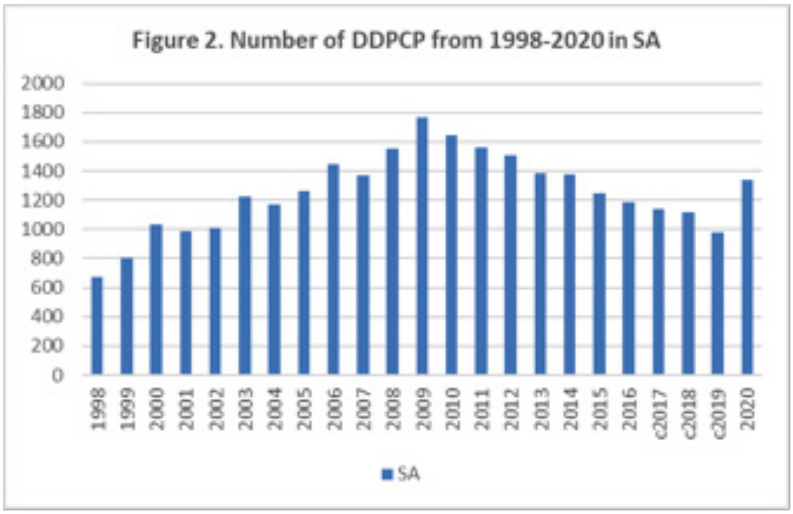
Figure 1. Comparison iMMR per province (2017-2020)



With iMMRs adjusted for EC and Gauteng, the iMMR has increased for EC and Gauteng as well as FS, KZN, MPU, NW and WC, but not for Limpopo and N. Cape. Although the iMMR decreased in Limpopo, the total number of maternal deaths increased, implying a relatively larger increase in the number of live births recorded in the DHIS. It is unclear whether there was real decrease in Limpopo or underreporting could have occurred also.

4. Trends in Deaths During Pregnancy, Childbirth and Puerperium and Maternal Mortality Rates

Figure 2 give the national number of DDPCP recorded per year since the inception of the confidential enquiries. Following the encouraging and steep decline from 2010, with an iMMR less than 100 in 2019, there has been an increase in 2020, to 126.1. This correlates with the onset of the Covid pandemic which started its impact in April 2020.
Figure 3 shows the trend in iMMR from 2005 and shows a significant upsurge in 2020 compared to previous years. The iMMR increased by 26%. This is less than the 38% described in the SAHR chapter (1), which describes data for financial year 2020/2021, from April 2020 and thus does not cover the first quarter of the year before the onset of the pandemic.



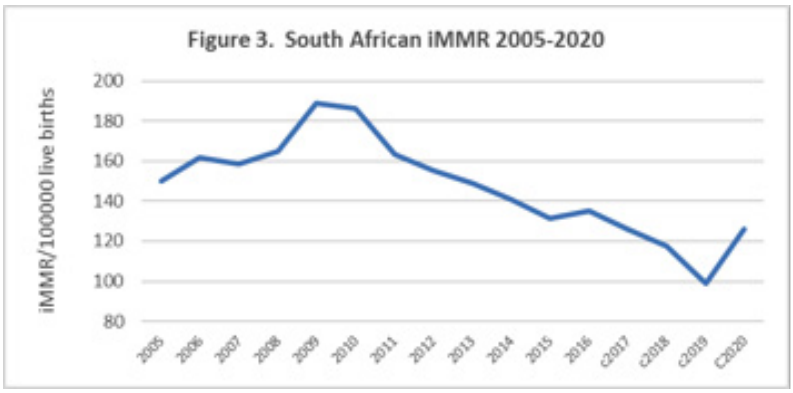
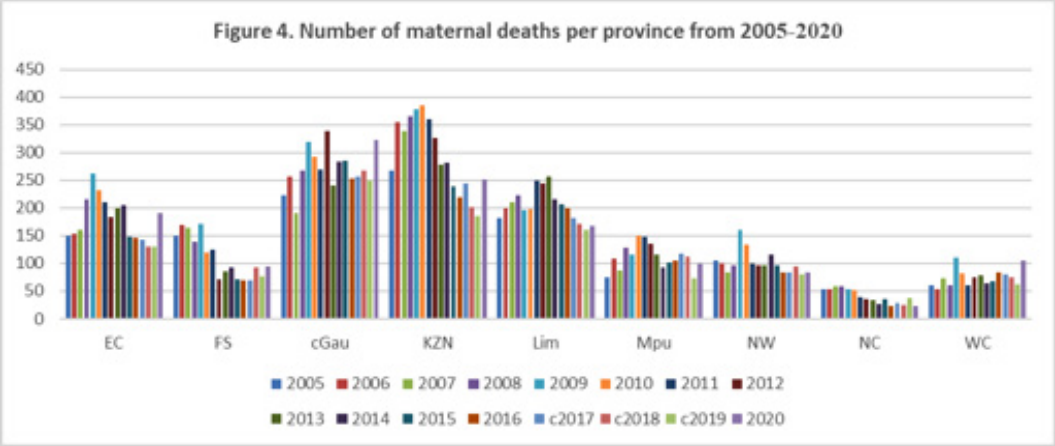
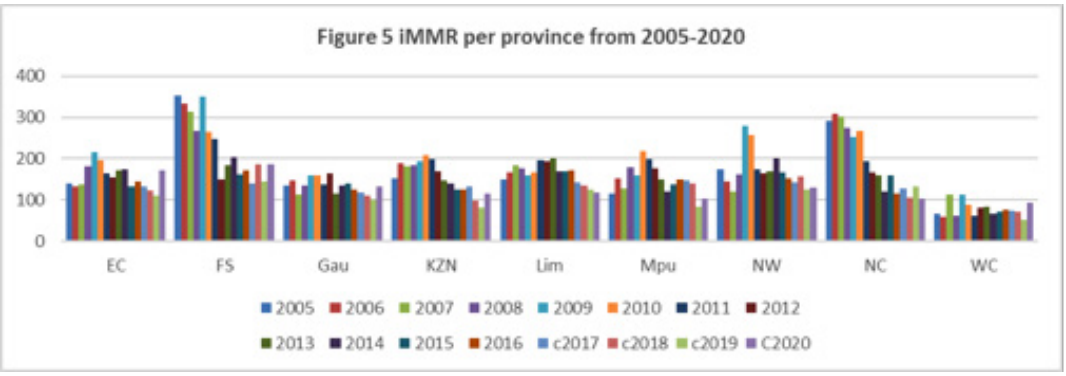


Figure 4 gives the number of maternal deaths per province and Fig 5 the iMMR per province since 2005. From 2009, there was a general trend to lower numbers of maternal deaths up to 2019, which then reversed in 2020 for EC, FS, GP, KZN, MPUWC, KZN, and WC (using corrected figures for EC and GP).





5. Primary Obstetric Causes of Maternal Deaths

Table 4 shows the Primary cause of death and related iMMR in 2020. Non-Pregnancy Related Infection (NPRI) is the leading cause accounting for 27.1% of deaths, followed by Obstetric Haemorrhage (OH) with 16.6%. Medical and Surgical disorders (M&S) are third (15.5%), with Hypertension (HYP) decreased to fourth place (15.2%), and pregnancy related sepsis (PRS) fifth (5.1%). However, if miscarriage and ectopic pregnancy are combined into one category as early pregnancy complications it would account for 9.2% of deaths and be in fifth place, thus emphasising their importance as a cause of death.
Corrections were not made for GP and EC because it could not be assumed that the pattern of disease in 2020 was similar to that in the previous triennium for these provinces which both were affected by the Covid 19 pandemic. Therefore, the cause of death data that follows is uncorrected national data.

Table 4. Primary Obstetric cause of Maternal deaths and iMMR for 2020 (UNCORRECTED)*

Primary obstetric problems*	Number MDs N=1152	%	iMMR
INDIRECT			
Non-pregnancy-related infections	312	27.1	30.1
Medical and surgical disorders	178	15.5	17.2
DIRECT			
Obstetric haemorrhage	191	16.6	18.4
Hypertensive disorders of pregnancy	175	15.2	16.9
Ectopic pregnancy**	35	3	3.4
Miscarriage**	47	4.1	4.5
Pregnancy-related sepsis	59	5.1	5.7
Anaesthetic complications	20	1.7	1.9
Adverse drug reactions	13	1.1	1.3
Embolism	32	2.8	3.1
Acute collapse - cause unknown	15	1.3	1.4
Miscellaneous	4	0.3	0.4
Unknown	71	6.2	6.9

**Deaths from Covid complications are classified under NPRI/other*
***Early pregnancy loss (ectopic and miscarriage) combined would be the 5th most common causal grouping*

Subcategories of cause of maternal death are displayed in Appendix 2.
The three following tables 5a, 5b, and 5c break down the three major primary obstetric causes in 2020 (NPRI, OH, and M&S) into subcategories and the proportions are compared with the previous triennium (2017-2019).

Table 5a. Subcategories of NPRI Maternal deaths in 2020, compared with 2017-2019 triennium

Subcategory	Number in 2020	% of NPRI (2020)	% of NPRI (2017-2019)
Pneumonia	73	23.4 %	33.9%
TB	61	20 %	36.2%
Meningitis	26	8.3 %	10.9 %
GIT, Appendicitis, Malaria etc	15	4.8 %	11.7 %
Other/specified*	137	43.9 %	7.3%
Total	**312**	**100%**	**100%**

***124 specified as Covid pneumonia /complication**

The largest subcategory of NPRI in 2020 was Other, with Covid pneumonia/complication specified. This will be discussed in detail in section 6. This has increased markedly from the proportion in the previous triennium when it was 7.3%. Of note in 2020, the proportion of NPRI deaths from Pneumonia and TB declined. It is unsure whether this represented a real decrease in these deaths or was due to a tendency to diagnose all cases of respiratory failure as due to Covid.

Table 5b. Subcategories of Obstetric Haemorrhage in 2020, compared with 2017-2019 triennium

Subcategory	Number in 2020	% of NPRI (2020)	% of NPRI (2017-2019)
Antepartum Haemorrhage	29	15.2 %	17.6 %
Ruptured uterus	30	15.7 %	11.2%
PPH after vaginal delivery	54	28.3 %	34 %
Bleeding at/after Caesarean delivery	78	40.8%	37.1%
Total	**191**	**100%**	**100%**

In 2020, the pattern of subcategories causing OH deaths changed in comparison to 2019, with Bleeding at/after Caesarean delivery (BLDACD) accounting for 40.8% and the proportion due to PPH after vaginal delivery decreasing. Also, the small increase in deaths from ruptured uterus is concerning and could reflect a decline in the quality of intrapartum care in 2020, and delays in accessing operating theatres due to unavailability for various reasons.

Table 5c. Subcategories of Medical and Surgical Disorders in 2020, compared with 2017-2019 triennium

Subcategory	Number in 2020	% of M&S	% of M&S (2017-2019)
Cardiac*	53	29.8 %	31.6 %
Respiratory	26	14.6 %	13.5 %
Psych/Suicide	11	6.2 %	4.6 %
Neoplasm	18	10.1 %	8.9 %
Haemat, GIT, CNS, Autoimmune etc	24	13.5 %	12.9 %
Other	46	25.8 %	28.5 %
Total	**178**	**100 %**	**100 %**

***39 (21.9%) Peripartum cardiomyopathy**

The most common causal subcategory in the Medical and Surgical disorders group was cardiac conditions, of which the majority were due to peripartum cardiomyopathy.
The pattern of causal subcategories was similar to the previous triennium.

Trends in Primary Obstetric Causes 2017-2020.

As indicated previously, the following data which compares numbers of deaths at a national level due to various causes in 2020 with the preceding years, needs to be cautiously interpreted due to the overall underreporting of deaths to the NCCEMD in 2020.

Table 6 and 7 compare numbers of maternal deaths and iMMR per Primary Obstetric cause from 2017 to 2020.

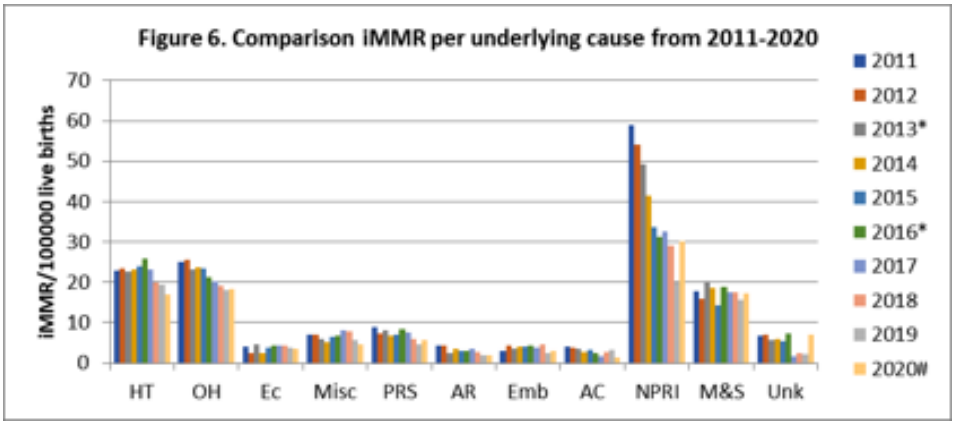
Table 6. Cause of maternal deaths for 2020 compared to preceding three years (UNCORRECTED)

Underlying Cause of DDPCP/Maternal death	2017	2018	2019	2020
Coincidental cause	38	34	43	31
Medical and surgical disorders	161	166	154	178
Non-pregnancy-related infections	297	276	197	312
Ectopic pregnancy	41	41	37	35
Miscarriage	75	73	56	47
Pregnancy-related sepsis	70	55	45	59
Obstetric haemorrhage	184	181	179	191
Hypertension	210	188	192	175
Anaesthetic complications	30	27	20	20
Adverse drug reactions	11	5	9	13
Embolism	35	43	24	32
Acute collapse - cause unknown	15	25	32	15
Miscellaneous	5	4	12	4
Unknown	53	64	45	71
DDPCP	1225	1182	1045	1183

Table 7. Comparison of iMMR for underlying causes per year 2017-2020 (UNCORRECTED)

Primary obstetric problems	2017	2018	2019	2020
Hypertension	23,09	19,88	19,39	16.9
Obstetric haemorrhage	20,13	19,19	18,09	18.4
Ectopic pregnancy	4,46	4,40	3,75	3.4
Miscarriage	8,11	7,90	5,63	4.5
Pregnancy-related sepsis	7,62	5,95	4,52	5.7
Anaesthetic complications	3,40	2,79	2,02	1.9
Embolism	3,84	4,53	2,47	3.1
Acute collapse - cause unknown	1,68	2,64	3,21	1.4
Non-pregnancy-related infections	32,59	29,15	19,95	30.1
Medical and surgical disorders	17,57	17,64	15,61	17.2
Unknown	1,66	2,52	2,12	6.9
iMMR for all maternal deaths	**125,89**	**117,69**	**98,82**	**111.3**

Figure 6 illustrates trends in iMMR per Primary Obstetric cause from 2011 to 2020. The same limitations apply to data interpretation as for previous tables and figures on causes.



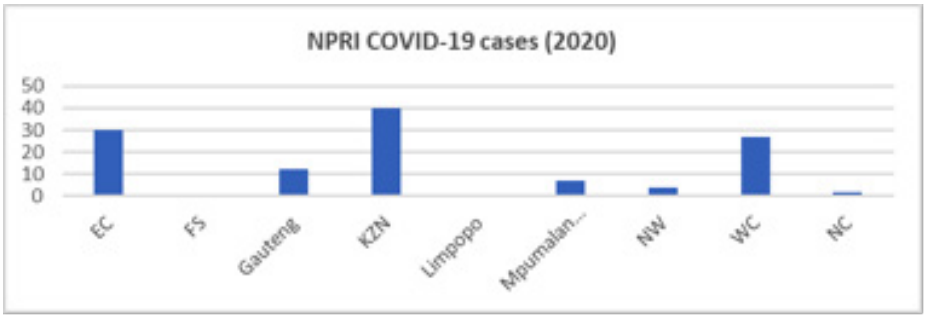
2020# data unreliable
HT – Hypertensive disorders in pregnancy, OH – Obstetric haemorrhage, Ec – ectopic pregnancy, Misc. – Miscarriage, PRS – Pregnancy related sepsis, AR – Anaesthetic related, Emb. – Embolism, AC – Acute collapse cause unknown, NPRI – Non-pregnancy related infections, M&S – pre-existing medical and surgical conditions, Unk. - Unknown

6. Classification of maternal deaths directly due to Covid 19 complications.

Deaths due to Covid complications were classified under NPRI/Other/specify Covid. The MAMMAs database showed a marked increase in NPRIs in most provinces. In previous reports, the subcategory TB and pneumonia have been the most common subcategories, and 'other' one of the smaller groups. However, in 2020 there were 137 deaths in the NPRI /other category, 124 of which were specified as 'Covid complication' (Figure 7). This group was two to three times larger than TB or pneumonia which had 43 and 61 deaths respectively.

Figure 7. Coding of Maternal deaths directly due to Covid 19 complications

Province	EC	FS	GAU	KZN	LIM	MPU	NW	NC	WC	TOTAL
NPRI COVID-19 cases (2020)	30	1	12	40	1	7	4	2	27	124



This report shows the documented contribution of Covid 19 to maternal mortality. However, it is likely to be an underestimate due to under reporting by EC and GP, and possibly due to misclassification of Covid deaths as NPRI/ subcategory other pneumonia, or Medical and Surgical disorders/subcategory respiratory or Coincidental. Obviously, misclassification could have occurred in the other direction; deaths coded as Covid 19 could have had another primary cause but incidentally found to be Covid positive.
It was reported that Gauteng had a more severe pandemic in the second wave, particularly in 2021, and this may be reflected in future reports.

7. Trends in Primary Obstetric causes of death per province

Table 8 and 9, and Figure 8 shows the Primary Obstetric Causes of maternal death in numbers and iMMR for the provinces. NPRI deaths are the leading cause of death in EC, KZN, MPU, NW, and WC.

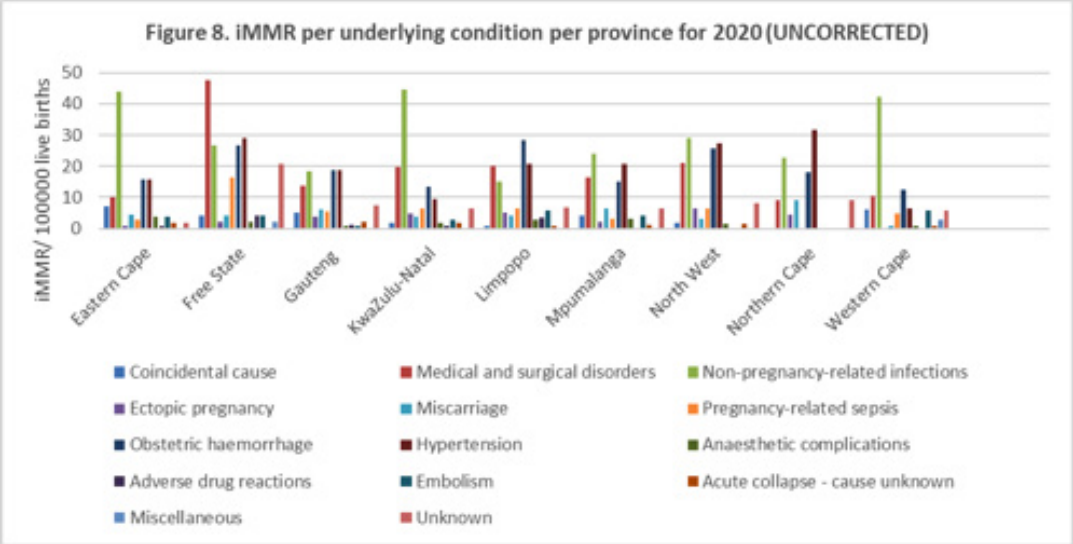
Table 8. Number of maternal deaths per province per Primary obstetric cause for 2020 (UNCORRECTED)

Primary obstetric problems*	Eastern Cape	Free State	Gauteng	KwaZulu-Natal	Lim-popo	Mpuma-langa	North West	Northern Cape	Western Cape	South Africa
Medical / Surgical disorders (M&S)	11	23	33	42	28	15	13	2	11	178
Non-preg related infections (NPRI)	48	13	44	96	21	22	18	5	45	312
EctopicPreg (Ect)	1	1	9	10	7	2	4	1	0	35
Miscarriage (Misc)	5	2	15	8	6	6	2	2	1	47
Pregnancy-related sepsis (PRS)	3	8	13	14	9	3	4	0	5	59
Obstetric haemorrhage (OH)	17	13	45	29	40	14	16	4	13	191
Hypertension (HYP)	17	14	45	20	29	19	17	7	7	175
Anaesthetic complications (AR)	4	1	2	4	4	3	1	0	1	20
Adverse drug reactions (ADR)	1	2	3	2	5	0	0	0	0	13
Embolism (Emb)	4	2	2	6	8	4	0	0	6	32
Acute collapse (AC)	2	0	5	4	1	1	1	0	1	15
Miscellaneous (Misc)	0	1	0	0	0	0	0	0	3	4
Unknown	2	10	18	14	8	6	5	2	6	71
Maternal deaths	115	90	234	249	166	95	81	23	99	1152
Live births 2020	109077	48452	240270	214694	140542	92094	62026	22042	106058	1,035,225
iMMR	105.4	185.4	97.4	116	118.1	103.2	130.6	104.3	93.3	111.3
Coincidental cause	7	4	5	2	1	4	2	0	6	31
DDPCP	122	94	239	251	167	99	83	23	105	1183
DDPCP MMR	111.8	194	99.5	116.9	118.8	107.5	133.8	104.3	99	114.3

The numbers for EC and GP are shaded yellow and are likely to be inaccurate, due to the under-reporting described earlier, with EC having an estimated 70 cases missing (38%), and GP estimated 82 cases missing (26%). One could scale up the numbers of deaths per cause to the “right” number, and put them in the categories but this is done proportionately. This could create significant errors as we have no idea of what the pattern of deaths would be given the differing burden of disease consequent on the Covid pandemic.

Table 9. iMMR per Primary Obstetric Cause per province for 2020 (MDs per 100,000 LBs) (UNCORRECTED)

Primary obstetric problems*	Eastern Cape	Free State	Gauteng	KwaZulu-Natal	Limpopo	Mpumalanga	North West	Northern Cape	Western Cape	South Africa
Medical and surgical disorders	10.1	47.5	13.7	19.6	20	16.3	21	9.1	10.4	17.2
Non-pregnancy-related infections	44	26.8	18.3	44.7	15	23.9	29	22.7	42.4	30.1
Ectopic pregnancy	0.9	2.1	3.7	4.7	5	2.2	6.4	4.5	0	3.4
Miscarriage	4.6	4.1	6.2	3.7	4.3	6.5	3.2	9.1	0.9	4.5
Pregnancy-related sepsis	2.8	16.5	5.4	6.5	6.4	3.3	6.4	0	4.7	5.7
Obstetric haemorrhage	15.6	26.8	18.7	13.5	28.5	15.2	25.8	18.1	12.3	18.4
Hypertension	15.6	28.9	18.7	9.3	20.6	20.6	27.4	31.8	6.6	16.9
Anaesthetic complications	3.7	2.1	0.8	1.9	2.8	3.3	1.6	0	0.9	1.9
Adverse drug reactions	0.9	4.1	1.2	0.93	3.6	0	0	0	0	1.3
Embolism	3.7	4.1	0.8	2.8	5.7	4.3	0	0	5.7	3.1
Acute collapse - cause unknown	1.8	0	2.1	1.9	0.7	1.1	1.6	0	0.9	1.4
Miscellaneous	0	2.1	0	0	0	0	0	0	2.8	0.4
Unknown	1.8	20.6	7.5	6.5	6.7	6.5	8.1	9.1	5.7	6.9
iMMR	105.4	185.8	97.4	116	118.1	103.2	130.6	104.3	93.3	111.3
Coincidental cause	7	4	5	2	1	4	2	0	6	3.0
DDPCP Rate	111.8	194	99.5	116.9	118.8	107.5	133.8	104.3	99	114.3



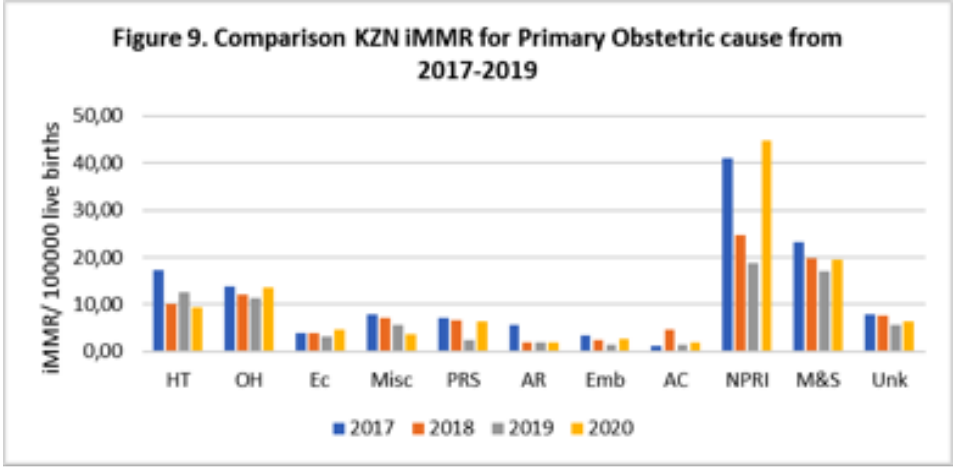
In Free State, M&S was the most common cause, in Limpopo OH remains a leading cause of maternal death and in NC the leading cause was Hypertension.

Trends in Primary Obstetric Causes for three provinces

The trends in iMMR for Primary Obstetric cause could be misleading when looking at the National Primary Obstetric Cause data for the reasons already mentioned. It is not possible to do a simple correction because the pattern of causes in EC and GP may be different to previous years before the pandemic. Therefore, it was decided to select three provinces, KwaZulu-Natal (KZN), Mpumulanga (MP) and Western Cape (WC), which had more comprehensive data collection; two of which (KZN and WC) were severely affected by the pandemic.

Table 10. Comparison of KZN iMMR for Primary Obstetric Cause per year 2017-2020

Primary Obstetric Problem	2017	2018	2019	2020
HT	17.17	10.09	12.68	9.3
OH	13.85	12.11	11.28	13.5
Ec	3.88	4.04	3.29	4.7
Misc	7.75	7.06	5.64	3.7
PRS	7.20	6.56	2.35	6.5
AR	5.54	2.02	1.88	1.9
Emb	3.32	2.52	1.41	2.8
AC	1.11	4.54	1.41	1.9
NPRI	40.98	24.73	18.79	44.7
M&S	23.26	19.68	16.91	19.6
Unk	7.75	7.57	5.64	6.5
Provincial iMMR	132.36	101.93	86.92	116



In KZN, the observed increase in iMMR was contributed to largely by NPRI. OH deaths and M&S deaths increased slightly, but Hypertension decreased as a cause of maternal death (Table 10, Figure 9)

In Mpumulanga, iMMR from NPRI, and M&S increased. However, there was a marked increase in deaths from Hypertension and reduction in OH (Table 11 and Figure 10). This trend is marked and differs from the national trend. The 2020 data has been confirmed as representing what was entered into MAMMAs. It needs to be interrogated by the province; and the 2020 data also verified.

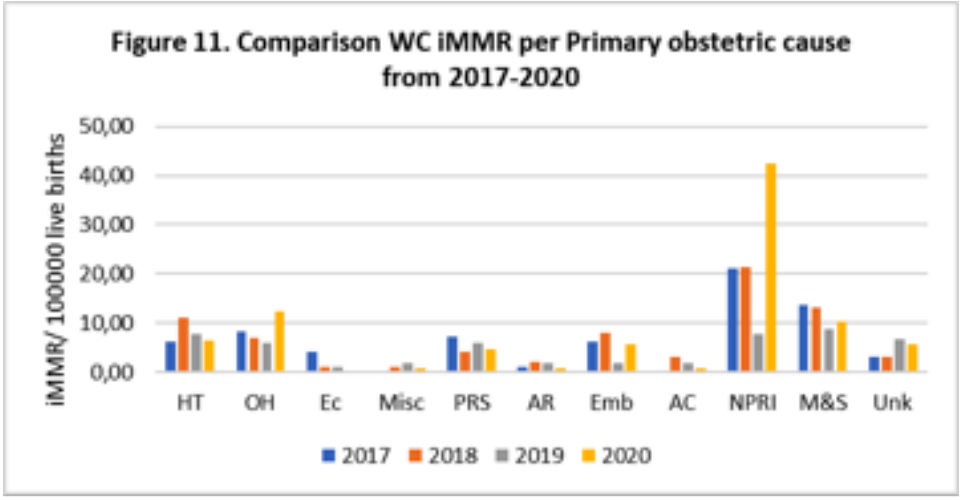
Table 11. Comparison of MPU iMMR for Primary Obstetric cause per year 2017-2020

Primary Obstetric Problem	2017	2018	2019		2020
HT	35.70	26.31	9.75		20.6
OH	26.45	28.82	25.59		15.2
Ec	5.29	8.77	4.87		2.2
Misc	17.19	17.54	6.09		6.5
PRS	6.61	5.01	1.22		3.3
AR	2.64	5.01	2.44		3.3
Emb	5.29	7.52	0		4.3
AC	1.32	2.51	0		1.1
NPRI	31.74	25.06	20.71		23.9
M&S	15.87	11.28	12.18		16.3
Unk	6.61	2.51	2.44		6.5
Provincial iMMR	154.72	140.34	88.94		103.2

In WC there was a very marked increase in NPRI, and also OH and Embolism when compared with the previous year 2019, with a lesser rise in M&S and a decline in Hypertension.
The rise in OH is thought to reflect collateral effects of the Covid pandemic on maternity care services.

Table 12. Comparison of WC iMMR for Primary Obstetric cause per year 2017-2020

Primary Obstetric Problem	2017	2018	2019	2020
HT	6.30	11.17	7.81	6.6
OH	8.40	7.11	5.86	12.3
Ec	4.20	1.02	0.98	0
Misc	0.00	1.02	1.95	0.9
PRS	7.35	4.06	5.86	4.7
AR	1.05	2.03	1.95	0.9
Emb	6.30	8.12	1.95	5.7
AC	0.00	3.05	1.95	0.9
NPRI	21.00	21.32	7.81	42.4
M&S	13.65	13.20	8.79	10.4
Unk	3.15	3.05	6.84	5.7
Provincial iMMR	76.67	75.13	60.54	93.3



8. Levels of Care, HIV, Caesarean delivery

Levels of Care of Maternal deaths

The majority (92.4%) of maternal deaths reported to the NCCEMD occurred in facilities, with 1.3% in transit and 6.3% at 'home'. The NCCEMD process is not designed to receive notifications of home deaths, so this latter percentage is an underestimate.

(Tables 13 a and b).

Public hospitals accounted for the majority of deaths (89.5%) with 78(7%) in private hospitals. This is a higher proportion of deaths in private facilities, compared to 35 deaths in 2017, 45 in 2018 and 35 in 2019.

Table 13a. Location of death

Primary obstetric problems	Facility	In transit	Home/Outside	Total
Coincidental cause	22	2	7	31
Medical and surgical disorders	169	1	8	178
Non-pregnancy-related infections	306	3	3	312
Ectopic pregnancy	33	1	1	35
Miscarriage	46	0	1	47
Pregnancy-related sepsis	56	0	3	59
Obstetric haemorrhage	186	3	2	191
Hypertension	166	4	5	175
Anaesthetic complications	20	0	0	20
Adverse drug reactions	13	0	0	13
Embolism	30	1	1	32
Acute collapse - cause unknown	13	0	2	15
Miscellaneous	4	0	0	4
Unknown	29	0	42	71
Total	**1093 (92.4%)**	**15 (1.3%)**	**75 (6.3%)**	**1183 (100%)**

Table 13b. In facility deaths per level of care and Primary Obstetric cause

(This total includes facility deaths and deaths in transit which are assigned to the level of care from which they were referred.)

Primary obstetric cause	CHC	District hospital	Regional hospital	Tert / National Central hospital	Private Hospital	TOTAL
Coincidental cause	2	5	5	10	2	24
Medical and surgical disorders	3	31	50	74	12	170
Non-pregnancy-related infections	4	59	98	112	36	309
Ectopic pregnancy	3	12	10	9	0	34
Miscarriage	4	8	15	19	0	46
Pregnancy-related sepsis	0	4	20	27	5	56
Obstetric haemorrhage	3	54	59	57	16	189
Hypertension	10	33	54	68	5	170
Anaesthetic complications	0	9	9	2	0	20
Adverse drug reactions	1	1	6	5	0	13
Embolism	2	18	6	3	2	31
Acute collapse - cause unknown	1	3	3	6	0	13
Miscellaneous	0	0	1	3	0	4
Unknown	5	6	8	10	0	29
TOTAL	38 (3.4%)	243(21.9%)	344(31%)	405(36.6%)	78(7%)	1108 (100 %)*

HIV status of DDPCP

HIV status was positive in 48% of women who died, and negative in 38.3%. This is similar to previous triennium, but for 13.7%, their status was known (Table 14). This compares with 9.5% unknown in the previous triennium, suggesting HIV testing may have been impacted on by the Covid pandemic.

Primary obstetric problems	Negative	Positive	Unknown	Total
Coincidental cause	8	1	22	31
Medical and surgical disorders	107	52	19	178
Non-pregnancy-related infections	90	204	18	312
Ectopic pregnancy	5	17	13	35
Miscarriage	16	12	19	47
Pregnancy-related sepsis	24	27	8	59
Obstetric haemorrhage	131	51	9	191
Hypertension	113	36	26	175
Anaesthetic complications	15	4	1	20
Adverse drug reactions	2	9	2	13
Embolism	16	9	7	32
Acute collapse - cause unknown	8	4	3	15
Miscellaneous	3	1	0	4
Unknown	30	26	15	71
DDPCP	**568 (48%)**	**453 (38.3%)**	**162 (13.7%)**	**1183 (100%)**

Caesarean delivery and Maternal deaths

Table 15. Caesarean delivery and maternal deaths (*CD CFR = Number CD deaths per 100,000 CDs)

PROVINCE (2020)	Deliveries 2020	CD	CD rate (%)	MD with CD	CDCFR*
ec Eastern Cape Province	111375	33710	30.3	29	86.2
fs Free State Province	49699	14824	29.8	36	242.8
gp Gauteng Province	244957	68707	28.0	104	151.4
kz KwaZulu-Natal Province	219689	75771	34.5	93	122.7
lp Limpopo Province	143387	32600	22.7	68	208.6
mp Mpumalanga Province	92714	19038	20.5	31	162.8
nw North West Province	63442	15473	24.4	27	174.5
nc Northern Cape Province	22545	4800	21.3	8	166.7
wc Western Cape Province	107933	31505	29.2	36	114.3
South Africa	1 055 741	296428	28.3	432	145.7

The national CD rate for 2020 was 28.3% which is similar to the previous triennium (28.1%). The Case Fatality rate was 145.7 per 100,000 CD in 2020 which has increased from 2019 (132.4 for 2017-2019 triennia and 112.5 in 2019). This increase in CD CFR could reflect deterioration of quality of care relating to CD or could be due to the higher CD rates in women with severe Covid pneumonia.
There were 78 deaths from bleeding associated with CD, giving a BLDACD CFR for 2020 of 26.3, increased from 23.6 in 2017-2019.

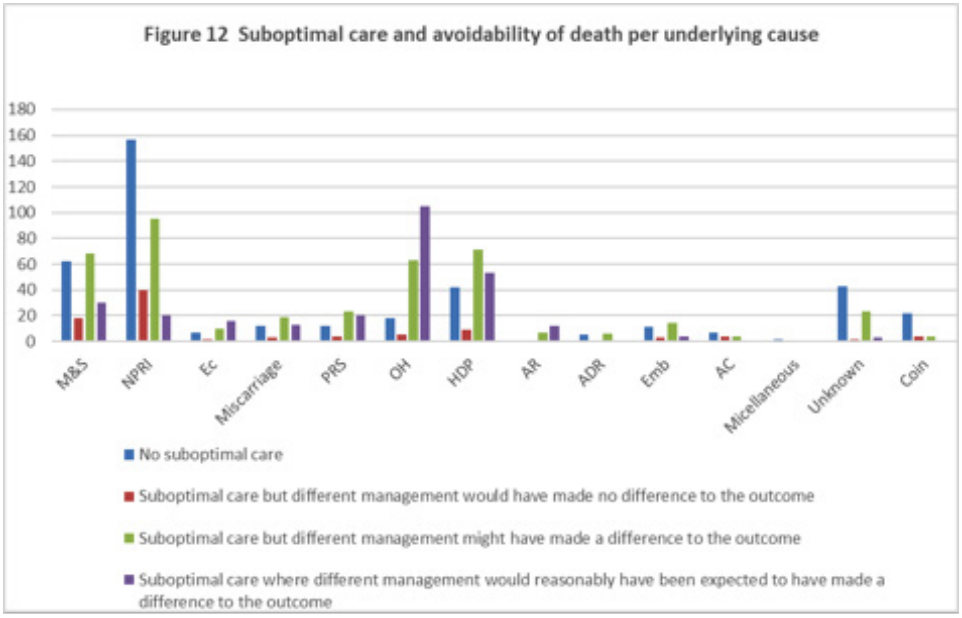
9. Overview of Avoidable maternal deaths

Table 16 shows the impact of suboptimal care on maternal deaths in facilities. There were 58% classified as possibly or probably avoidable, compared to 62.4% in 2017-2019

Table 16. Impact of suboptimal care for maternal deaths

- No suboptimal care identified	401
- Suboptimal care, no impact on outcome	96
- Suboptimal care, possible impact on outcome	408
- Suboptimal care, probable impact on outcome	278

Figure 12 shows that the majority of NPRI deaths were not thought to be avoidable within the health system. However, OH and HDP had high numbers of avoidable deaths.
The collateral impact of the Covid 19 pandemic can be indirectly inferred from this data, since the excess maternal mortality appears not only to be contributed to by direct Covid complications. Anecdotal accounts indicate quality of maternal care being negatively impacted by the requirements of managing the pandemic and lockdown measures. A more detailed examination of avoidable factors (Appendix 4) confirms this. The proportion of cases with Administrative avoidable factors increased to 57.1% in 2020 from 48.1% in the previous triennium. These factors included delays in emergency transport, delays in attending to patients, non-availability of ICU beds, lack of staff on duty and non-availability of the required skill levels.



10. Discussion

This report with suspected under reporting from some provinces unfortunately reflects how the NCCEMD processes of Maternal Death Notification and Assessment were adversely affected by the pandemic. This occurred in a year when it would have been very important to document accurately changes in iMMR in each province and document any differences in pattern of primary obstetric causes.

Due to observed discrepancies between DHIS and MAMMAs data for EC and GP suggesting under-reporting, a correction was made to adjust for this, as has been done in previous SM reports. Details of this is found in Appendix 1, which also contains uncorrected Figures.
It is important going forward that the NCCEMD is supported to become more resilient in a pandemic. Also, rigorous use of the Maternal Deaths classification system with quality assessment in provinces is necessary to ensure that coding is consistent.

An important finding of this report is the increase in iMMR of 26 % in 2020 compared to 2019, after correcting for under-reporting. This is less than SAHR chapter estimate of a 38% increase because during 2020, the pandemic was only present for three -quarters of the year having started its impact in April 2020. The SAHR chapter review was for a financial year, April 2020 to March 2021 during which the pandemic was present throughout. Other global systematic reviews have also demonstrated increases in MMR during the pandemic of 30 to 40 % (5).
In 2017, the Maternal, Neonatal, Child and Women's health cluster in the National Department of Health set the goal of reducing the number of maternal deaths annually to below 1000 and the iMMR to below 100/100,000 livebirths by 2020; on the way to achieving the Sustainable Development Goal (SDGs) of an iMMR of less than 70/100,000 by 2030. This goal was achieved in 2019. In 2020, this gain has been reversed, largely due to direct and indirect effects of the Covid-19 pandemic which resulted in increased death rates from non-pregnancy related respiratory infections, as well as from other causes which could have been affected by the additional demands on the health system. It is notable that OH deaths increased in 2020. These deaths are strongly influenced by the functioning of the health system, and it is likely that this increase could be due to staff shortages and lack of monitoring with delayed response due to stresses on the health system. These latter problems are reflected in the increase in Administrative avoidable factors in 2020.
Hypertension deaths on the other hand, decreased in several provinces. Whether this was a real decrease due to improved care or was related to earlier delivery in women who had this condition together with Covid 19 is unclear and needs further interrogation.

It is also unclear why MP had such a different pattern of primary obstetric cause with a marked increase in deaths from HDP and reduction in OH, compared to previous years.

The provinces with the most marked increases in iMMR were FS, KZN and WC, the latter two of which had large numbers of Covid 19 cases. As discussed earlier, EC and GP were suspected to have under-reported maternal deaths. EC was known to have been adversely affected by the first wave of the pandemic whereas Covid 19 had more impact in Gauteng in the second wave. DHIS data described in the recent SAHR report suggested a movement of pregnant women to rural provinces, Mpumulanga and Limpopo, with corresponding pressure on their services (1). The same report also shows a reduction in contraception and termination of pregnancy visits in most provinces during 2020.
In the private sector, there was a notable increase in total maternal deaths (more than doubled), and NPRI deaths, showing that Covid 19 affected all sections of the population.

The Covid pandemic started in the second quarter (April to June) of 2020 and the second wave started in the last quarter (October to December) of 2020 and continued into the first quarter (January to March) of 2021. The third (delta) wave occurred mid-2021 and the fourth (Omicron) wave at the end of 2021 and the start of 2022. The next annual report (for 2021) will thus show further impacts of the pandemic.

11. Conclusion

The reduction in iMMR seen in 2019 and the previous triennium has been reversed in 2020, due directly to the impact of the Covid 19 pandemic causing maternal deaths due to Covid pneumonia and indirect effects on the management of other causes such as obstetric haemorrhage.
Collection of maternal death data for the Saving Mothers report was also hindered due to human resource and other challenges in maintaining the NCCEMD process during the pandemic. This meant that the data is not as precise and accurate as in previous years.

12. Recommendations

Previous recommendations from the 2017-2019 triennial report (2) are still very relevant and need to be implemented, see Appendix 5.
There is a need to regain the progress made up to 2019, before the Covid-19 pandemic overwhelmed services.

However, the Covid 19 pandemic brought new issues into focus which require new
Recommendations:

- Strengthen the reporting, assessment and report writing processes of the NCCEMD so it is enabled to provide information timeously at national and provincial level.
- Ensure Consistency in coding of primary obstetric causes of maternal death by strengthening training of new assessors and Quality Assurance at provincial level.
- Strategies to protect maternity services during future pandemics need to be devised.
- Integration of Covid 19 management into maternity services, with upskilling of health care workers and retention of personnel in Maternity services. (This should be a prototype for Future pandemics similar to the way PMTCT and ART were incorporated into Antenatal care)
- The model of Covid Obstetric wards or areas should be promoted with relevant resources in terms of equipment (eg.high flow nasal oxygen) and human resources

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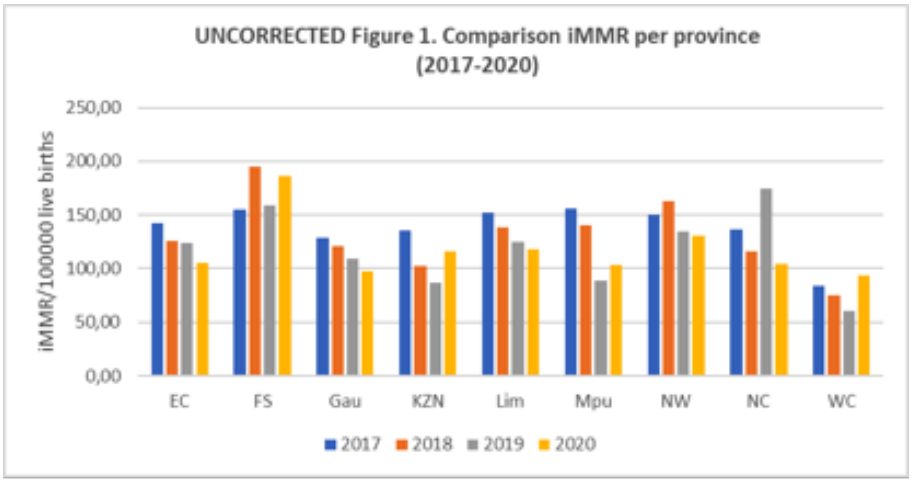
Appendices 1-5

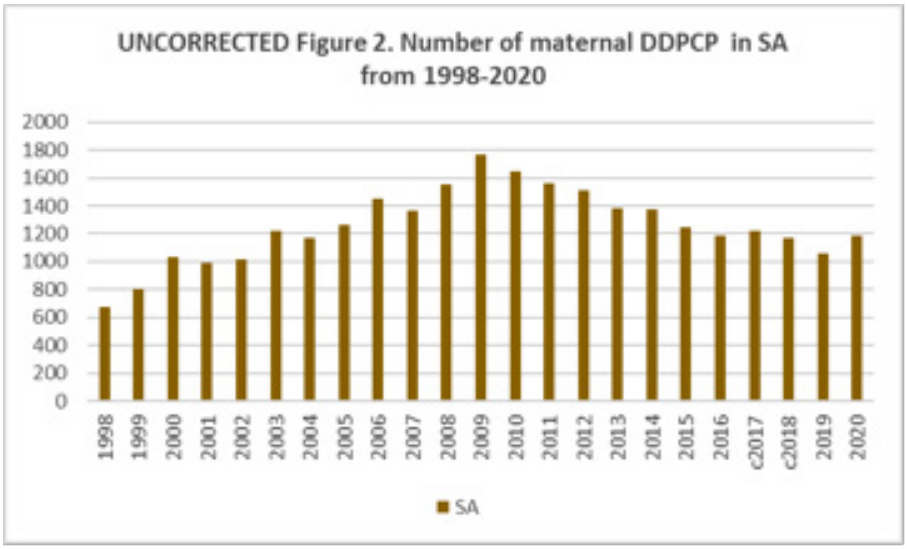
Appendix 1. Reliability of data

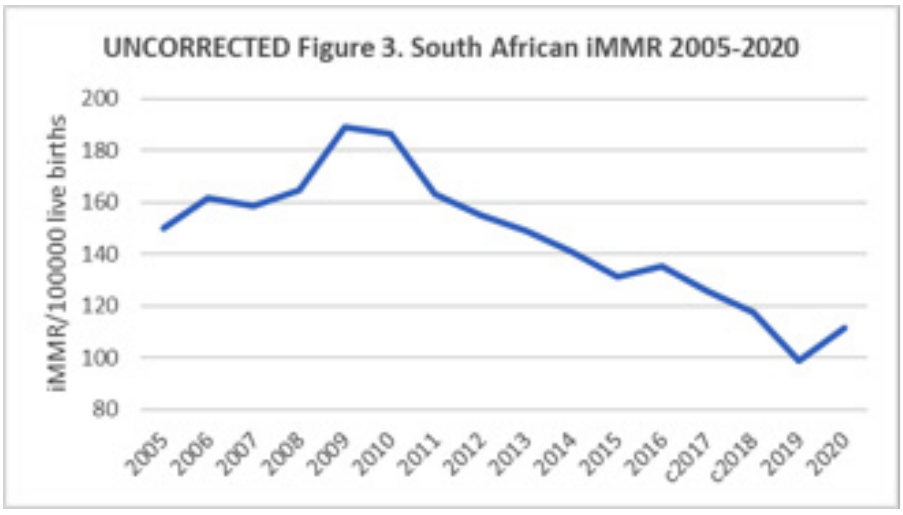
Table A1. Comparisons DHIS and NCCEMD data per province 2020

Province	Maternal deaths in facility (DHIS)	MaMMAs deaths		Difference (% diff)
ec Eastern Cape Province	160	122	-38	-31,1
fs Free State Province	70	94	24	25,5
gp Gauteng Province	271	239	-32	-13,4
kz KwaZulu-Natal Province	220	251	31	12,4
lp Limpopo Province	157	167	10	6,0
mp Mpumalanga Province	77	99	22	22,2
nw North West Province	72	83	11	13,3
nc Northern Cape Province	17	23	6	26,1
wc Western Cape Province	77	105	28	26,7
Estimated deaths SA	1121	1183	62	5,2

Figures 1-3 show the UNCORRECTED numbers, rates and trends for maternal deaths and rates, not taking into account the assumed under-reporting.







APPENDIX 2. Subcategories of cause of death by province in 2020

Primary obstetric problems	EC	Free State	Gauteng	KZN	Limpopo	Mpumalanga	NC	NW	WC	TOTAL
Coincidental cause	7	4	5	2	1	4	0	2	6	31
- MVA	3	1	1			3				8
- Other accidents		1		1					1	3
Assault			1			1		1		3
- Other	4	2	3	1	1			1	5	17
Medical and surgical disorders	11	23	33	42	28	15	2	13	11	178
- Cardiomyopathy		3	3	13	10	4	1	3	2	39
- Rheumatic heart disease	1	1	1	2					3	8
- Other cardiac disease			1	4				1		6
- Endocrine			3	1	1			2		7
- GIT	1	1	2	3	5				2	14
- CNS	2	1	3	3		1			2	12
- Respiratory	2	11	4	2	3			4		26
- Haematological		2	1	2	3					8
- Suicide	3			2		4			1	10
- Other psychiatric disease				1						1
- Neoplasm	1		8	6		3				18
- Auto-immune			1	1	1					3
- Genito-urinary		1			1					2
- Other	1	3	6	2	4	3	1	3	1	24
Non-pregnancy-related infections	48	13	44	96	21	22	5	18	45	312
- PCP pneumonia		6	5	7	5	4	1	2		30
- Other pneumonia	3	4	10	12	1	4	2	4	3	43
- TB	11	1	7	22	2	4		7	7	61
- UTI									2	2
- Appendicitis			1						1	2
- Cryptococcal meningitis				4	5				1	10
- Other meningitis	2		3	5	4	1			1	16
- Kaposi's sarcoma						1				1
- Hepatitis				1	1					2
- Gastroenteritis				1	1			1		3
- Wasting syndrome			3	2						5
- Other	32	2	15	42	2	8	2	4	30	137
Ectopic pregnancy	1	1	9	10	7	2	1	4	0	35
- Less than 20 weeks		1	7	9	7	2	1	3		30
- More than 20 weeks (extrauterine pregnancy)	1		2	1				1		5
Miscarriage	5	2	15	8	6	6	2	2	1	47
- Septic miscarriage	3	2	7	5	4	5		2	1	29
- Haemorrhage (non-traumatic)	2		5	1		1	1			10
- Uterine trauma				1	1					2
- GTD			3							3
- Following legal TOP				1	1		1			3
Pregnancy-related sepsis	3	8	13	14	9	3	0	4	5	59
- Chorioamnionitis (ruptured membranes)		1		3				1		5
- Chorioamnionitis (intact membranes)			1							1
- Puerperal sepsis after NVD	1	3	2	2	5	2		1	3	19
- Puerperal sepsis after CD	1	3	9	6	4			2	1	26
- Bowel trauma at CD	1	1	1	3		1			1	8
Obstetric haemorrhage	17	13	45	29	40	14	4	16	13	191
- Abruption with hypertension	2	1	4	3	1	2	1	2	1	17
- Abruption without hypertension				1	1	1			1	4
- Placenta praevia	2	1	1		1	1				6
- Other APH not specified		1			1					2
- Ruptured uterus with previous CD	1		6	5	4	1		1	1	19
- Ruptured uterus without previous CD	1		3	3	4					11
- Retained placenta after NVD (morb adherent)		1	1				1		1	4
- Retained placenta after NVD (not adherent)	2		1			1	1	1	2	8
- Uterine atony after vaginal delivery	2	1	3	6	2	2		3		19
- Vaginal trauma after vaginal delivery		2		1		1				4
- Cervical trauma after vaginal delivery	1			1	3					5
- Inverted uterus after vaginal delivery	1									1
- Bleeding during CD (morbidly adherent placenta)		1	7	1	2	1		1		13
- Bleeding during CD (not adherent placenta)			5	6	6				1	18
- Bleeding after Caesarean delivery	4	4	13	1	11	2	1	6	5	47
- Other PPH not specified after vaginal delivery	1	1	1	1	4	2		2	1	13
Hypertension	17	14	45	20	29	19	7	17	7	175
- Chronic hypertension		1	2	3	3					9
- Gestational hypertension	1		2		2	1			1	7
- Pre-eclampsia with severe features	4	3	12	8	2	8	2	4	1	44
- Pre-eclampsia without severe features	1	1	1					1		4
- Eclampsia	10	7	24	9	13	5	4	11	5	88
- HELLP	1	2	3		9	5	1	1		22
- Liver rupture			1							1
Anaesthetic complications	4	1	2	4	4	3	0	1	1	20
- General anaesthetic	1				2					3
- Spinal anaesthetic	3	1	2	4	2	3		1	1	17
Adverse drug reactions	1	2	3	2	5	0	0	0	0	13
- ARV medication			1		3					4
- TB medication				1						1
- Other medication	1	2	1		2					6
- Herbal medication			1	1						2
Embolism	4	2	2	6	8	4	0	0	6	32
- Pulmonary embolism	4	1	2	6	7	4			3	27
- Amniotic fluid embolism		1			1				3	5
Acute collapse - cause unknown	2	0	5	4	1	1	0	1	1	15
Miscellaneous	0	1	0	0	0	0	0	0	3	4
- Hyperemesis gravidarum		1								1
- Acute fatty liver									3	3
Unknown	2	10	18	14	8	6	2	5	6	71
- Death at home or outside health services	1	9	9	3	7	3	2	3	3	40
- No primary cause found		1	3	1		1		2	3	11
- Lack of information	1		6	10	1	2				20
Total:	122	94	239	251	167	99	23	83	105	1183

Appendix 3. Maternal deaths per underlying cause per district 2020

Province	District	M&S	NPRI	Ec	Miscarriage	PRS	OH	HDP	AR	ADR	Emb	AC	Micellaneous	Coin	Unknown	ALL
Eastern Cape	Alfred Nzo Districts	2	1	0	0	0	3	0	1	0	0	0	0	2	0	9
	Amahole+ Buffalo city	1	20	1	1	0	5	5	1	0	1	0	0	0	0	35
	Chris Hani	0	1	0	0	1	3	3	0	1	1	0	0	0	0	10
	Joe Gqabi District Municipality	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Nelson Mandela Bay Metropolitan	1	12	0	1	0	1	2	0	0	0	0	0	0	1	18
	Oliver Tambo	6	13	0	3	2	5	7	2	0	1	1	0	4	0	44
	Sarah Baartman	0	1	0	0	0	0	0	0	0	1	1	0	1	1	5
Total		**11**	**48**	**1**	**5**	**3**	**17**	**17**	**4**	**1**	**4**	**2**	**0**	**7**	**2**	**122**
Free State	Fezile Dabi	0	2	0	1	1	3	3	0	1	0	0	0	0	0	11
	Lejweleputswa	6	2	1	1	1	5	2	1	0	1	0	0	1	2	23
	Mangaung Metropolitan Municipality															0
	Thabo Mofutsanyana	6	3	0	0	3	1	6	0	0	1	0	1	0	6	27
	Xhariep District Municipality	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
	Motheo	11	6	0	0	3	4	3	0	1	0	0	0	3	0	31
Total		**23**	**13**	**1**	**2**	**8**	**13**	**14**	**1**	**2**	**2**	**0**	**1**	**4**	**10**	**94**
Gauteng	**City of Johannesburg Metropolitan Municipality**	**15**	**12**	**2**	**4**	**8**	**12**	**17**	**1**	**1**	**1**	**2**	**0**	**0**	**7**	**82**
	City of Tswhane Metropolitan	9	14	4	2	2	7	9	0	0	0	0	0	2	6	55
	Ekurhuleni Metropolitan Municipality	6	11	2	8	3	14	9	0	1	0	2	0	3	4	63
	Sedibeng District Municipality	1	4	1	0	0	5	2	1	0	1	1	0	0	1	17
	West Rand District Municipality	2	3	0	1	0	7	8	0	1	0	0	0	0	0	22
	Metsweding	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		**33**	**44**	**9**	**15**	**13**	**45**	**45**	**2**	**3**	**2**	**5**	**0**	**5**	**18**	**239**

Kwa-Zulu Natal	**kz Amajuba District Municipality**	**3**	**4**	**0**	**1**	**2**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**
	kz eThekwini Metropolitan Municipality	13	40	4	3	7	7	4	0	1	5	1	0	0	4	89
	kz Harry Gwala District Municipality	0	2	1	0	0	2	1	0	0	0	0	0	0	0	6
	kz iLembe District Municipality	1	3	0	1	0	1	1	0	0	0	0	0	0	2	9
	kz King Cetshwayo District Municipality	1	8	2	0	1	5	4	0	0	1	1	0	0	2	25
	kz Ugu District Municipality	1	9	0	0	0	2	2	1	0	0	1	0	0	1	17
	kz uMgungundlovu District Municipality	10	15	0	1	3	2	3	0	1	0	1	0	2	3	41
	kz Umkhanyakude District Municipality	1	1	1	1	0	1	1	0	0	0	0	0	0	1	7
	kz Umzinyathi District Municipality	1	3	1	0	1	2	1	1	0	0	0	0	0	0	10
	kz Uthukela District Municipality	7	7	0	1	0	2	0	0	0	0	0	0	0	0	17
	kz Zululand District Municipality	4	4	1	0	0	2	2	2	0	0	0	0	0	1	16
Total		**42**	**96**	**10**	**8**	**14**	**29**	**20**	**4**	**2**	**6**	**4**	**0**	**2**	**14**	**251**

Limpopo	**lp Capricorn District Municipality**	**19**	**8**	**0**	**3**	**6**	**16**	**15**	**1**	**3**	**3**	**1**	**0**	**1**	**4**	**80**
	lp Mopani District Municipality	2	3	3	1	2	6	4	0	0	4	0	0	0	2	27
	lp Sekhukhune District Municipality	1	4	0	2	0	3	3	0	0	1	0	0	0	2	16
	lp Vhembe District Municipality	5	2	3	0	1	12	5	3	2	0	0	0	0	0	33
	lp Waterberg District Municipality	1	4	1	0	0	3	2	0	0	0	0	0	0	0	11
	Bohlabela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		**28**	**21**	**7**	**6**	**9**	**40**	**29**	**4**	**5**	**8**	**1**	**0**	**1**	**8**	**167**

Mpumalanga	**mp Ehlanzeni District Municipality**	**5**	**14**	**1**	**2**	**2**	**5**	**11**	**0**	**0**	**1**	**1**	**0**	**2**	**3**	**47**
	mp Gert Sibande District Municipality	3	4	0	0	0	5	3	0	0	3	0	0	1	2	21
	mp Nkangala District Municipality	7	4	1	4	1	4	5	3	0	0	0	0	1	1	31
Total		**15**	**22**	**2**	**6**	**3**	**14**	**19**	**3**	**0**	**4**	**1**	**0**	**4**	**6**	**99**

Northern Cape	**nc Frances Baard District Municipality**	**1**	**2**	**1**	**1**	**0**	**1**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**
	nc John Taolo Gaetsewe District Municipality	0	1	0	0	0	3	1	0	0	0	0	0	0	1	6
	nc Namakwa District Municipality	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	nc Pixley ka Seme District Municipality	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	nc Zwelentlanga Fatman Mgcawu District Municipality	1	2	0	1	0	0	1	0	0	0	0	0	0	0	5
Total		**2**	**5**	**1**	**2**	**0**	**4**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**23**

North West	**nw Bojanala Platinum District Municipality**	**4**	**11**	**4**	**1**	**2**	**3**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**3**	**31**
	nw Dr Kenneth Kaunda District Municipality	6	6	0	1	0	5	5	0	0	0	0	0	1	0	24
	nw Dr Ruth Segomotsi Mompati District Municipality	0	0	0	0	0	2	5	0	0	0	0	0	1	2	10
	nw Ngaka Modiri Molema District Municipality	3	1	0	0	2	6	5	1	0	0	0	0	0	0	18
Total		**13**	**18**	**4**	**2**	**4**	**16**	**17**	**1**	**0**	**0**	**1**	**0**	**2**	**5**	**83**

Western Cape	**wc Cape Winelands District Municipality**	**3**	**6**	**0**	**0**	**1**	**2**	**1**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**17**
	wc Central Karoo District Municipality	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2
	wc City of Cape Town Metropolitan Municipality	5	32	0	1	4	9	6	1	0	2	0	3	3	5	71
	wc Garden Route District Municipality	2	7	0	0	0	2	0	0	0	0	0	0	1	1	13
	wc Overberg District Municipality	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	wc West Coast District Municipality	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Total		**11**	**45**	**0**	**1**	**5**	**13**	**7**	**1**	**0**	**6**	**1**	**3**	**6**	**6**	**105**
																1183
	South Africa	**178**	**312**	**35**	**47**	**59**	**191**	**175**	**20**	**13**	**32**	**15**	**4**	**31**	**71**	**1183**

Appendix 4. Details of Avoidable Factors for Maternal deaths, 2020

Table A4a. Patient/Community level avoidable factors

Description	Number	% of cases
Lack of information	130	11
No avoidable factor	532	45
No antenatal care	170	14,4
Infrequent antenatal care	45	3,8
Delay in accessing medical help	293	24,8
Declined medication/surgery/advice	86	7,3
Family problem	23	1,9
Community problem	8	0,7
Unsafe abortion	11	0,9
Other	103	8,7
Total	1401	

Table A4b. Administrative avoidable factors

Description	**Number**	**% of cases**
Lack of information	110	9,3
No avoidable factor	508	42,9
Transport problem: Home to institution	17	1,4
Transport problem: Institution to institution	63	5,3
Lack of accessibility: Barriers to entry	26	2,2
Lack of accessibility: Other	15	1,3
Delay in attending to patient (Overburdened service)	87	7,4
Delay in attending to patient (Reason unknown)	60	5,1
Lack of health care facilities: ICU	103	8,7
Lack of health care facilities: Blood/blood products	25	2,1
Lack of health care facilities: Other	41	3,5
Inadequate numbers of staff on duty	103	8,7
Appropriate skill not available on site / on standby	96	8,1
Communication problems: Technical	25	2,1
Communication problems: Interpersonal	14	1,2
Other	126	10,7
Total cases	1419	

Table 4Ac. Medical care Avoidable factors by level of care

Description	CHC	DH	RH	TH	PVT H
Lack of information	51	51	39	46	22
No avoidable factor	274	156	165	213	36
Initial assessment	99	119	65	31	16
Problem with recognition / diagnosis	99	178	104	72	18
Delay in referring the patient	56	113	28	5	0
Managed at inappropriate level	25	89	29	1	0
Incorrect management (Wrong diagnosis)	17	59	28	21	7
Sub-standard management (Correct diagnosis)	49	143	127	91	17
Not monitored / Infrequently monitored	8	50	42	19	2
Prolonged abnormal monitoring with no action taken	15	57	49	27	3
Total managed at this level of care	**513**	**552**	**434**	**425**	**95**

Appendix 5. Recommendations from Saving Mothers triennial report 2017-2019

The recommendations assume that every site conduct morbidity and mortality review meetings, where minutes are kept, actions assigned to individuals and there is feedback at subsequent meetings to hold individuals to account.

Summary of crucial recommendations

- Contraception services need to expand to include postpartum IUCD insertion and LARCs; and ensuring contraceptive availability at all facilities caring for women and at high risk medical clinics.
- Set up an expert group to recommend on improving management of early pregnancy and its complications: miscarriage and ectopic management, early pregnancy counselling service and access to safe TOP, earlier initiation of antenatal care after pregnancy diagnosis, screening for mental health issues and identifying women at risk of suicide.
- Antenatal care restructured to ensure every problem case reviewed on-site prior to referral by most experienced midwife and all pregnant women have their pregnancies reviewed by the most experienced and knowledgeable midwife at least once between 28-34 week's gestation.
- Establish On-site Midwife run Birthing Units (OMBUs) at all large district, regional and tertiary hospitals (conducting large numbers of births for women with no risk factors).
- Establish a Safe Labour criteria and evaluation programme like the Safe Caesarean Delivery (surgery and anaesthesia) programme and maintain focus on the Safe CD programme.
- Implement the updated PMTCT protocol for better HIV management and TB detection
- Ensure ESMOE (including anaesthetic ESMOE) training for all new staff and two yearly updates for existing staff. EOST drills/exercises must occur monthly in maternity facilities. This is especially so at primary care and district hospital level as the rarity of conditions makes doing emergency drills essential to maintain skills. Each hospital and CHC should have at least one on-site trainer able to run the relevant ESMOE modules and drills.
- Ensure functional communication channels exist for consultation with and referral to higher levels of care e.g. by using the "Vula App".
- Prior to discharge from a ward and facility, specific criteria must be met and documented.

The following poster summarises the crucial recommendations according to the 5 Hs (priority conditions), essential health system pillars and key interventions along the continuum of care.

Poster of key Recommendations from Saving Mothers triennial report 2017-2019

		What	How	When & Where	
		Focal areas for interventions	Pillars necessary for quality Care	Interventions along continuum of care	
		5Hs	5 Pillars	Phase	Interventions at health care facilities
Mortality and morbidity reviews, minutes, actions, accountability and feedback	NCCEMD	1. HIV 2. Obstetric Haemorrhage 3. Hypertensive disorders in pregnancy 4. Heart and other M&S conditions 5. First Half pregnancy	1. **Appropriately resources and accessible health facilities** Equipment and human resources determined by Safe Labour and CD programmes On site Midwifery Birthing Units (OMBUs) to relieve pressure on Regional and Tertiary hospital labour wards Policy on retention of staff in historically disadvantaged districts 2. **Functional inter-facility consultation and referral system** Ensure proper communication between clinicians at various levels and sites using Vula App. Improve access at Level one to higher level of expertise via Outreach from Regional hospitals or telephonic, or IT/Virtual linkages for advice in antenatal clinics and in emergency situations. Wi-fi in all facilities 3. **Competent (knowledgeable and skilled) health care providers** Ensure ESMOE (including anaesthetic ESMOE) training for all new staff and two-yearly updates for existing staff. EOST drills/exercises must occur monthly in maternity facilities. This is especially so at primary care level as the rarity of conditions makes doing emergency drills essential to maintain skills 4. **Quality Care** Establish minimum standards for safe maternity care/ safe care during labour including minimum staffing norms for safe care in labour. Respectful care at all levels 5. **Community** Use MomConnect to send messages to pregnant women CHWs to integrate maternal health, mental health and contraception into their home visits Increase numbers of social workers available to assess at risk women for social grants, and food parcels. Integration of Home affairs departments in delivery facilities enables immediate issuing of birth certificates and access to grants	1. Pre-pregnancy 2. First Half Pregnancy 3. Pregnancy and Childbirth 4. Postnatal - Mother 5. Postnatal care - neonate	**Pre-pregnancy** • Contraception services need to expanded to include postpartum IUCD insertion and LARCs; and ensuring contraceptive availability at all facilities caring for women and at high risk medical clinics, adolescent clinics and higher institutions • Pre-pregnancy high risk clinics **Pregnancy** Early pregnancy focus • Set up expert group to recommend on improving management early pregnancy: miscarriage and ectopic Mx, early pregnancy counselling service and access to safe TOP, earlier initiation ANC after pregnancy diagnosis, screening mental health and identifying women at risk suicide **Antenatal care** Follow-up antenatal care • Antenatal care restructured to ensure every problem case reviewed on-site prior to referral by most experienced midwife and all pregnant women have their pregnancies reviewed by the most experienced and knowledgeable midwife at least once between 28-34 week's gestation **Intrapartum care** • Introduce new intrapartum care guidelines (CLEVER) • Training in Safe CD and anaesthesia **Postnatal care mother** • Following hypertension with severe features, senior advice should be sought before discharge and patients provided with antihypertensive medications. • Before discharge certain criteria must be met. Temperature <37.2, Pulse <100, • Improve postnatal care coverage including use of contraception and detection of mental health problems

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