Saving Babies 2003-2005:

Fifth Perinatal Care Survey of South Africa

Compiled by

MRC Research Unit for Maternal and Infant Health Care Strategies, PPIP Users and the Saving Babies Technical Task Team

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Acknowledgements

Saving Babies Technical Task Team

Section Authors

Overview - <u>Pattinson</u>

Recommendations

1. Community - Fuentes, <u>Steinberg</u>
2. Antenatal care - <u>Moran</u>, Njie, Snyman, Steyn
3. Intrapartum care - Bartlett, Buchmann, Goosen, <u>Macdonald</u>
4. Neonatal care - Bamford, <u>Greenfield</u>, Pityana, Velaphi
5. Quality of care - <u>Pattinson</u>

Chief authors underlined

Commonly used abbreviations

Abbreviation	Meaning
Admin.	Admission
AP+HT	Abruptio placentae and hypertension
APH	Antepartum haemorrhage
Cong. Abn.	Congenital abnormality
CPAP	Continuous positive airway pressure
ENND	Early neonatal death
FSB	Fresh stillbirth
HT	Hypertension
Idio. IUGR	Idiopathic intrauterine growth restriction
IPA	Intrapartum asphyxia
IPA+T	Intrapartum asphyxia and birth trauma
IUGR	Intrauterine growth restriction
LBWR	Low birth weight rate
LNND	Late neonatal death
Mac. SB	Macerated stillbirth
Mat. Dis.	Pre-existing maternal disease
MRC unit	MRC Maternal and infant health care strategies research unit
nCPAP	Nasal continuous airway pressure
NND	Neonatal death
NNDR	Neonatal death rate
PCI	Perinatal care index
PNMR	Perinatal mortality rate
PPIP	Perinatal Problem Identification Programme
SB	Stillbirth
SBR	Stillbirth rate
Tot.	Total
Unex. IUD	Unexplained stillbirth
Unk.	Unknown

Foreword

Saving the lives of thousands of South African babies – the bad and the good news

As a new nation South Africa has made remarkable progress on the international stage during the last decade. One indicator of good governance is how well a country is looking after its most vulnerable citizens. In any society the most vulnerable are babies – both newborns and babies about to be born. Global recognition of the importance of newborn health is relatively recent. Worldwide, 4 million babies die in the first month of life, now accounting for almost 40% of child deaths, yet in many countries newborn deaths have been invisible.[1] The world's 3.2 million stillbirths are even more invisible.[2] It is clear that any country which is serious about meeting Millennium Development Goal 4 (MDG-4) for child survival by 2015 cannot afford to ignore newborns[3].

South Africa has been ahead of the curve by producing the remarkable "Saving Babies" reports, of which this is the fifth. The fact that so many South African healthcare professionals in 164 sites meet, review their data and voluntarily send reports to the national Perinatal Problem Identification Programme (PPIP) database is to be highly commended. The system now covers 20% of South Africa's births each year thanks to many healthcare professionals who are committed to improve services for babies. The leadership and hard work of a handful of truly inspirational South Africans has been crucial. Now South Africa has "Saving Mothers" and most recently, "Saving Children" reports. Other countries have studied "Saving Babies" and some, such as Bangladesh, have even made this their national system for perinatal audit.

So what steps forward have been made in South Africa? Tracking progress towards MDG 4 for child survival in South Africa is complicated by the lack of nationally representative data. The available estimates suggest that South Africa's under-five mortality has increased due to HIV/AIDS and that the neonatal mortality rate (risk of death in the first 28 days of life) is 21 per 1000 live births, with limited if any reduction in recent years. This risk of neonatal death is lower than the sub-Saharan African neonatal mortality rate (NMR) of 41 per 1000, but is much higher than countries with an average national income comparable to that of South Africa. For example, Mauritius, with a similar average national income has a NMR of 12 per 1000. A recent report, "Opportunities for Africa's Newborns",[4] found 6 very low income countries with national incomes one tenth of South Africa's that have made remarkable progress in reducing their

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neonatal mortality rates. For example, Malawi achieved a 25% reduction in NMR in the last 5 years.

Despite greater national wealth and rapid economic growth, each year in South Africa an estimated *23 000 babies die in the first month of life*. This number is equivalent to a daily crash of four minibuses full of passengers killing all on board. Even one such crash is a front page story – yet the daily deaths of South African babies occur silently with no news coverage or high level interest. An even greater number of babies die as stillbirths – almost one third of whom die during the time of birth.

The "Saving Babies" report holds both bad and good news about these deaths. The BAD NEWS is that according to the report *"one in five deaths could have been clearly avoided",* and inequalities are also highlighted with avoidable deaths being twice as common in rural areas. The same avoidable causes are still being seen in this fifth report as were seen in the first report.

The GOOD NEWS is that these deaths are not complex or expensive to prevent – improving the quality of care during childbirth is a top priority that would also save mothers' lives and reduce long term disabilities in children. Local Saving Babies audit meetings can and do generate solutions that make a difference. At the same time the local data can be collected into the national dataset and used to guide national priorities to reduce utterly avoidable deaths of stillbirths and newborn babies. However, recommendations in a report alone cannot save babies. Effects at national level are dependent on government and partners to take up these challenges, provide leadership and invest to ensure action. So what are the key actions?

Firstly, healthcare workers and trainers can do much to improve care in daily practice, especially in antenatal care, childbirth care and in improved essential and emergency newborn care. Better monitoring in labour and simple solutions such as kangaroo care are essential steps forward. Having enough skilled staff is the foundation. This report provides practical recommendations.

However, it is clear that this data must not remain only with the already converted who may read this report. The solutions require families and communities to know that this is a problem and to act. HIV/AIDS is now well known and prevention messages are clear. Maternal, newborn and child deaths also affect the public who need to be empowered to prevent problems and to act quickly when problems do occur. High level policymakers are accountable for progress, and need to know that one in

three child deaths in South Africa is a that of a newborn, and that more action is needed. Better population based national data and tracking of progress linked to these powerful data about avoidable causes and improving quality of care must reach those with the means to invest to save South Africa's next generation. Many of the recommendations cross-link with "Saving Mothers" and "Saving Children" and joint recommendations as well as linking these to data for action at province level could be key in harmonising and accelerating current actions.

If we read this report and together undertake even half of the very achievable actions suggested, then the lives of thousands of South African babies will be saved before the next Saving Babies report. We all have a part to play in making this happen "…as governments to lead, as policymakers to guarantee essential interventions and equity, as partners and donors to support programmes, as health workers to provide high quality care, and as humans and parents to advocate for more action for Africa's newborns, mothers, and children."[4]

Dr Joy Lawn
Senior Policy and Research Advisor
Saving Newborn Lives, Save the Children
Based in Cape Town, South Africa

References
1. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: when? Where? Why? Lancet 2005; 365(9462):891-900.
2. Stanton C, Lawn JE, Rahman H, Wilczynska-Ketende K, Hill K. Stillbirth rates: delivering estimates in 190 countries. Lancet 2006; 367(9521):1487-1494.
3. Martines J, Paul VK, Bhutta ZA, Koblinsky M, Soucat A, Walker N et al. Neonatal survival: a call for action. Lancet 2005; 365(9465):1189-1197.
4. Lawn JE, Kerber K, eds. Opportunities for Africa's Newborns: practical data, policy and programmatic support for newborn care in Africa. Cape Town: PMNCH, Save the Children, UNFPA, UNICEF, USAID, WHO; 2006

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Appendices including further tables available at www.ppip.co.za

Preface

The national PPIP database administered by the MRC Maternal and Infant Health Care Strategies Research Unit was set up on 1 October 1999 and up until 30 March 2006 had recorded 1 117 858 births. This fifth report on perinatal care in South Africa analyses data submitted to the national database from the end of the last report (30 September 2003) to 30 March 2006. During this period 164 sites from throughout the country have submitted data and 576 065 births have been entered. This comprises approximately 20% of all births in South Africa during this time period.

The perinatal, stillbirth and neonatal death rates per month (since January 2000) are illustrated in Figure 1.

Figure 1. Perinatal Mortality, Stillbirth and Neonatal Mortality Rates for South Africa: January 2000-March 2006 (500g+)
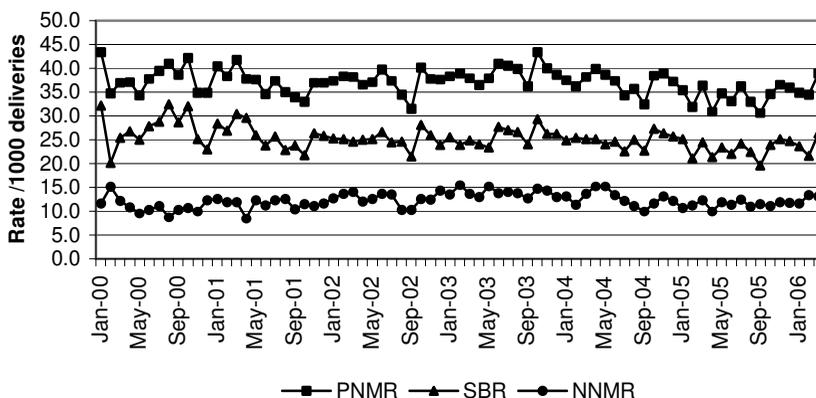
The format of this report has changed from the fourth report to bring it into line with international trends in reporting perinatal deaths. The overview reports on all deaths ≥500g to conform to the WHO definition of perinatal death. Stillbirths and early neonatal deaths are reported separately, and the stillbirths are further subdivided into antepartum and intrapartum stillbirths following the recommendations of Kramer, *et al.*[1] However, all tables will be replicated for babies ≥1000 g, and for perinatal deaths, in an extensive appendix. The appendix is available on the website at www.ppip.co.za.

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Further the recommendations have been phrased as follows:

1. The information – What does the analysis of the database say?
2. The action (recommendation) – what must be done?
3. The level – at which level the implementation should occur?
   - Policy
   - Administration
   - Clinical practice
   - Education

The task group hopes that by phrasing the recommendations in this way, health workers and administrators may know what they as individuals can do, with responsible persons being clearly identified.

It must be stressed that the recommendations are the views of the task group and do not represent the policy of the Department of Health. However, the recommendations were discussed with representatives of the cluster of Maternal Child and Women's Health and Nutrition at a special meeting in April 2007.

Reference

1. Kramer MS, Liu S, Luo Z, Yuan H, Platt RW. Analysis of perinatal mortality and its components: Time for change? Am J Epidemiol 2002;156(6):493-497.

Summary and recommendations

Aim: To assess perinatal care in South Africa by analysing information from the national Perinatal Problem Identification (PPIP) database obtained from health institutions using PPIP and to make recommendations for priority actions that will reduce perinatal deaths in South Africa if implemented.

Method: Information was obtained from 164 institutions, and 576 065 births were recorded from October 2003 to March 2006. This represents approximately 20% of all births in South Africa each year.

Results: In the PPIP dataset the perinatal mortality for infants ≥500 g was 37.5/1000 births, and the pre-discharge early neonatal death rate was 13.6/1000 live births. For infants ≥1000 g the PNMR was 27.9/1000 births and early neonatal mortality rate was 8.5/1000 live births. In this data there were almost twice as many stillbirths as neonatal deaths, and 40% of the stillbirths occurred during delivery (intrapartum stillbirths). South Africa has a slightly higher neonatal mortality rate and stillbirth rate than other middle-income countries but seems to have a much higher intrapartum stillbirth rate. An analysis of the database indicates that neither the perinatal mortality rate nor the neonatal death rate has changed since the national database started in 2000.

Unexplained intrauterine death was the most commonly recorded primary cause of perinatal death, followed by spontaneous preterm birth and intrapartum asphyxia/birth trauma. These three categories made up almost two thirds of all deaths and were consistently in the top two causes of death regardless of birth weight category. Preterm birth and hypoxia were by far the two most common final causes of neonatal death in the PPIP dataset, although it is likely that neonatal infections are missed here, as these occur mostly after discharge.

Health workers felt that one out of five perinatal deaths were clearly avoidable by addressing factors within the health system. The intrapartum period was the area in which clearly avoidable deaths were most frequent.

Conclusions: Trends indicate that South Africa's neonatal mortality rate is not being reduced, although good nationally representative data is lacking. In order to reach Millennium Development Goal 4 (reduce by two-thirds the mortality rate of children under 5 by 2015 compared with 1990), more attention should be given to reducing neonatal deaths. This links closely to stillbirths, especially intrapartum stillbirths. The number of avoidable intrapartum stillbirths is a striking feature of this report. The report gives

clear indications of opportunities to improve quality of care and prevent many avoidable deaths of South African babies.

Recommendations

1. **Community based:**
   Pregnant women should:
   a. Initiate and attend antenatal clinic early in pregnancy.
   b. Have a basic knowledge of appropriate pregnancy care, danger signs of pregnancy and labour, the effects of HIV on pregnancy, where they are to deliver, how they will get there, and their responsibilities.
   c. Have a basic knowledge of how to look after their babies (warmth, cleanliness, breastfeeding when appropriate), how to recognise danger signs, and when and where to seek help and how to get there.
2. **Antenatal care**
   a. Ensure that a standardised evidence-based model for antenatal care is used at all centres providing antenatal care.
3. **Intrapartum care**
   a. Maintain appropriate standards for management of labour.
4. **Neonatal care**
   a. Deaths in very low birth weight infants must be reduced.
   b. The frequency of perinatal hypoxia must be reduced.
5. **Quality of care**
   a. All sites involved in the care of pregnant women must be involved in perinatal review meetings, and issues identified in the review meetings should be systematically addressed

Overview

Introduction

On 8 September 2000 the global community (including South Africa) declared its commitment to "create an environment – at the national and global levels alike – which is conducive to development and to the elimination of poverty". This led to the adoption of eight goals, the Millennium Development Goals (MDGs). Two of these directly relate to maternal and child health, namely MDG-4: reduce child mortality; and MDG 5: improve maternal health. Specific targets were set for each goal. For MDG 4 it is a reduction by two-thirds, between 1990 and 2015, in the under-five mortality rate. For MDG-5 it is a reduction by three-quarters, between 1990 and 2015, in the maternal mortality ratio (MMR).

Since 2003 there has been the realisation that without a substantial reduction in deaths in the first month of life (neonatal deaths) MDG-4 will not be met.[1] This has given renewed interest in neonatal mortality rates and most importantly on improving neonatal care. A reduction in the neonatal mortality rate (NMR) will also result in a reduction in the perinatal mortality rate (PNMR) that includes early neonatal deaths (babies born alive and dying in the first week of life) and stillbirths (babies born dead after at least 22 weeks of pregnancy or weighing ≥500 g). Achieving MDG-4 and MDG-5 necessitates significant improvements in the coverage and quality of care received by pregnant women and their infants, as well as ensuring that the health system is appropriately structured and functioning properly.

The lack of progress towards achieving MDG-4 in South Africa is disturbing. A new paediatric health care survey has come into being (*Saving Children 2004: A survey of child healthcare in South Africa*[2]) since the last *Saving Babies* report. The second report (*Saving Children 2005*[3]) report suggests the infant mortality rate is increasing. The increase in child mortality is closely linked to the HIV epidemic. *Saving Children 2004*[2] reported that the deaths of three out of every five children who died under the age of 5 years were associated with HIV infection, and in *Saving Children 2005*[3] that proportion has risen to four out of five.

Similarly, progress towards MDG-5 is not on track and is being retarded by the HIV epidemic. The *Saving Mothers 2002-2004*[4] reported that AIDS was the most common primary obstetric cause of death, being responsible for two out of every five maternal deaths. In the face of these challenges, a major concern expressed in *Saving Mothers 2002-2004*[4] has been the lack of progress in the implementation of the recommendations given in the

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1999-2001 Saving Mothers[5] report. The National Committee on Confidential Enquiries into Maternal Deaths (NCCEMD) adjusted its recommendations in *Saving Mothers 2002-2004*[4] to address the lack of progress in implementing the recommendations by making them far more specific, and by implication indicating who was responsible for doing what.

This *Saving Babies* report reviews perinatal care and the causes of perinatal deaths, and outlines the most frequent areas of avoidable factors, missed opportunities and substandard care for the period October 2003 to March 2006. We will be able to assess where improvements can be made in the care of pregnant women and their babies, and suggest strategies to implement these improvements. The recommendations here have followed the style of the *Saving Mothers 2002-2004*[4] report to ensure they are clear and indicate at what level changes need to be made.

Methods

This fifth report on perinatal care in South Africa analyses data submitted to the national database from the end of the last report (30 September 2003) to 30 March 2006. During this period 164 sites from throughout the country submitted data and 576 065 births were entered. This comprises approximately 20% of all births in South Africa during this time period. Details of the methods and definitions used are given in Appendix 1 (available at www.ppip.co.za).

Comparisons between perinatal mortality indices between the various Saving Babies reports is difficult as new sites are continually being added, and some of the sites included in earlier reports have ceased submitting their data to the national database. Some sites only contributed their minimum perinatal data sets (first section of PPIP). This data was included in the analysis and called the total delivery data. The pattern of disease was taken from the sites that allocated causes and avoidable factors to their perinatal deaths, and this was termed the detailed perinatal death data. The total delivery data recorded 21 525 perinatal deaths ≥500 g, and of these deaths, detailed data was available on 15 294. When calculating the rates of death per disease category, a falsely low rate would have been obtained if only data from the detailed perinatal death data was shown as the denominator for these rates came from the total delivery data (PPIP always calculates rates from the total delivery data set because in amalgamated data it cannot differentiate which perinatal deaths were allocated a cause or not). Therefore, rates of death per disease category were adjusted for the population studied by a correction factor to compensate for the lack of deaths in the detailed perinatal death data set. Dividing the rates obtained from the total delivery data by the rates obtained from the detailed perinatal

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data gave this adjustment factor. The rate obtained per disease category was multiplied by this factor to obtain the corrected rate. This rate is closer to reality for the population for which data was available in PPIP.

As before, the country is divided into metropolitan areas, city and towns, and rural areas.

Perinatal care indices

Table 1 lists the perinatal care indices for the various groupings.

Table 1. Perinatal care indices for South Africa, metropolitan, city and town, and rural areas in the PPIP database (October 2003 to March 2006) showing available national data and estimates for 2006

	South Africa[6] 2006	National PPIP database	Metro	C&T	Rural
All births		576065	251092	178739	146234
Stillbirths	19,500	14001	6238	4420	3343
Live births	1,093,000	562064	244854	174319	142891
Early neonatal deaths	17,250	6872	2734	2204	1934
Late neonatal deaths	5,750	752	406	210	136
Indices ≥500 g:					
Perinatal mortality rate/1000 births		37.5	37.3	38.2	37
Stillbirth rate/1000 births		24.3	24.8	24.7	22.9
Early neonatal death rate/1000 live births	16	12.2	11.2	12.6	13.5
Neonatal death rate/1000 live births	21	13.6	12.8	13.8	14.5
Indices ≥1000 g:					
Perinatal mortality rate/1000 births	33.6	27.9	24.8	30.2	30.5
Stillbirth rate/1000 births	18	18.6	16.9	20.2	19.4
Early neonatal death rate/1000 live births	-	8.5	6.8	9.3	10.5
Neonatal death rate/1000 live births	-	9.5	8.0	10.2	11.3
Low birth weight rate (%)	15	15.5	16.5	15.9	13.3
Stillbirth : early neonatal death ratio	1.12	1.8	2	1.8	1.6
Perinatal care Index		1.8	1.5	1.9	2.3

Sources for the South African national data and estimates[6]

It is important to note that there are almost twice as many stillbirths as there are neonatal deaths in the PPIP dataset, although it is possible that this is partly due to complicated pregnancies resulting in stillbirths being more common in sites that are collecting PPIP data.

The perinatal care indices are very similar to those reported in the fifth Saving Babies report. Figures 1 to 4 illustrate the differences in the mortality rates per area and birth weight category.

Figure 1. Comparison of perinatal mortality rates per area 500g+
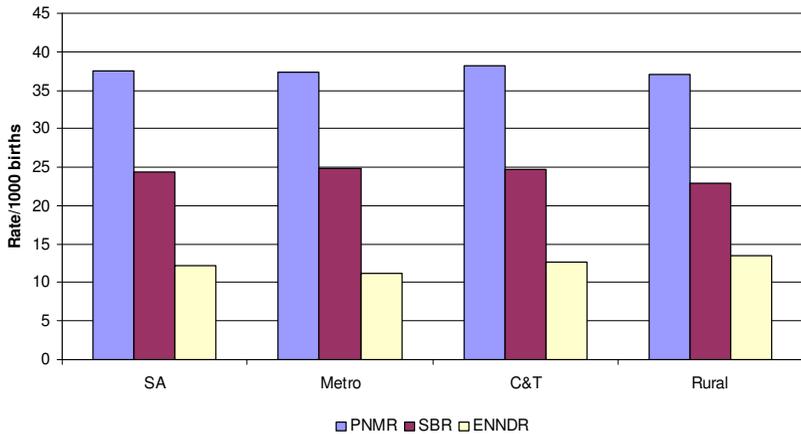
Figure 2. Comparison of PNMR in weight categories per area
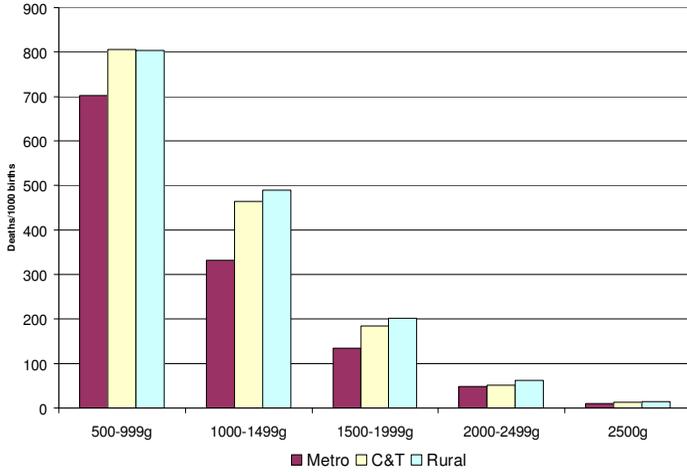
Figure 3. Comparison of Stillbirth Rate in weight categories per area
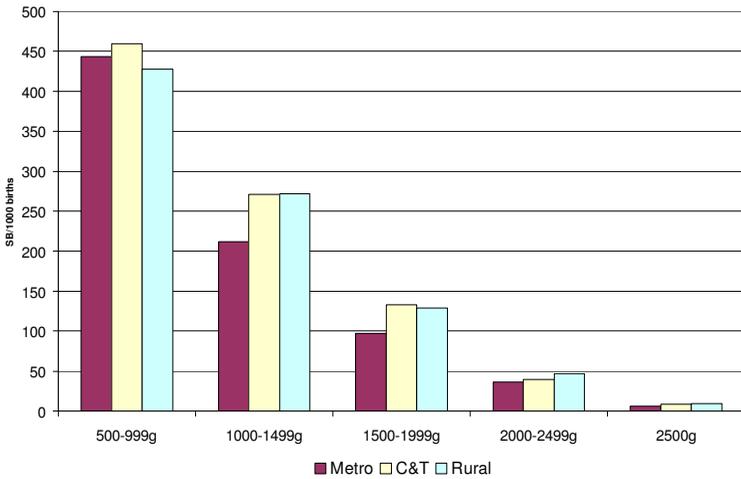
Figure 4. Comparison of Neonatal Death Rate in weight categories per area
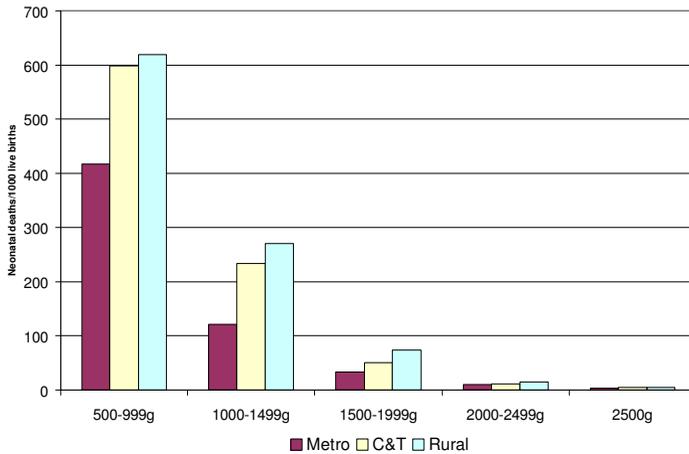
The stillbirth rates are slightly higher and the neonatal death rates are slightly lower in this report compared with the last *Saving Babies* report. This information is difficult to interpret, as there are some differences in the sites included.

Primary obstetric causes of perinatal death

Table 2 lists the primary obstetric causes of death for South Africa and Figure 5 illustrates the differences in rates per area (the detailed data is available in the appendices).

Table 2. Primary causes of perinatal deaths in South Africa (≥500 g)

Primary causes	N	% Total	Rate/1000
Unexplained intrauterine death	3766	24.6	9.28
Spontaneous preterm labour	3750	24.5	9.24
Intrapartum asphyxia	2062	13.5	5.08
Trauma	272	1.8	0.67
Hypertensive disorders	1647	10.8	4.06
Antepartum haemorrhage	1535	10	3.78
Infections	785	5.1	1.94
Fetal abnormality	592	3.9	1.46
Intrauterine growth restriction	338	2.2	0.83
No obstetric cause / Not applicable	268	1.8	0.66
Maternal disease	193	1.3	0.48
Other	86	0.6	0.21
Total Births	576065		37.70

Figure 5. Comparison of mortality rates per primary obstetric causes (500g+)

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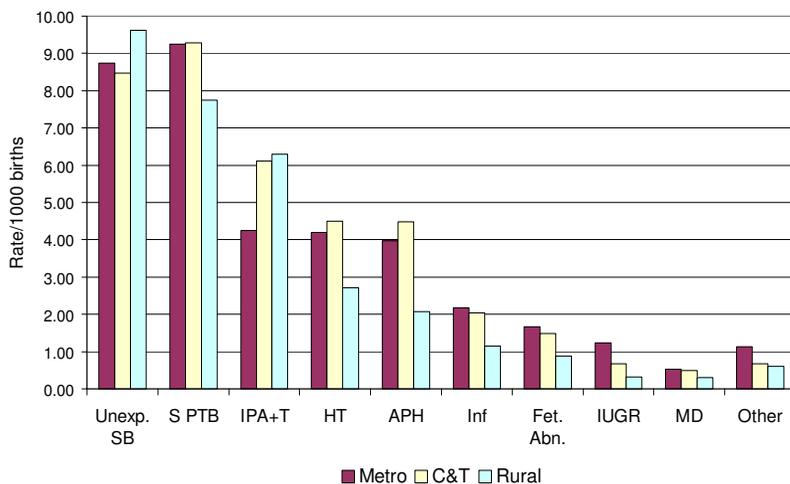
Causes of stillbirths

Table 3 lists the primary obstetric causes of stillbirths, and this is illustrated in Figure 6. The stillbirths are divided into macerated stillbirths (indicating antepartum death) and fresh stillbirths and those alive on admission in labour (indicating intrapartum stillbirths).

Table 3. Primary causes of stillbirths in South Africa

≥500 g:	Number	% Total	Rate/1000
Unexplained stillbirth	3747	37.7	9.24
Hypertension	1398	14.1	3.45
Antepartum haemorrhage	1321	13.3	3.26
Intrapartum asphyxia and birth trauma	1111	11.2	2.74
Spontaneous preterm birth	1030	10.4	2.54
Infections	510	5.1	1.26
Fetal abnormality	296	3	0.73
Idiopathic intrauterine growth restriction	285	2.9	0.70
Pre-existing maternal disease	156	1.6	0.38
Other	89	0.9	0.22

Table 4. Primary causes of macerated stillbirths in South Africa

500g+	Number	% Total	Rate/1000
Unexplained stillbirth	2891	53.6	7.13
Hypertension	923	17.1	2.28
Antepartum haemorrhage	454	8.4	1.12
Infection	335	6.2	0.83
Pre-existing medical disease	251	4.7	0.62
Intrapartum asphyxia and birth trauma	214	4.0	0.53
Intrauterine growth restriction	149	2.8	0.37
Fetal abnormality	93	1.7	0.23
Spontaneous preterm birth	48	0.9	0.12
Other	32	0.6	0.08

Table 5. Primary causes of fresh stillbirths in South Africa

≥500 g (Alive admission or fresh SB)	Number	% Total	Rate/1000
Antepartum haemorrhage	872	22.1	2.18
Intrapartum asphyxia and birth trauma	922	23.3	2.31
Unexplained stillbirth	715	18.1	1.79
Spontaneous preterm birth	552	14.0	1.38
Hypertension	444	11.3	1.11
Fetal abnormality	148	3.8	0.37
Infections	147	3.7	0.37
Idiopathic intrauterine growth restriction	66	1.7	0.17
Pre-existing maternal disease	40	1.0	0.10
Other	40	1.0	0.10

The vast majority of macerated stillbirths were unexplained, whereas intrapartum asphyxia and antepartum haemorrhage accounted for almost half of the fresh stillbirths, with only 18% being unexplained.

The stillbirth rate for fetuses ≥1000 g was 18.6/1000 births. The rate for fresh stillbirths and fetuses ≥1000 g alive on admission was 7.5/1000 births and this is an indirect measure of intrapartum stillbirths. The rate for macerated fetuses (≥1000 g) was 11.1/1000 births and this is a measure of antepartum deaths. Forty percent of stillbirths ≥1000 g were intrapartum.

Figure 6. Primary causes of Stillbirths (500g+)

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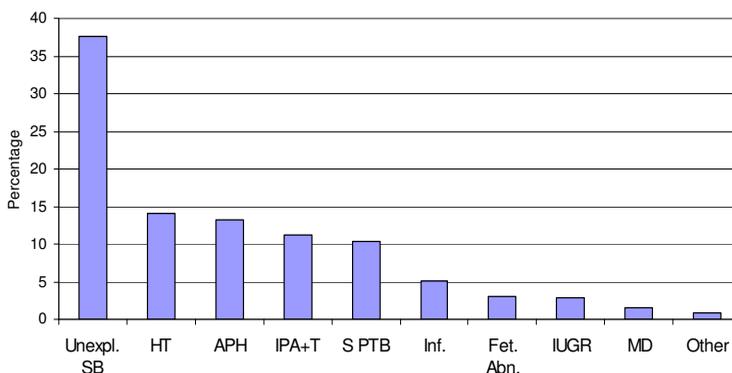
Figure 7. Primary causes of fresh stillbirths (500g+)
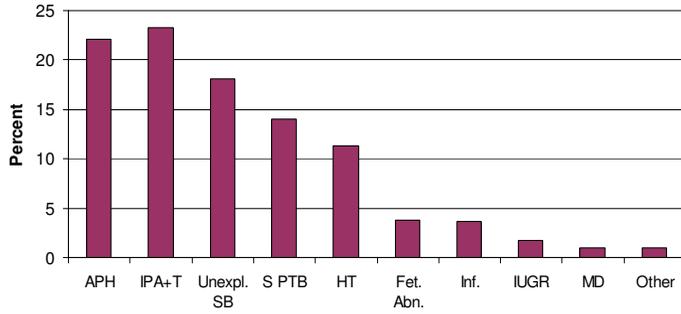
Neonatal Deaths

The primary obstetric causes of neonatal death are shown in Table 6 and illustrated in Figure 8.

Table 6. Primary causes of pre-discharge early neonatal deaths in the national PPIP database

≥500 g:	Number	% Total	Rate/1000
Spontaneous preterm birth	2720	50.8	6.92
Intrapartum asphyxia and birth trauma	1223	22.8	3.11
Fetal abnormality	296	5.5	0.75
Infections	275	5.1	0.70
Hypertension	249	4.7	0.63
Antepartum haemorrhage	214	4	0.54
Idiopathic intrauterine growth restriction	53	1	0.13
Pre-existing maternal disease	37	0.7	0.09
Other	284	5.4	0.72

Figure 8. Primary causes of neonatal deaths (500g+)
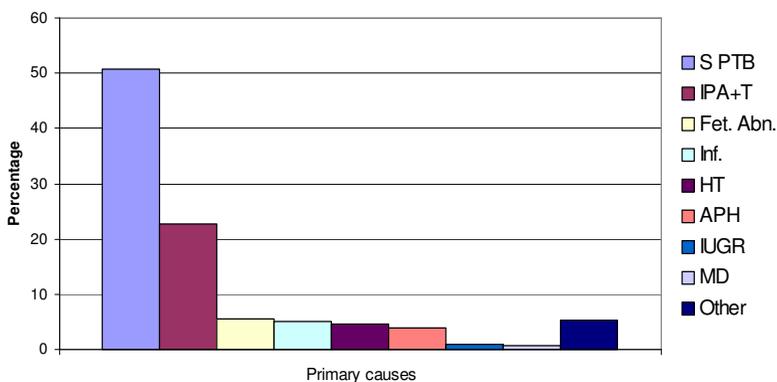
Table 7 lists and Figure 9 illustrates the final causes of neonatal death in the National PPIP database.

Table 7. Final causes of pre-discharge early neonatal deaths in the national PPIP database

≥500 g:	Number	% Total	Rate/1000
Immaturity	2706	50.6	6.88
Hypoxia	1375	25.7	3.50
Infection	528	9.9	1.34
Congenital abnormality	399	7.5	1.02
Other	174	3.3	0.44
Unknown	99	1.9	0.25
Trauma	51	1	0.13

Figure 9. Comparison of final causes of neonatal death (500g+)
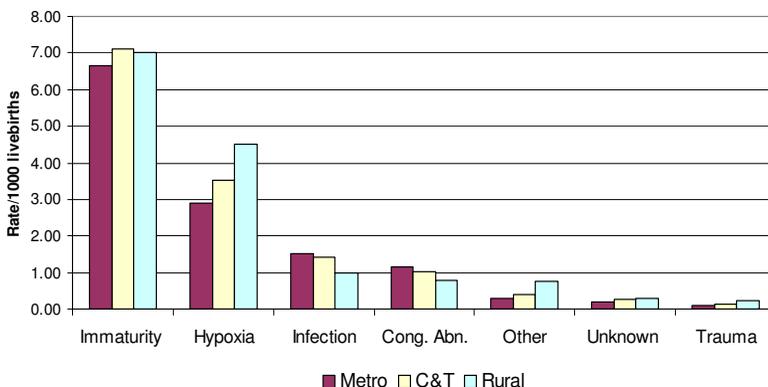
There were 89 402 low birth weight babies, comprising 15.5% of all births in the dataset. The PNMR for these babies was 178.4/1000 births, the stillbirth rate 115.4/1000 births and the neonatal mortality 71.2/1000 live births. For babies ≥2500 g, the PNMR was 11.7/1000 births, the stillbirth rate 7.6/1000 births and the neonatal mortality rate 4.1/1000 live births. Figures 10 to 15 illustrate the different pattern of primary causes of death for each weight category.

Figure 10. Primary causes of deaths 500-999g
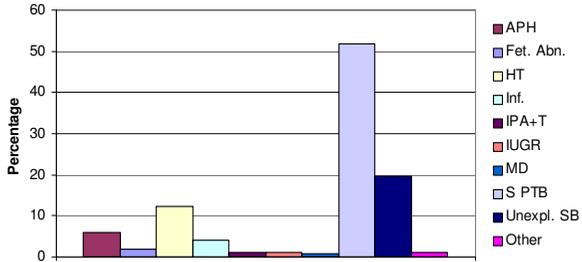
Figure 11. Primary causes of death 1000-1499g
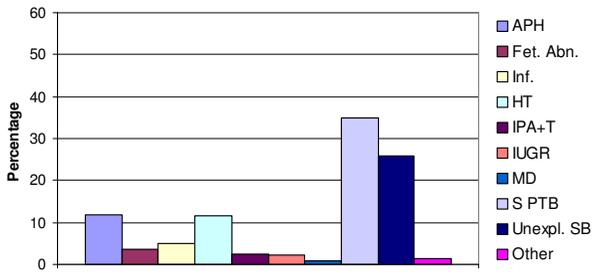
Figure 12. Primary causes of death 1500-1999g
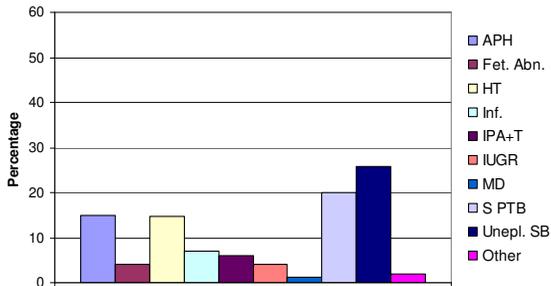
Figure 13. Primary causes of deaths 2000-2499g
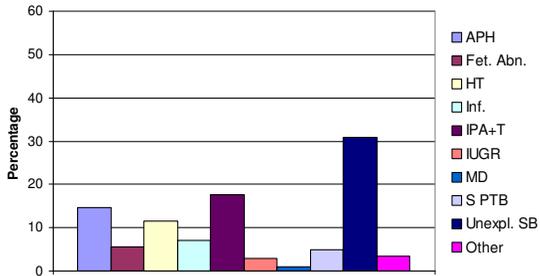
Figure 14. Primary causes of deaths 2500g+
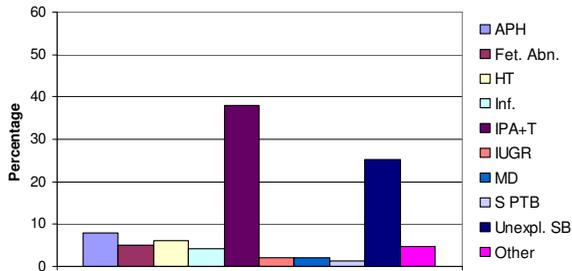
To summarise the overview of causes of stillbirths and neonatal deaths, the top three causes in all birth weight categories are unexplained stillbirth, spontaneous preterm labour, and intrapartum asphyxia and birth trauma. Unexplained stillbirths are most common between 1500 g and 2500 g, while spontaneous preterm birth is most important in the lowest birth weight categories (500 – 1500 g). For the higher birth weights (≥2500 g), deaths due to intrapartum asphyxia and birth trauma, associated with prolonged or obstructed labour, are most frequent. Hence, the two priority causes of death to address are preterm birth and intrapartum hypoxia. Infections remain an important, and also the most easily preventable, cause of neonatal deaths. However, these do not show up in PPIP datasets, thus emphasising the need for cross-linking of this data with that from the Saving Children reports.

14

Missed opportunities, avoidable factors and substandard care

Tables 8 to 11 list the common probable avoidable factors, missed opportunities and substandard care. All tables list only the probable factors. This means that the assessing clinicians felt that the factor listed **was directly related** to the death of the infant. Had this factor been avoided, the infant would probably have lived.

Table 8. Comparison of the main categories of missed opportunities, avoidable factors and substandard care

	SA		Metro		C&T		Rural	
	N	% Deaths	N	% Deaths	N	% Deaths	N	% Deaths
Patient associated	2447	16.0	641	10.2	1073	20.1	820	22.2
Health worker associated	2245	14.7	561	9.0	986	18.5	611	16.6
Administrative problems	963	6.3	182	2.9	441	8.3	340	9.2
Insufficient notes	108	0.7	10	0.2	64	1.2	34	0.9

The metropolitan area has the least probable avoidable factors compared with city and towns and rural areas. Overall within the health system (health worker related and administrative), clinicians felt that one in every five deaths could clearly have been avoided. That varied between approximately one in four for city and towns, and rural areas, and one in eight in metropolitan areas.

Table 9. Common patient related modifiable factors

Probable	Number	% Deaths
Inappropriate response to poor fetal movements	586	3.8
Never initiated antenatal care	557	3.6
Delay in seeking medical attention during labour	486	3.2
Booked late in pregnancy	300	2.0
Infrequent visits to antenatal clinic	109	0.7
Lack of transport - Home to institution	102	0.7
Inappropriate response to rupture of membranes	57	0.4
Inappropriate response to antepartum haemorrhage	56	0.4
Failed to return on prescribed date	45	0.3
Declines admission/treatment for personal/social reasons	40	0.3
Attempted termination of pregnancy	27	0.2
Alcohol abuse	20	0.1
Delay in seeking help when baby ill	7	0
Infanticide	7	0

Table 10. Common administrative related modifiable factors

Probable	Number	% Deaths
Inadequate facilities/equipment in neonatal unit/nursery	228	1.5
Delay in medical personnel calling for expert assistance	94	0.6
Personnel not sufficiently trained to manage the patient	84	0.5
No accessible neonatal ICU bed with ventilator	76	0.5
Lack of transport - Institution to institution	68	0.4
Insufficient nurses on duty to manage the patient adequately	67	0.4
Insufficient doctors available to manage the patient	46	0.3
Personnel too junior to manage the patient	39	0.3
Result of syphilis screening not returned to hospital/clinic	35	0.2
No response to positive syphilis serology test	32	0.2
No syphilis screening performed at hospital/clinic	28	0.2
No on-site syphilis testing available	27	0.2
Anaesthetic delay	26	0.2
Inadequate theatre facilities	25	0.2
Lack of adequate neonatal transport	14	0.1
No dedicated high risk ANC at referral hospital	12	0.1
Staff rotation too rapid	7	0

Table 11. Common health worker related modifiable factors

a. Antenatal care

Probable	Number	% Deaths
No response to maternal hypertension	214	1.4
No response to history of stillbirths, abruptio etc.	62	0.4
No response to poor uterine fundal growth	73	0.5
Multiple pregnancy not diagnosed antenatally	40	0.3
No response to apparent post-term pregnancy	40	0.3
Fetal distress not detected antenatally; fetus monitored	38	0.2
Physical examination of patient at clinic incomplete	38	0.2
Antenatal steroids not given	28	0.2
Fetal distress not detected antepartum; fetus not monitored	36	0.2
No response to history of poor fetal movement	22	0.1
Inadequate / No advice given to mother	21	0.1
Incorrect management of antepartum haemorrhage	18	0.1
No response to maternal glycosuria	16	0.1
Incorrect management of premature labour	14	0.1
No antenatal response to abnormal fetal lie	10	0.1
Iatrogenic delivery for no real reason	9	0.1

Probable	Number	% Deaths
Fetal distress not detected intrapartum; fetus monitored	235	1.5
Fetal distress not detected intrapartum; fetus not monitored	157	1.0
Management of 2nd stage: prolonged with no intervention	114	0.7
Management of 2nd stage: inappropriate use of vacuum	23	0.2
Management of 2nd stage: inappropriate use of forceps	4	0.0
Medical personnel underestimated fetal size	72	0.5
Medical personnel overestimated fetal size	50	0.3
Poor progress in labour, but partogram not used	50	0.3
Poor progress in labour - partogram interpreted incorrectly	49	0.3
Poor progress in labour, but partogram not used correctly	48	0.3
Breech presentation not diagnosed until late in labour	42	0.3
Multiple pregnancy not diagnosed intrapartum	33	0.2
Incorrect management of cord prolapse	9	0.1

c. Neonatal care

Probable	Number	% Deaths
Neonatal care: management plan inadequate	85	0.6
Neonatal resuscitation inadequate	57	0.4
Neonatal care: inadequate monitoring	37	0.2
Inadequate resuscitation equipment	33	0.2
Baby managed incorrectly at Hospital/Clinic	22	0.1
Nosocomial infection	10	0.1
Baby sent home inappropriately	3	0

d. Health worker related delays

Probable	Number	% Deaths
Delay in referring patient for secondary/tertiary treatment	168	1.1
Delay in doctor responding to call	50	0.3
Doctor did not respond to call	22	0.1

No response to poor fetal movements is the most frequent patient related modifiable factor. A randomised trial performed in developing countries is urgently needed to ascertain the real value of observing fetal movements in pregnancy. No antenatal care, infrequent visits or delay in starting antenatal care was the most common patient related avoidable factor. It is still uncertain how many deaths antenatal care would have prevented and how many are the result of patient blaming by the clinicians. Delay in seeking medical attention during labour is mostly due to lack of transport from home to a health care institution, and not because of an unwillingness to

seek help. If this is coupled with lack of transport, – home to institution and institution to institution – there were 656 instances where transport played a direct role in the death of an infant.

Discussion

In *Opportunities for Africa's Newborns*[6] it is stated that:

"Each year in Africa, 30 million women become pregnant, and 18 million give birth at home without skilled care. Each day in Africa

- 700 women die of pregnancy-related causes.
- 3100 newborns die, and another 2400 are stillborn.
- 9600 children die after their first month of life and before their fifth birthday
- 1 in every 4 child deaths (under 5 years) in Africa is a newborn death"

And:

"Every year in sub-Saharan Africa 1.16 million babies die in the first month of life, and another million babies are stillborn."

How does South Africa compare with Africa and other countries?

Table 12. Comparison of rates of stillbirths between countries

Region	Country	SB rate/1000 total births (BW ≥ 1000g)[7]	Intrapartum SB rate/1000 total births (BW ≥ 1000g)[8]
Developed countries	Australia	4.4	0.5
	Canada	4.5	0.3
	Denmark	6.7	0.5
Latin America	Argentina	11	1.3
	Bolivia	21	2.5
	Brazil	13	1.6
Middle East	Egypt	21	7.2
	Jordan	12	3.1
	Saudi Arabia	11	3.5
South Asia	India	30	7.4
	Nepal	55	23.5
	Pakistan	41	24
Asia/Pacific	China	24	11
	Malaysia	8	2.8
	Papua New Guinea	17	3.3
Sub-Saharan Africa	Cote d'Ivoire	34	14.2
	Malawi	39	8.6
	Mauritius	11	3.0
	Zambia	31	10.5
	South Africa (DHIS)[*]	**25**	
	National PPIP	**19**	**7.5**

[*] - South Africa (DHIS) data is from the National Department of Health, Department of Health Information System

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Table 12 lists stillbirth rates of various countries. In this comparison South Africa has rates that are comparable with other middle-income countries. However, it appears the intrapartum stillbirth rate is higher than comparable countries.

Table 13 gives a comparison of South Africa's neonatal mortality and low birth weight rates with those of other countries. It is not certain what birth weight cut-offs were used for other countries, but the data from South Africa is for babies ≥500g. In comparison with other middle-income countries, the national PPIP data shows a high low birth weight rate, and a low neonatal mortality rate. This lower rate is probably due to the lack of capture of deaths of neonates after discharge from hospital (see below).

Table 13. Comparison of neonatal mortality rates and low birth weight rates between countries

Region	Country	NMR/1000 live births[9,10]	LBW (%)[11]
Developed countries	Australia	3	7
	Canada	4	6
	Denmark	3	5
Latin America	Argentina	10	8
	Bolivia	24	7
	Brazil	13	8
Middle East	Egypt	17	12
	Jordan	16	12
	Saudi Arabia	11	11
South Asia	India	39	30
	Nepal	32	21
	Pakistan	53	19
Asia/Pacific	China	18	4
	Malaysia	5	9
	Papua New Guinea	32	11
Sub-Saharan Africa	Cote d'Ivoire	65	17
	Malawi	31	16
	Mauritius	12	14
	Zambia	37	12
	South Africa[*]	**12** (16 in PPIP)	**12** (16 in PPIP)

[*] - Live born infants ≥ 500g,

There is often bias in classifying intrapartum deaths as stillbirths or early neonatal deaths. It is easier for clinicians to say a baby is stillborn rather than a neonatal death because of burial policies and ease of administration. Hence it is best to combine intrapartum stillbirths with neonatal deaths to compare regions and countries (Table 14). In this respect, South Africa compares adequately with other middle-income countries.

It is estimated that 94% of pregnant women in South Africa attend antenatal care and 74% attend four or more times.[6] Eighty-four per cent have a skilled attendant at birth.[6]

Table 14. Comparison of early neonatal death mortality rates and intrapartum stillbirths between countries

Region	Country	NMR/1000 live births[6,9]	Intrapartum SB (≥ 1000g)[11]
Developed countries	Australia	3	0.5
	Canada	4	0.3
	Denmark	3	0.5
Latin America	Argentina	10	1.3
	Bolivia	24	2.5
	Brazil	13	1.6
Middle East	Egypt	17	7.2
	Jordan	16	3.1
	Saudi Arabia	11	3.5
South Asia	India	39	7.4
	Nepal	32	23.5
	Pakistan	53	24
Asia/Pacific	China	18	11
	Malaysia	5	2.8
	Papua New Guinea	32	3.3
Sub-Saharan Africa	Cote d'Ivoire	65	14.2
	Malawi	31	8.6
	Mauritius	12	3.0
	Zambia	37	10.5
	South Africa[*]	**21 (14 in PPIP)**	**7.5**

[*] - Live born infants ≥ 500g

How does the PPIP care compare with other South African data?

Table 15 shows the rates of deaths from the "Opportunities for Africa's Newborns" report[6] and from the PPIP sites. The data from the "Opportunities for Africa's Newborns" is quoted as coming from the Demographic and Health Survey. The National District Health Information Systems reports a stillbirth rate of 25/1000 births and a PNMR of 34.9/1000 births (the neonatal death rate was not reported).[12] The PPIP data consistently records lower rates of neonatal deaths.

Table 15. Comparison of mortality rates from different data sources in South Africa

	DHS (1998)	NDHIS (2005)	PPIP (≥500 g)	PPIP (≥1000 g)	Sub-Saharan Africa[6]
Maternal Mortality Ratio (/100000 live births)	230		-		940
Annual maternal deaths	2500		-		247 300
Stillbirth rate /1000 births	18	25	24	19	32
NMR /1000 live births	21		14	10	41
U5MR /1000 live births	67		-		164
NMR as percentage U5MR	31%		-		25%

NMR - Neonatal mortality rate
U5MR - Under 5 mortality rate

Table 16 compares the causes of neonatal deaths globally with the different South African data sets. Infections appear much less frequently in the PPIP data than elsewhere. This is partly due to a lower incidence and death rate in South Africa, but also because most late neonatal deaths are not captured in PPIP, as most infection related deaths occur in the late neonatal period.

Table 16. Comparison of causes of neonatal deaths globally and in South African national estimates compared with PPIP national dataset[1]

Cause	Estimated distribution for sub Saharan Africa[6] (%)	Estimated distribution for South Africa (%)	PPIP ≥ 1000g (%)	PPIP ≥ 500g (%)	SADHS (%)
Infections	37	23	12	9	21
Sepsis/pneumonia	28	21			18
Tetanus	6	>1			1
Diarrhoea	3	2			2
Preterm	25	38	32	51	38
Asphyxia	24	21	37	26	21
Congenital	6	10	10	8	10
Other	7	6	9	5	6

Global estimates and South African estimates based on work by the WHO Child Health Epidemiology Reference Group for 192 countries for the year 2000, updated for 2006.

This lower neonatal death rate is due to PPIP not capturing neonatal deaths once the mother and baby have been discharged from hospital. The *Saving*

Children 2005[3] report (which uses the Child Healthcare Problem Identification Programme – ChIP) found that approximately 16% of all child deaths occurred in the neonatal period and 82% of these deaths were due to infections. These deaths occurred in "paediatric" wards and excluded neonates that died in the maternity nurseries. Hence the true neonatal death rate would be a combination of the neonatal deaths from the ChIP and PPIP. Data from Kalafong Hospital, where both databases (PPIP and ChIP) are used, show that the pattern of disease is similar to the estimated global distribution (Table 17).

Table 17. Pattern of neonatal deaths at Kalafong Hospital for 2005 where PPIP and ChIP databases are combined

Cause	% ≥1000 g (n=14)	% ≥500 g (n=41)
Infections	35	14
Preterm	7	58
Asphyxia	21	7
Congenital abnormalities	21	7
Other	14	12

The figures available from PPIP accurately reflect the pattern of disease for early neonatal deaths, and the early death neonatal death mortality rates.

Overall, South Africa is clearly a leader in Africa, but given our gross national income per capita (US$3630), we should be doing much better. If care for pregnant women and their children continues as it is now, we will not get close to achieving the Millennium Development Goals 4 and 5.

Acknowledgements

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Recommendations

The next section deals with the challenges identified by analysis of the PPIP data. Each chapter starts with a summary of the challenges followed by the recommendations.

The recommendations have been phrased as follows:

> 1. The action (recommendation) – what must be done
> 2. The Level – at which level the implementation should occur
>   - Policy
>   - Administration
>   - Clinical practice
>   - Education

The task group hoped that phrasing the recommendations in this way will assist health workers and administrators to know what they as individuals can do. Responsible persons in each case may then be clearly identified.

There were some threads that were general to most recommendations and these are highlighted here.

1. Staffing norms should be established for maternity and neonatal units (or nurseries). An example of staffing norms is given below.
2. Recommendations that apply to health care managers at all levels should be included in their Key Performance Areas (KPA).
3. Outreach should be on-site and face-to-face preferably by a community obstetrician/paediatrician or midwife. Outreach should be part of their job descriptions. Provincial Departments of Health should consider creating such posts for each district or region, perhaps in conjunction with medical schools.

Suggested Staffing norms

Maternity:[1]

Labour and postnatal wards:	16 midwives per 100 deliveries per month on the staff establishment at a level 1 health care facility.
Antenatal care:	2 – 3 midwives per 100 bookings per month on the staff establishment.

These are conservative calculations

Newborn care[2]

Intensive care (Level 3)	Ideal: 1 nurse to 1 patient Acceptable: 1 nurse to 2 patients. These need to be Professional Nurses, preferably with neonatal training
High care (Level 2)	Ideal: 1 nurse to 2 patients Acceptable: 1 nurse to 3 patients. These could be Enrolled Nurses or Enrolled Nursing Assistants. There would need to be Professional Nurse cover (±1 per 12 – 15 patients).
Level 1 care	Ideal: 1 nurse to 4 patients Acceptable: 1 nurse to 6 / 7 patients. These could be Enrolled Nurses or Enrolled Nursing Assistants with Professional Nurse cover.

These figures for the newborn care are the requirement for the number of staff on duty in that area 24 hours in the day.

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2. Community related challenges in saving babies

What does the PPIP data say?

Rates of unexplained stillbirths still very high

When analyzing the data of the PPIP over the thirty months (October 2003-March 2006), it stands out that a quarter of the perinatal deaths ≥500 g at the PPIP sites are classified as unexplained deaths. When looking at only that group of deaths and analyzing the avoidable factors, the five most common probable avoidable factors have largely to do with the community participation aspect of the service. In order of occurrence as avoidable factors they appear as:

Inappropriate response to poor fetal movements   (10.2%)
Never initiated antenatal care   (3.1%)
Delay in seeking medical attention in labour   (1.9%)
Booked late in pregnancy   (1.8%)
Infrequent visits to antenatal clinic   (0.7%)

Although these avoidable factors do not exclusively fall into the domain of the patients' responsibility, patients do need to take most of the responsibility for the avoidable deaths in these situations.

Looking at all avoidable factors given in the data set and analyzing those classified as "Inappropriate response to poor fetal movements", two thirds of these perinatal deaths are classified as unexplained, the majority being macerated. The second most common cause under this category of avoidable factors appears as hypertensive disorders at the magnitude of 10%. This would mean that should we be able to get the patient and health worker to respond appropriately to a decrease in fetal movements, many of the babies' lives may be saved.

Looking at all avoidable factors given in the data set and analyzing those classified as "Never initiated antenatal care", one quarter of the deaths are classified as unexplained. The second most common cause of death under this category of avoidable factors is spontaneous preterm labour at 21%. It is assumed that should these women have attended antenatal care, a significant proportion of these death may have been prevented.

Looking at all avoidable factors given in the data set and analyzing those classified as "Booked late in pregnancy", the most common cause of death is once again recorded as unexplained, at 29%. It may be argued that should a mother book earlier, the unexplained death could possibly be prevented.

It is of note that the avoidable factors frequently associated with unexplained deaths have similar percentages when looking at those classified as probable and possible, compared to those classified as probable avoidable factors only.

Looking at all the avoidable factors given in the data set and analyzing those classified as "Delay in seeking medical attention in labour", the most common causes of perinatal death are classified as spontaneous preterm labour at 40%, followed by intra-partum asphyxia at 26%, then by unexplained intrauterine deaths at 16%.

The perinatal mortality rate for babies born before arrival in certain institutions is up to ten times higher than the perinatal mortality rate for those institutions' supervised deliveries, e.g. National District Hospital, Bloemfontein.

The reasons for women finding it difficult to attend antenatal care and delaying in seeking attention during labour have been investigated by Jackson, *et al.* in three sites in South Africa, namely Paarl, Rietvlei, and Umlazi[1]. They found that the main barriers to antenatal clinic attendance were accessibility (time when services were provided, time and distance to services, costs to travel to services) and attitude of nurses. These are health system problems not related to lack of knowledge surrounding antenatal care. It is estimated that 95% of all pregnant women in South Africa attend antenatal care.[2]

When taking these factors into account it is clear that pregnant women in the community need to plan to attend and book at antenatal clinic earlier than is currently done. Patients also need to be aware of the danger signs during pregnancy, to allow prevention of at least some deaths by earlier intervention.

Low birth weight and poor antenatal clinic attendance.

Low birth weight is a risk factor for perinatal death. The lower the birth weight, the greater the perinatal mortality rate. When analysing avoidable factors in mothers that have had perinatal deaths, those whose babies died at a lower birth weight had a higher rate of "never initiated antenatal care" recorded as an avoidable factor as seen in the table below. The higher proportions earlier in pregnancy are not due to women not wanting to attend antenatal care, but rather the result of complication intervening before they start antenatal care.[3] Initiating antenatal care at confirmation of pregnancy will help reduce these numbers.

Avoidable factor	Birth weight category	% Deaths
Never initiated antenatal care	500-999 g	25.3
	1000-1499 g	19.3
	1500-1999 g	14.6
	2000-2499 g	10.8
	2500+ g	5.2

HIV - the effect of HIV on perinatal care

The low HIV testing rate, less than 50% in those areas recording the data, is of concern, as the perinatal mortality is twice as high in HIV infected women compared with those not infected.

The effect of HIV on perinatal care has not yet been fully captured by the PPIP data for the period under review. The causative link between HIV infections and an increase in perinatal mortality rate has been suspected for some time and is postulated to be effected mainly by an increase in spontaneous preterm deliveries and the resulting increased mortality among the lower birth weight neonates. It is however also being considered whether the high rate of "unexplained" intrauterine deaths in not partly due to HIV infections.

The control of HIV infections and the resulting diseases is a major challenge to the community and healthcare services in efforts to save babies' lives.

Recommendations related to community involvement in perinatal care:

The recommendations that follow from the PPIP data include:

1a. Every pregnant woman must be able to *confirm pregnancy and initiate antenatal care early.*
- Community members must be educated that this important responsibility rests with them.
- Policies within the district health systems must be developed to ensure that sufficient clinic facilities are available.
- Facilities for antenatal care must have appropriately trained staff to manage perinatal care effectively. (See antenatal recommendations)

1b. Every pregnant woman, family and community member needs to *have a basic knowledge of, and access to*, the following:
- A *wide range of contraceptives* in order to prevent unwanted pregnancies
- The *signs of pregnancy and the danger signs of pregnancy,* as well as the facilities available for pregnant women to access help.
- Normal signs of onset of labour and the *importance of planning intrapartum care* i.e. which facility to use, and the necessary transport arrangements.
- The *effects of HIV on the pregnancy*, the mother and the baby. The HIV testing policy should be *provider initiated counselling and testing* (opt out). Communities, and pregnant women must be informed that HIV testing is an integrated part of antenatal care and contraceptive services. (The role of male circumcision may need to be explored.)
- Correct *infant feeding choices, contraceptive decisions, as well as neonatal and child care*.

Action
Community education in partnership with community organisations needs to be strengthened.
- Communication between the health service provider and recipient needs to be enhanced
- Programs such as BANC, BBI and BHFI need to be embraced by communities and used to spread important health knowledge to all community members
- Community health workers can perform an important role in this partnership

Level of responsibility:

Policy:
The services outlined in the standing policies and guidelines for district health services with respect to the provision of maternity services[4] must be provided in each district.

Responsibility: Facility managers and district managers as well as local political and community leaders.

Administration:
- District Health administrations need to ensure that clinic staff are empowered to provide reproductive health services, such as contraceptive services, termination of pregnancy, antenatal, labour and postnatal care, STI care, and HIV counselling and testing
- Clinic staff need sufficient resources (physical and emotional) to implement provider initiated (opt out) HIV testing
- Mechanisms and responsibilities for transporting woman in labour to the relevant facilities must be clearly defined. Creative systems should be made available to ensure timeous arrival at health facilities, e.g. coupon system, antenatal hostels
- Seamless integration of the services within communities needs to be encouraged
- KPAs for the above-mentioned responsibilities must be introduced for CEOs, facility managers and district managers

Responsibility: District manager, facility managers and hospital boards.

Clinical:
- Continuous updating of the clinicians' knowledge and skills in caring for the pregnant woman
- Clinical staff should be encouraged and empowered in patient education. KPAs of clinical staff must include the above-mentioned responsibilities

Responsibility: Unit and facility managers.

Education:
- Key messages about maternal and child care should be distributed in the community. Local media and community organisations may be used to impart basic messages.

- Educational structures, such as schools, adult education and religious structures, community organisations, NGOs and FBOs may be used to transmit knowledge about perinatal care
- Key messages must dovetail with the content of curricula at training institutions for healthcare workers in the perinatal field

Responsibility:
National and provincial health departments
District managers in co-operation with NGOs and community media
Tertiary education units such as universities and nursing colleges

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3. Antenatal care challenges

Introduction

The previous (fourth) Saving Babies report[1] had separate chapters, each focusing on a major cause of perinatal death, as identified by the PPIP database. Each of these chapters made recommendations aimed at reducing deaths from the cause being discussed. It was found that problems in antenatal care contributed to various different causes of perinatal death. In planning this (fifth) Saving Babies report, the Saving Babies task team felt it would be important to have a chapter focusing on antenatal care and its role in reducing perinatal deaths.

The chapter sets the scene by reviewing the findings from the previous Saving Babies reports in order to outline what type of perinatal deaths have the potential to be reduced through improvements in antenatal care. The latest findings from the PPIP database (October 2003 to March 2006) are then used to identify the most important antenatal avoidable factors associated with these perinatal deaths. The implications of each of these antenatal avoidable factors are discussed in some detail. Data from the first Saving Children report[2] are also reviewed to assess whether improvements in antenatal care could influence infant or child deaths (beyond the perinatal period).

Based on this analysis, the chapter then suggests what the essential content of antenatal care in South Africa should be. The chapter also draws on the available evidence about possible models of antenatal care. The results of a pilot study evaluating a new approach to antenatal care for South Africa (BANC) are presented.

Finally, based on these discussions, recommendations regarding antenatal care have been made, and are presented in the "Recommendations" section at the end of this chapter.

What types of perinatal death can be reduced through improvements in antenatal care?

The chapters on the primary obstetric causes of perinatal death in the previous (fourth) Saving Babies report[1] clearly identify the categories of death where improvements in antenatal care are likely to make a positive impact. These categories of death are discussed below. For each of these categories, the most common antenatal probable avoidable factors, as documented in the PPIP database Oct 2003 to March 2006, are listed.

1. Unexplained Stillbirths

The latest data from the PPIP database show that unexplained stillbirths make up the largest category of perinatal death in all areas of South Africa. Approximately 80% of these unexplained stillbirths are macerated. We can reasonably assume that in the great majority of these cases of macerated stillbirth the fetus died before the onset of labour. This means that we have to look at strategies based in the antenatal period in order to reduce these deaths. The stillbirth to neonatal death ratio in South Africa is higher than in most other countries of the world, both developed and less developed,[3] and may reflect a deficiency in the quality of antenatal care relative to neonatal care.

The previous Saving Babies report[1] discussed the possible underlying causes of the deaths reported as unexplained, and concluded that many of these were probably due to IUGR, postmaturity, syphilis, congenital anomalies and amniotic fluid infection syndrome. Deaths due to the first three of these causes are clearly avoidable if good antenatal care is provided. Given the large numbers of deaths in this category of unexplained stillbirth, this is certainly an area with great potential for reduction in perinatal deaths through improved antenatal care.

Antenatal probable avoidable factors for unexplained stillbirths:
Inappropriate response to poor fetal movements
Never initiated antenatal care / booked late in pregnancy / infrequent ANC visits

2. Hypertension and abruptio placentae

These two conditions are both within the top five causes of perinatal death in South Africa, and were discussed together in the previous report because there is a large overlap between the two. The majority of these deaths were stillbirths, many of which could probably have been prevented by better antenatal care. In particular, correct action by personnel in dealing with hypertension, poor fundal growth, and poor obstetric history, with timely referral to the appropriate level of care, is likely to reduce deaths from these causes.

Antenatal probable avoidable factors for hypertension:
Never initiated antenatal care / booked late / infrequent ANC visits
No response to maternal hypertension
Inappropriate response to poor fetal movements
Delay in referring patient for secondary / tertiary treatment

No response to poor uterine fundal growth

Antenatal probable avoidable factors for abruptio placentae:
Never initiated antenatal care / booked late / infrequent ANC visits
No response to maternal hypertension
Inappropriate response to antepartum haemorrhage
Inappropriate response to poor fetal movements
Delay in referring patient for secondary / tertiary treatment
No response to history of stillbirths, abruption etc.

3. Infections
Although the PPIP data lists infection as being the sixth most common cause of perinatal death in South Africa, there is no doubt that this is an underestimate. Many of the deaths categorised as unexplained stillbirths or as idiopathic preterm labour must be due to infections. Syphilis is one of the contributors to this category of death. Deaths due to syphilis can obviously be reduced through better antenatal care, including on-site testing and treatment for syphilis at the first antenatal visit. This is still lacking in many antenatal services in South Africa. It is less clear whether antenatal care interventions can reduce deaths from other infections such as the amniotic fluid infection syndrome.

Antenatal probable avoidable factors for infections:
Never initiated antenatal care / booked late / infrequent ANC visits
Inappropriate response to poor fetal movements
No response to positive syphilis serology test
No on-site syphilis testing available

4. Idiopathic IUGR and postmaturity
This is another category of death where the numbers recorded in the PPIP database are an underestimate, with the deaths often labelled as unexplained stillbirths. This is one of the categories where deaths can most effectively be reduced through good antenatal care. As long as a woman books reasonably early so that the gestational age can be determined accurately, and as long as she has her fetal growth monitored at each visit, then death from IUGR or post-maturity can be avoided through appropriate intervention.

Antenatal probable avoidable factors for IUGR and post-maturity:
No response to poor uterine fundal growth
No response to apparent post-term pregnancy
Never initiated antenatal care / booked late

Delay in referring patient for secondary / tertiary treatment
Inappropriate response to poor fetal movements

5. Traumatic breech delivery

Although the overall numbers are not large, traumatic breech delivery is the most common cause of death from birth trauma. If breech presentation is detected by routine palpation at the 36-week antenatal visit, then steps should be taken to avoid a subsequent labour with breech presentation. The options are either to perform an external cephalic version (ECV) or to plan an elective caesarean section. Applying this principle in antenatal care would be likely to reduce the numbers of deaths from this cause.[4]

Antenatal probable avoidable factors for traumatic breech delivery:
Breech presentation not diagnosed until late in labour
Never initiated antenatal care / booked late

6. Diabetes mellitus

Although the previous PPIP report[1] did not focus on maternal diabetes as a major cause of perinatal death in South Africa, the latest PPIP data (Oct 2003 to March 2006) do include 89 deaths due to maternal diabetes. There is now good evidence that screening for and treating gestational diabetes during the antenatal period, does lead to a reduction in perinatal deaths.[5]

Antenatal probable avoidable factors for diabetes:
Never initiated antenatal care / booked late / infrequent ANC visits
Inappropriate response to poor fetal movements
No response to maternal glycosuria

Antenatal avoidable factors: Implications for antenatal care

For each death recorded in the PPIP database, any avoidable factors associated with the death are listed. Where an avoidable factor is listed as "probable" (as opposed to "possible"), it means that there is a clear link between the factor and the death. In other words, if the factor had been avoided, then it is likely that the baby would have survived. The most common probable avoidable factors occurring during the antenatal period are therefore a good guide to the priority areas for change or improvement in the way we conduct antenatal care, in order to reduce perinatal deaths. These common antenatal avoidable factors have been listed above, and are discussed below according to whether they are patient-related, administrative, or health worker-related:

Patient-related avoidable factors

1. Never initiated antenatal care / booked late / infrequent ANC visits

These avoidable factors obviously have implications for community education about the importance of early antenatal care booking and compliance with scheduled antenatal visits. These factors are classified as patient-related, but in many cases, this is probably putting the blame on the patient inappropriately. It has been shown in the South African setting that women often visit a health care practitioner (e.g. a private general practitioner) early in the pregnancy to confirm that they are indeed pregnant.[6] The practitioner then fails to initiate formal antenatal care at that time, and the patient ends up being "unbooked'' or a "late booker''.

This is in fact a health service-related rather than a patient behaviour-related problem. The implications for antenatal care are that systems should be put in place to ensure that formal antenatal care is started as soon as the pregnancy is confirmed.[7] This must happen when the patient first attends a state institution or a private practitioner. This is in keeping with the National Guidelines for Maternity Care in South Africa.[8] The state will need to engage the private sector to achieve this, for example by making the same standardised maternity care books used in the state sector available to private practitioners.

2. Inappropriate response to poor fetal movements

This is another avoidable factor that is classified as a patient-related factor. It refers to the situation where a woman presents with an intra-uterine death often several days after she has noticed that her fetal movements have become poor or absent. The assumption is made that there would have been an opportunity to save the baby had she responded promptly to the decreased fetal movements. In many of these cases, however, the patient has never been taught about how to monitor her fetal movements, and how to act if the movements decrease. In such circumstances, the avoidable factor is not so much patient-related as health service-related. It is in fact a problem of the health worker failing to take steps to ensure that the fetus is monitored in the antenatal period, and has implications for the education of pregnant women at antenatal clinic. It emphasises the need for all pregnant women to be educated about the importance of monitoring their fetal movements from the time that their fetus has reached a viable gestation (approximately 28 weeks). There is inconclusive evidence from randomised controlled trials to support formalised fetal kick counting,[9,10] but the large numbers of deaths in the PPIP database, where inappropriate response to

fetal movements is cited as a probable avoidable factor, is a valid basis for recommending the practice in the South African setting.

3. Inappropriate response to antepartum haemorrhage

This again emphasises the need for antenatal care to include education of the patient, in this case about danger signs in pregnancy and how to react to them.

Health worker-related avoidable factors

These include: no response to maternal hypertension; no response to history of stillbirths, abruption etc.; no response to positive syphilis serology test; delay in referring patient for secondary / tertiary treatment; no response to apparent post-term pregnancy; no response to poor uterine fundal growth; breech presentation not diagnosed until late in labour; and no response to maternal glycosuria.

There are several reasons why such avoidable factors occur. Firstly, a risk factor may be missed during the antenatal period because of a lack of insight about the importance of checking for the risk factor. For example, the health worker may not realise the importance of calculating the gestational age at each visit, and may therefore miss the fact that the patient has gone post-term. A breech presentation at term may be missed because the health worker is not aware of the importance of checking for breech presentation specifically at the 36-week antenatal visit. Secondly, even if a risk factor is detected, the health worker may lack insight about the need to take action or about what action to take. For example, a blood pressure of 140/90 mmHg with 2+ proteinuria may be detected and documented, but not recognised as an indication for referral to a higher level of care. Thirdly, these avoidable factors may occur because of a lack of attention from the health worker rather than because a lack of insight, knowledge or skill. This could result from a lack of motivation on the part of the health worker or it could reflect poor staffing with too great a workload of antenatal patients, meaning that inadequate time is available for complete clinical assessment at the antenatal visit.

These avoidable factors suggest that the education that medical students and student midwives receive should be critically reviewed to ensure that essential knowledge and skills pertaining to antenatal care are taught and assessed. There is also a clear need for a quality assurance process to be implemented at all antenatal sites, so as to highlight deficiencies at a local level, and guide the priority areas for in-service education.

Evidence-based guidelines must form the basis of antenatal care, to minimise errors and omissions. Clear referral criteria and referral routes should be in place. To facilitate risk assessment and appropriate referral, a checklist system may be used, rather than relying entirely on the knowledge and insight of the health worker. The checklist should ensure that risk factors are not overlooked, and may be used with in conjunction with a flow chart indicating subsequent referral and management guidelines.

Finally the quality and quantity of staff working in antenatal clinics needs to be reviewed relative to the workload, and staffing norms for antenatal care need to be established.

Administrative avoidable factors

"No on-site syphilis testing available" is the only antenatal administrative factor highlighted in the latest PPIP data. This is a clear message that on-site testing at the first visit will save lives, and there is no excuse for it not being implemented at all antenatal sites in the country.[11]

Lack of staff does not feature as an antenatal avoidable factor in the PPIP database. This is because it is impossible to assess staffing levels and their impact on the quality of antenatal care rendered by examining a patient's antenatal record. However, as discussed above, many of the health worker-related avoidable factors may in fact reflect a problem of lack of staff. One reason why antenatal clinics are so busy is that antenatal patients often have too many scheduled visits. For low-risk women, many of these visits may be unnecessary. Reducing the quantity of antenatal visits, thus allowing an improvement in the quality of the visits, may be an important strategy in providing more effective antenatal care. This is discussed below under "models of antenatal care".

Can improvements in antenatal care reduce childhood deaths beyond the perinatal period?

The answer to this question cannot be found in the PPIP database, as it only contains information about perinatal deaths. We can, however, refer to the Saving Children 2004 report,[2] which reviewed the causes of and factors related to infant and under-5 child deaths in several sites across South Africa.

One of the most striking findings of this report was that over 50% of all deaths were associated with HIV-related disease or AIDS. It can be assumed that almost all of these deaths resulted from mother-to-child transmission of HIV. This fact is extremely relevant to the way we conduct

antenatal care, as it emphasises the critical need for effective prevention of mother-to-child transmission (PMTCT) programmes to be incorporated into routine antenatal care. Given the high prevalence of HIV infection among pregnant women in South Africa, and the availability of effective PMTCT strategies, which must start during the antenatal period, it can be argued that a PMTCT programme has the potential to prevent more deaths than any other single antenatal intervention. The first step in providing an effective PMTCT strategy is to provide counselling and on-site HIV testing for all women attending their first antenatal visits. Such testing should be organised on a provider-initiated (opt-out) basis: i.e. all women will be tested unless they decline.

Another important finding from the Saving Children data is that many of the mothers whose children die are themselves either chronically ill or are already dead. Thus any antenatal intervention which reduces the chance of maternal death is likely to reduce the risk of childhood death in the offspring. Maternal deaths from hypertension and from AIDS can be prevented with good antenatal care. Preventing maternal deaths from AIDS requires antenatal care to identify women with AIDS to institute HAART therapy, as well as to identify and treat opportunistic infections promptly.

Education given to pregnant women during antenatal care may also be important in reducing childhood deaths, either directly by influencing the care of the child, or indirectly by improving the health of the mother. In this context, education about appropriate methods of infant feeding, about all aspects of HIV/AIDS, and about family planning may be particularly important.

For these reasons, it has been suggested that effective antenatal care may be the most important factor in achieving a reduction in under-5 child deaths.[12]

The data from the Saving Children report demonstrate that we will have to monitor not only perinatal deaths but also childhood deaths in order to assess the quality of our antenatal care, particularly in relation to the PMTCT aspect.

Content of antenatal care

The antenatal avoidable factors from the PPIP database as well as the ChIP data discussed above help us to define some key elements of effective antenatal care, i.e. antenatal care that will result in a reduction in perinatal and childhood deaths. These key elements are as follows:

- First ANC visit at confirmation of pregnancy

- Education for the patient on pregnancy danger signs (including decreased fetal movements), HIV, breastfeeding, family planning, and on making a plan for getting to the appropriate delivery site promptly when in labour (transport arrangements)
- On-site testing at first visit for Rh, syphilis, Hb, and HIV (opt-out system)
- Checklist for risk classification together with protocols (e.g. flow-chart format) for referral / management
- Integration of PMTCT into ANC including CD4 counts on diagnosis of HIV and availability of HAART during pregnancy
- Evidence-based ANC activities (see Table 1)
- Appropriately trained antenatal care providers with adequate time to conduct all the necessary ANC activities
- Quality assurance of ANC

Table 1. Conditions that may be prevented or detected and treated effectively through antenatal activities[13]

Problem	Prevention	Screen/diagnose	Treatment
Mother			
Anaemia	Iron and folate prophylaxis	Check haemoglobin	Iron and folate or iron injections or blood transfusion
Hypertension/pre-eclampsia	Calcium supplementation	Check blood pressure, urine	Treat hypertension
Syphilis	As for STIs	RPR, VDRL	Penicillin
Vaginitis	As for STIs	Syndromic approach	Erythromycin and metronidazole
Urinary tract infection	Personal hygiene	Urine dipstick or urine culture	Ampicillin
HIV	As for STIs	Counselling and voluntary testing	HAART for mother, PMTCT for fetus/neonate Multivitamin supplementation
Tuberculosis	TB prophylaxis where indicated	Chest X ray, sputum culture	Anti-TB drugs
Malaria	Prophylaxis	Symptomatic treatment	Antimalarial drugs
Pre-existing medical conditions, Diabetes, heart disease, epilepsy		History and examination	Refer
Gestational diabetes mellitus	Obesity prevention	Family history, previous baby's birth weights, Glycosuria	Investigate, refer and treat
Malnutrition	Socio-economic improvements, community programmes	History, clinical examination (body mass index, arm circumference)	Referral to social workers, food supplementation

Problem	Prevention	Screen/diagnose	Treatment
Fetus			
Poor fetal growth	Balanced protein/calorie supplementation, advice on smoking	Uterine growth (serial symphysis-fundus measurements)	Timely delivery
Post-maturity	Accurate gestational age calculation	Calculate gestational age	Induce labour at 41+ weeks gestation
Multiple pregnancies	Careful assisted reproduction	Uterine growth, ultrasound	Refer
Breech presentation		Uterine palpation, ultrasound	External cephalic version, elective caesarean section
Congenital abnormalities	Peri-conception folic acid supplementation, advice on alcohol consumption	Maternal age, previous history, uterine growth, ultrasound	Refer to specialists
Rhesus isoimmunisation	Anti –D prophylaxis for Rh negative women in previous pregnancy	Rapid Rh, Coombs test for Rh negative women	Refer Rh-negative women with anti-D antibodies
Neonatal tetanus	Tetanus toxoid immunisation		

Models of antenatal care

Current models of antenatal care in South Africa are not necessarily based on any substantive evidence. For example, there is no good evidence to support the current South African Nursing Council guideline of 12 routine antenatal visits.[14] The National Guidelines for Maternity Care in South Africa[8] recommend seven visits. The WHO multi-centre randomised controlled trial compared the standard "western" model of antenatal care with a new WHO model that limited the number of visits to the clinic and restricted the tests, clinical procedures and follow-up actions to those that had been proven by research evidence to improve outcomes for women and their newborns.[15] The results of this trial showed that there were no significant differences between the new and standard model in terms of the outcomes for the mothers or their babies. The WHO schedule of antenatal visits is as follows:

- First visit: as early as possible during the pregnancy
- Second visit: 26 weeks
- Third visit: 32 weeks
- Fourth visit: 36 weeks
- Fifth visit: only if labour has not occurred by 41 weeks

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What this implies is that the number of antenatal visits can be safely reduced in low-risk pregnancies as long as the appropriate activities are thoroughly conducted at each of the visits. A new approach to antenatal care is required in South Africa, where the number of low-risk antenatal visits is greatly reduced, but the quality of care provided at each visit is improved.

BANC: An implementation aid for effective antenatal care

The World Health Organisation (WHO) produced a quality improvement package consisting of flow charts, titled: Integrated Management of Pregnancy and Childbirth. Pregnancy, Childbirth, Postpartum and Newborn Care: A Guide for Essential Practice.[16] Pattinson adapted the antenatal care flow charts to suit South African conditions and developed a multimedia **Implementation Package for Basic Antenatal Care (BANC).[17]** This includes a purpose written **Basic Antenatal Care Handbook** and **Training of Trainers modules** to guide users through the implementation process.

The BANC package describes the minimum antenatal care that every pregnant woman should receive. Every aspect is based on best evidence and only aspects that have been shown to be effective are included. The care has been simplified to enable every primary health care professional nurse to perform basic antenatal care. The BANC package provides clear guidelines for assessing pregnant women. At the first visit, ideally at the time of pregnancy confirmation, those pregnant women with uncomplicated pregnancies can go into the BANC programme. There are set criteria that must be met for women to qualify for BANC, and these are recorded on the patient's clinic file by a checklist and on the antenatal card. This assists the primary health care nurse to identify women who require basic care and separate them from those women requiring additional care and referral. At each subsequent visit, the woman must be reassessed to see if she still qualifies for BANC or should be referred on for further attention. Approximately 25% of pregnant women at the end of their first visit will not qualify for BANC and need further special care. This percentage is increased in very poor areas. During pregnancy, that percentage will increase by about a further 20%. After the first visit, the subsequent BANC visits follow the same format, and are recorded on the patient's antenatal card and on the checklist in the patient's clinic file. The visits follow the new WHO recommended schedule of visits.[15] Checklists have been shown to improve the quality of care of pregnant women by ensuring that essential procedures are not forgotten.

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The flow charts in the BANC package are a tool for clinical decision-making with respect to different risk factors and conditions that may present during pregnancy. Each flow chart is presented in a framework using different colours to indicate the severity of a condition. For example, red for emergencies, yellow for less urgent conditions that nevertheless need attention, and green for normal care. The framework is based on a syndromic approach whereby the primary health care nurse identifies a limited number of key clinical signs and symptoms, enabling her/him to classify the condition according to severity and provide appropriate treatment.

Early evidence from pilot sites indicates that where the BANC package is implemented:
° The gestational age at first visit declined significantly from a mean of 26.9 at baseline to 23.0 at six months after implementation.
° A checklist to screen pregnant women for risk factors was implemented successfully; it assists in implementation of the new WHO schedule of visits. Nurses interviewed reported that they like the checklist, that they see patients less often, but know them better.
° Clinic specific protocols, with referral criteria, were developed to assist and guide the primary health care nurses in management of women with high risk conditions
° The new schedule of visits leads to a reduction in workload at primary health care level but increases the referral rate to secondary level hospitals as the women with pregnancy risk factors are better identified and referred.

For successful implementation of BANC, the support of the Department of Health and institutional managers is essential, as implementation will involve major changes in the way antenatal care is provided. The nursing colleges and medical schools will also need to incorporate the programme into their curricula.

Conclusion

The approach to antenatal care in South Africa needs to be drastically changed in order for antenatal care to be more effective in saving babies. For example, attitudes need to change to ensure that antenatal care starts at the time the patient first presents to a health care practitioner to confirm the pregnancy. The number of routine visits for low-risk patients should conform to the WHO schedule of visits, so that emphasis is put on quality of care rather than quantity of visits. The HIV pandemic demands the incorporation of comprehensive PMTCT measures into routine ANC, including HAART therapy for AIDS patients. Implementation aids such as

BANC can facilitate the provision of effective, evidence-based antenatal care. Avoidable factors from perinatal and childhood death audit must be used to highlight deficiencies in antenatal care provision. This chapter has not attempted to provide a comprehensive guide to the implementation of effective antenatal care, but has sought to establish some evidence-based principles, so that recommendations can be made for antenatal care. These recommendations are presented below. As with all recommendations in this report, the recommendations for antenatal care are structured in such a way as to facilitate implementation. If these recommendations are implemented, many babies will surely be saved.

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17. Implementing a basic antenatal care quality improvement programme using a training of trainers methodology in primary health care clinics in South Africa. Information on the package is available from MRC Maternal and infant Health Care Strategies Research Unit (matinfru@up.ac.za)

Recommendations for antenatal care

Information

The most common category of perinatal death in all geographical areas is unexplained stillbirth. Compared to other developed and less developed countries, South Africa has a higher stillbirth to neonatal death ratio. Of these unexplained stillbirths, 87.4% were macerated. Many of these deaths are likely to be due to unrecognized IUGR, postmaturity and perinatal infections including syphilis and amniotic fluid infections. Most of these conditions are preventable if good antenatal care is provided.

Deaths resulting from hypertension and abruptio placentae with hypertension together make up the fourth largest category of perinatal death. Common avoidable factors related to these deaths include failure to act on antenatal hypertension and failure to refer appropriately. Therefore many of the deaths could be prevented with good antenatal care.

Better antenatal care would also prevent some perinatal deaths due to maternal diabetes and traumatic breech delivery.

Data from ChIP has shown us that the most important factor associated with under-5 childhood deaths in South Africa is paediatric HIV-disease. Good antenatal care incorporating effective PMTCT programmes has great potential for reducing childhood mortality.

Recommendation

Ensure that a standardized evidence-based model for antenatal care is used at all centres providing antenatal care

Targets
1. There should be at least one functioning BANC site in every District by the end of 2008. Indicator: Provincial MCWH reports on BANC implementation within each Province.
2. At least 90% of women delivering at health facilities should have HIV test results documented by the time of delivery. Target date: end of 2008. Indicator: PPIP data from PPIP sites, DHIS data.

Implementation strategy

Policy
Antenatal care (ANC) model should comprise:

- First ANC visit at the time of confirmation of pregnancy (irrespective of site where pregnancy confirmed – e.g. private GP or public health facility)
- Standardised patient-held ANC record, which should be made available to all potential antenatal care providers (private or public)
- Education for women on pregnancy danger signs, HIV, breastfeeding, and family planning
- On-site testing at first visit for Rh, syphilis, Hb, HIV, protein / glucose in urine
- WHO schedule of visits
- Checklist for risk classification and flow-chart for referral / management
- Integration of PMTCT into ANC including voluntary HIV testing on a provider-initiated (opt-out) basis, CD4 counts on diagnosis of HIV, and availability of HAART during pregnancy for all who meet the criteria for HAART

Note: Public-private partnerships for ANC should be encouraged in situations where this will improve quality or continuity of care (e.g. allowing private GPs access to free ANC screening tests at a public facilities for their pregnant patients).

Responsibility:
National and Provincial DOH

Administration
- Antenatal care must be implemented according to the policy, with unit-specific protocols
- BANC, a quality improvement package for basic ANC, should be promoted as an implementation aid for the primary care level
- Adequate numbers of appropriately trained staff must be allocated to antenatal clinics to allow full implementation of the policy (suggested minimum for ANC at primary health care level: 2 midwives/100 new bookings/month)[1]
- Appropriate equipment must be available at all antenatal clinics – see appendix

Responsibility:
District managers, Institutional managers at clinics and hospitals
Human Resource Departments should provide staffing norms for ANC

Clinical practice
- All PHC nurses, midwives and doctors responsible for antenatal care must provide standardised evidence-based antenatal care, according to the policy.
- There must be a system of quality assurance of antenatal care at all antenatal sites.

Responsibility:
Unit managers (nursing and medical) supervising the antenatal clinics

Education
- A standardised evidence-based ANC model must be incorporated into midwifery training and medical training
- For those already in service, workshops, and in-service education must be used to introduce the evidence-based ANC model

Responsibility:
Universities, nursing colleges, provincial MCWH directors
HPCSA, SA Nursing Council.

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Appendix
Essential equipment for the antenatal clinic

Obstetric calendar wheel
Tape measure
Adult scale (for weight and height)
Blood pressure measuring equipment with normal adult and large adult cuff
sizes
Pinard stethoscope
Doptone (hand-held electronic fetal heart detector)
Clinical stethoscope
Cusco speculums with adequate light source
Equipment for taking Pap smears
Equipment / kits for on-site   -pregnancy tests
                                        -syphilis tests
                                        -Rhesus blood group test
                                        -HIV tests
                                        -haemoglobin estimation
                                        -glucose estimation (glucometer)
                                        -urinalysis (urine dipsticks)
Resuscitation trolley
Oxygen supply
Equipment for setting up intravenous lines
Foley catheters
Eclampsia box
Emergency delivery pack
Telephone or other effective means of communicating with referral centre

In addition to the above, antenatal clinics for high-risk patients should have
easy access to:

Ultrasound machine with Doppler facility
CTG machine

4. Intrapartum care challenges

PPIP information

Saving Babies 3 (October 1999 to September 2003) reported that 18% of all perinatal deaths ≥1000 g were caused by intrapartum asphyxia and birth trauma. The incidence was highest in rural areas, somewhat lower in the city and town category, and lowest in metropolitan facilities.

The pattern of the latest report is alarmingly similar, with intrapartum asphyxia and birth trauma accounting for 20.4% of perinatal deaths ≥1000 g. Sub-analysis of fresh stillbirths gives even greater cause for concern. Almost all women who gave birth to fresh stillbirths, identified as being caused by intrapartum asphyxia and trauma, were admitted with live babies and probably failed by the health system. Similarly, examination of causes of neonatal deaths shows a significant contribution by intrapartum asphyxia and birth trauma (Figure 1). This is especially pronounced for neonatal deaths ≥2500 g, with almost two-thirds being associated with intrapartum asphyxia and trauma (Figure 2).

Figure 1. Primary causes of Neonatal Deaths (1000g+)
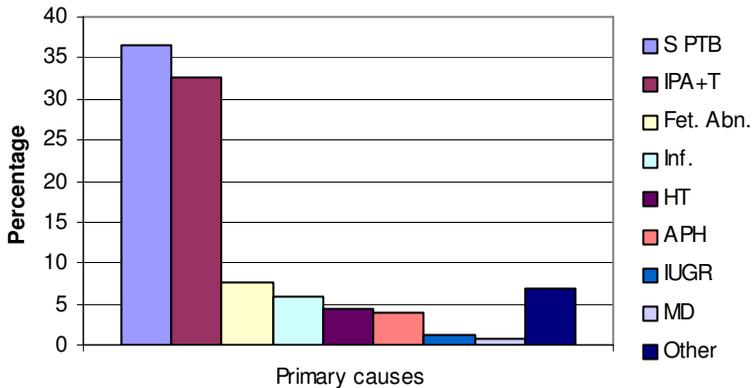
Figure 2. Primary causes neonatal deaths 2500g+
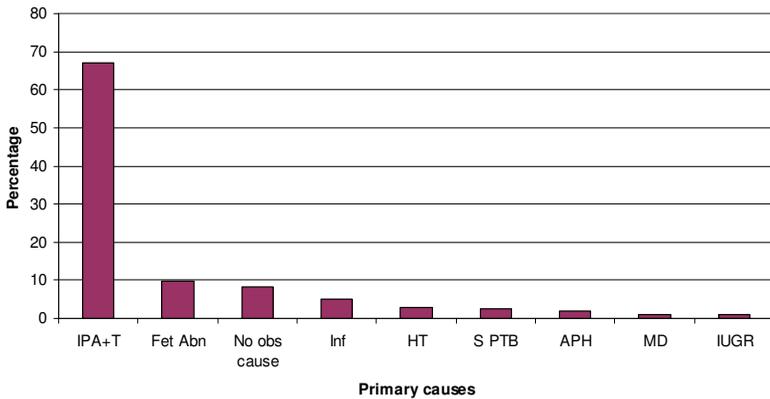
To discover why so many deaths are caused by intrapartum asphyxia and birth trauma at PPIP sites, it is necessary to examine the avoidable factors reported (Table 1). Examination of overall substandard care in the intrapartum period reveals a dismal picture of mismanagement, demonstrating a lack of basic skills or an unwillingness to follow management protocols.

The picture is confirmed when all substandard care, missed opportunities and avoidable factor patterns are examined separately in the intrapartum asphyxia and trauma categories (Table 2). The most frequent avoidable factors are health worker related. Failure to detect distress, not monitoring the progress of labour, and delays in doctor availability, transport and referral all suggest poor performance by the institutions concerned.

Table 1. Intrapartum care avoidable factors (all deaths)

Intrapartum care	N	% Deaths
Fetal distress not detected intrapartum; fetus monitored	235	1.5
Fetal distress not detected intrapartum; fetus not monitored	157	1
Management of 2nd stage: prolonged with no intervention	114	0.7
Management of 2nd stage: inappropriate use of vacuum	23	0.2
Management of 2nd stage: inappropriate use of forceps	4	0
Medical personnel underestimated fetal size	72	0.5
Medical personnel overestimated fetal size	50	0.3
Poor progress in labour, but partogram not used	50	0.3
Poor progress in labour – partogram interpreted incorrectly	49	0.3
Poor progress in labour, but partogram not used correctly	48	0.3
Breech presentation not diagnosed until late in labour	42	0.3
Multiple pregnancy not diagnosed intrapartum	33	0.2
Incorrect management of cord prolapse	9	0.1

Table 2. Intrapartum asphyxia and birth trauma probable avoidable factors

Probable avoidable factors		
Description	**n**	**% total**
Intrapartum asphyxia		
Fetal distress not detected intrapartum; fetus monitored	165	8
Fetal distress not detected intrapartum; fetus not monitored	111	5.4
Delay in seeking medical attention during labour	106	5.1
Management of 2nd stage: prolonged with no intervention	102	4.9
Delay in medical personnel calling for expert assistance	52	2.5
Poor progress in labour - partogram interpreted incorrectly	44	2.1
Poor progress in labour, but partogram not used	41	2
Poor progress in labour, but partogram not used correctly	41	2
Delay in doctor responding to call	36	1.7
Insufficient nurses on duty to manage the patient adequately	35	1.7
Lack of transport - Institution to institution	31	1.5
Delay in referring patient for secondary/tertiary treatment	28	1.4
Medical personnel underestimated fetal size	27	1.3
Personnel not sufficiently trained to manage the patient	27	1.3
Neonatal resuscitation inadequate	26	1.3
Inappropriate response to poor fetal movements	25	1.2
Never initiated antenatal care	25	1.2
Inadequate facilities/equipment in neonatal unit/nursery	24	1.2
Lack of transport - Home to institution	22	1.1
Insufficient doctors available to manage the patient	21	1
Trauma		
Delay in seeking medical attention during labour	25	9.2
Breech presentation not diagnosed until late in labour	18	6.6
Personnel not sufficiently trained to manage the patient	13	4.8
Medical personnel underestimated fetal size	12	4.4
Delay in medical personnel calling for expert assistance	9	3.3
Other	8	2.9
Lack of transport - Home to institution	7	2.6
Management of 2nd stage: inappropriate use of vacuum	6	2.2
Never initiated antenatal care	6	2.2
Booked late in pregnancy	5	1.8
Insufficient doctors available to manage the patient	5	1.8

Recommendations

The care of women in labour must be improved, and appropriate standards for management of labour must be set and maintained

Implementation strategy

Policy

- **Guidelines**

Ensure development of level-specific institutional protocols by medical and nursing management, within national guidelines for intrapartum care. National intrapartum care guidelines should be available electronically, and easily accessible to provincial and local managers. Provincial committees may assist in adapting the intrapartum care guidelines for use as institutional protocols.

- **Staffing and equipment norms, and referral**

Staffing and equipment norms, referral routes and criteria, and transport needs are matters of policy. This includes equitable and appropriate provision of essential staff establishments, facilities and equipment, and provision of dedicated maternity ambulances wherever possible.

Responsibility:
National and Provincial Departments of Health

Administration

- **Protocols**

Level-specific protocols based on national intrapartum care guidelines must be available at all institutions that provide intrapartum care. All midwives and doctors should be provided with copies of protocols, and protocols for selected emergencies should be posted in clearly visible places in maternity units.

- **Staffing**

It has been recommended that at least 16 full-time midwives, divided into appropriate shifts, be employed for every 100 deliveries.[1] This number should be increased at higher levels of care. In the labour ward, there should be at least one midwife directly caring for every two women in labour. Such midwives should be experienced and interested in management of labour. Referral institutions (i.e. level 1 to level 3 hospitals) must have suitably qualified doctors immediately available on a 24 hour basis. Caesarean section is an essential surgical skill for such doctors. The

use of volunteer labour companions (doulas) should be encouraged, with a nominal stipend payment to acknowledge their contribution. In areas with critical shortages of doctors, mid-level health workers may need to be trained and permitted to perform caesarean sections.

- **Facility and equipment norms**

Labour ward facilities must be provided in accordance with national guidelines for intrapartum care. Referral institutions are expected to have caesarean section facilities available on a 24 hour basis. Essential labour ward equipment must include hand held Doppler fetal monitoring instruments, cardiotocographs in referral institutions, infusion pumps in institutions where oxytocin augmentation is used, and vacuum delivery equipment. Hand-pumping vacuum equipment ('Vacca cup') and wind-up Doppler monitors are especially useful. There should be adherence to protocols regarding use of cardiotocographs. All equipment must be regularly checked and maintained. A comprehensive equipment list is provided in the appendix below.

- **Transport and referral**

Institutional protocols must clearly define referral criteria, referral routes, modes of transport and escorts. Decisions on clinical priority are best made by persons who have understanding of the clinical problems or emergencies, and not by transport officials.

Responsibility:
District and institutional managers

Clinical practice

- **Emergency care**

As mentioned above, there must be level-specific protocols for the management of emergency obstetric problems that may result in birth trauma or asphyxia. These include prolongation of the first and second stages of labour, fetal distress and intrauterine resuscitation, breech delivery, cord prolapse and shoulder dystocia. Partogram use is essential in the management of all women in labour.

- **Training and outreach**

All doctors and midwives involved in care of women in labour must receive appropriate orientation and continuing education (face-to-face interactive training) in partogram use, intrapartum fetal assessment, and practical obstetrics. Video presentations on caesarean section, vacuum delivery, external cephalic version and vaginal breech delivery are freely available on the WHO's electronic Reproductive Health Library compact disc.[2]

Sessional doctors and midwives must be included in such training programmes. Outreach visits to level 1 Hospitals and Community Clinics are particularly helpful. Ambulance workers should be competent in the management of normal deliveries and common emergencies. Where referring clinics and referral hospitals are remote from each other, telephonic consultation may help in managing difficult clinical problems. Telephone numbers, including cell phone numbers, of available consultants should be provided to referral clinics for easy access.

- **Perinatal audit**

Labour ward audit is a compulsory activity that is invaluable in identifying problems that lead to asphyxia and birth trauma. Perinatal review ('morbidity and mortality') meetings, with the emphasis on learning rather than punishing, must be held at least monthly in all institutions that conduct deliveries. At these meetings, regular statistics are presented, and specific cases are discussed. The PPIP methodology and software is recommended for collecting and presenting statistics. Partogram use should be audited regularly and the findings presented at such meetings. Minutes of these meetings must be kept and decisions taken must be implemented.

Responsibility:
Unit managers, community obstetricians or midwives

Education

All medical schools and nursing colleges should be aware of the challenges regarding intrapartum care. Curricula must include sufficient material on the issues discussed above, to equip midwives and doctors with essential skills and knowledge to manage labour safely.

Responsibility:
Principals of nursing colleges and deans of medical schools, the Health Professions Council and the Nursing Council.

References

1. Greenfield DH. Midwifery Staffing Needs in a Maternity Ward. Proceedings of the 25th Conference on Priorities in Perinatal Care in South Africa, Drakensberg, KwaZulu-Natal, March 2006.

2. World Health Organisation Department of Reproductive Health and Research. The Reproductive Health Library no. 9. Geneva: Update Software, 2006.

Appendix: Essential medical equipment for intrapartum care

	Community Health Centre	Level 1 Hospital	Level 2 and 3 Hospital
Delivery bed with wedge	×	×	×
Trolley-bed with cot-sides		×	×
Sphygmomanometer	×	×	×
Stethoscope	×	×	×
Clinical thermometer	×	×	×
Haemoglobinometer	×	×	×
Hand-held Doppler instrument	×	×	×
Cardiotocograph		×	×
Basic ultrasound scanner		×	×
Intravenous infusion pump		×	×
Vacuum extractor and suction		×	×
Obstetric forceps		×	×
Delivery pack	×	×	×
Episiotomy repair pack	×	×	×
Cervical cerclage removal pack		×	×
Cusco vaginal speculum	×	×	×
Symphysiotomy knife (fixed-blade)		×	×
Electrocardiograph			×
Pulse oximeter			×
Multifunction maternal monitor			×
Fully equipped resuscitation trolley	×	×	×
Defibrillator	×	×	×

Notes:
1. The exact numbers of each item should depend on the level of care, structure of the labour ward, work-load and case-mix of patients.
2. The list excludes anaesthetic and theatre equipment, e.g. for caesarean section, hysterectomy, advanced management of postpartum haemorrhage, and cervical cerclage insertion.
3. In addition, there are consumables specific to intrapartum care, such as 30 mL Foley catheter, disposable vacuum extractor, cord clamp and amniotomy hook

5. Neonatal Care Challenges

This report will concentrate on infants with a birth weight ≥1000 g or more, as most of these infants should have a good chance of survival, given good basic care. The problems in infants with a birth weight <1000 g are mainly those of immaturity.

Delivery statistics

**Table 1: Births, neonatal deaths and neonatal mortality rates
(Birth weight ≥1000 g)**

	SA	Metro	C&T	Rural
All births	568322	246433	176884	145005
SB	10558	4173	3568	2817
Live births	557764	242260	173316	142188
ENND	4756	1653	1604	1499
LNND	556	280	167	109
ENNDR	8.5	6.8	9.3	10.5
NNDR	9.5	8.0	10.2	11.3

Information
Figures 1-3 illustrate the rates and causes of neonatal deaths ≥1000 g.

Figure 1. Comparison of early neonatal death rate in weight categories per area

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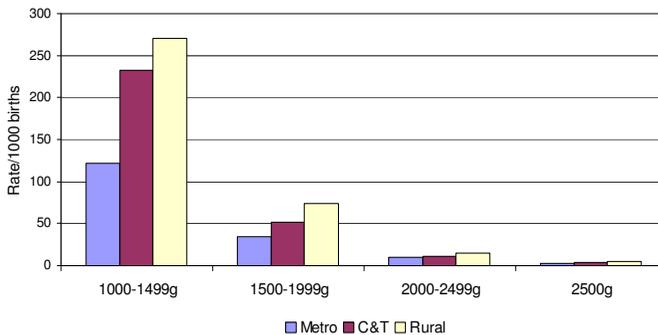
Figure 2. Primary obstetric cause of neonatal deaths (1000g+)
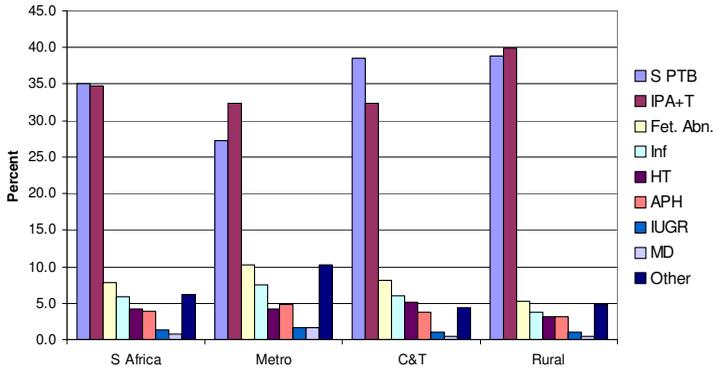
Figure 3. Final causes of neonatal deaths (1000g+)

60
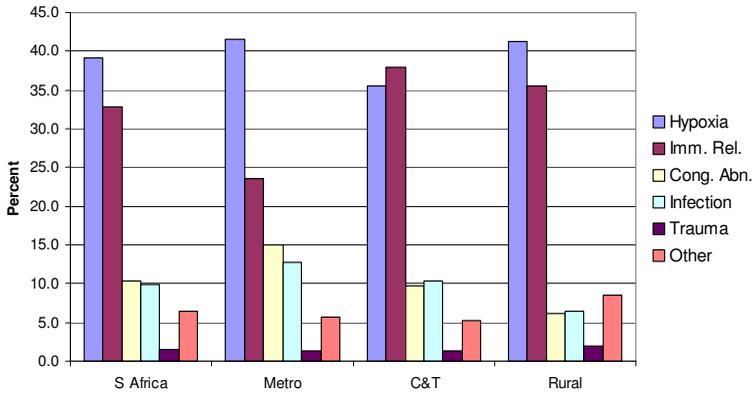
Final neonatal cause of death, birth weight 1000 – 1499 g: Immaturity related

S Africa	Metro	Cities and Towns	Rural
71.6%	54.3%	79.2%	77.8%

Final neonatal cause of death, birth weight ≥2500 g: Hypoxia

S Africa	Metro	Cities and Towns	Rural
69.2%	67.8%	68.8%	71.0%

Comment:
- About 70% of neonatal deaths in infants ≥1000 g are due either to immaturity following preterm delivery or hypoxia occurring during labour
- The neonatal mortality rates are lowest in the metropolitan areas and highest in the rural areas

Avoidable factors
Figures 4 and 5 illustrate the avoidable factors, missed opportunities and substandard care.

Figure 4. Medical personnel related avoidable factors
(Probable, 1000g+, ENND)
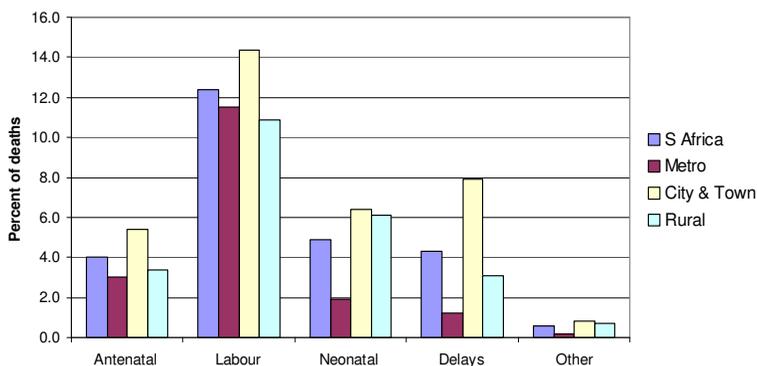
Figure 5. Adminstrative related avoidable factors
(Probable, 1000g+, ENND)
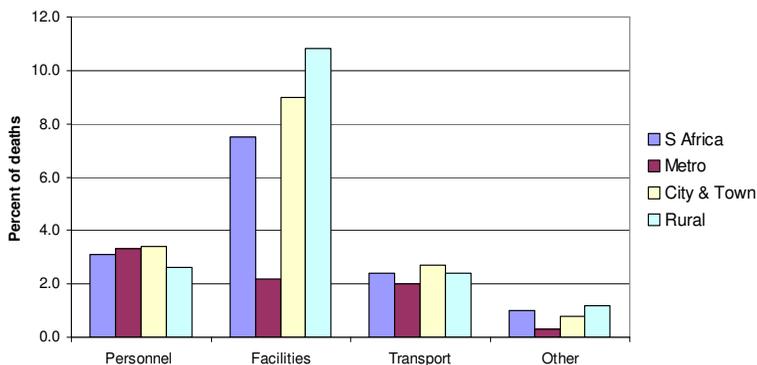
Comments:
- Figure 4 shows that the most important medical personnel related avoidable factors occur in the management of labour
- Many of the "delays" are also occurring during labour
- Delays are most frequent in the cities and towns
- Neonatal management problems are most frequent in the cities and towns, and in the rural areas. This suggests problems in knowledge and skills among obstetric and midwifery staff
- Figure 5 shows that the main administrative problem is poor neonatal facilities in the cities and towns, and in the rural areas.

The following problems have been identified.

The early neonatal mortality rate for infants of 1000 – 1499 g is relatively high, especially in the cities and towns and rural areas, where it is over 200/1000 live births. An initial suggested target rate for this group is 150/1000. The major primary obstetric cause of death in these infants is spontaneous preterm birth, and the major final neonatal cause of death is immaturity, with some infections contributing.

The early neonatal mortality rate for infants ≥2500g is unacceptably high. The fresh stillbirth rate in this birth weight category is also high. The cause

of death in these infants is related to fetal hypoxia that occurs during labour.

The recorded avoidable factors show that:
- Many of the neonatal facilities are inadequate or not properly equipped to deal with sick infants
- There are medical staff problems indicating a lack of skills and knowledge when managing newborn infants
- There are significant medical staff associated problems in the management of pregnant women, antenatally and especially during labour.

The mortality rates in both the very low birth weight infants, and also in those with a birth weight ≥2500 g, are highest in the facilities situated in rural areas, followed by those in towns and cities.

In summary:
There is a high early neonatal mortality rate in the 1000-1499 g birth weight group. This is highest in cities and towns, and in rural areas. This is also the case for infants <1000 g. This will be addressed by Recommendation 5a.

There is a high early neonatal death rate for infants ≥2500 g. This is also seen in the fresh stillbirth rate in the same birth weight group. The main cause of death in these infants is related to intrapartum hypoxia. This will be addressed by Recommendation 5b.

Recommendation 5a

Deaths in very low birth weight infants must be reduced.

Action
Health care workers must be able to manage low birth weight infants, particularly the very small infants <1500 g.

Implementation strategy

Policy:

Knowledge and skills:
- All health workers who work with newborn infants must be competent in identifying and managing problems in very low birth weight infants
- Management protocols for the main problems occurring in very low birth weight infants must be developed, based on the National Guidelines, and be available to all staff working with newborns.

Newborn Care Facilities:
All facilities where newborn infants are cared for must have:
- Adequate nursery space to care for sick infants. This must be situated close to labour ward and theatre.
- Adequate space for Kangaroo Mother Care (KMC)
- Adequate accommodation within the unit for lodger mothers

Appropriate equipment must be available (see attachment)

Staffing:
- Staffing norms for newborn care must be established (suggested norms attached)
- Staff working with newborns must not be rotated

Practice:
- Newborn care must be provided within the framework of the Baby Friendly Hospital Initiative
- Particularly important are the practices of KMC and breastfeeding
- HIV infected mothers should be offered antiretroviral drugs while they are breastfeeding

The emphasis on improving newborn care must be in rural hospitals and clinics, and in the towns and cities.

Each province must have a plan for newborn care

Responsibility:
Department of Health, national and provincial MCWH directorates
District MCWH managers
Hospital and newborn care unit managers (medical and nursing)
Hospital services (revitalisation planning, and new facilities)
Nutrition managers

Administration

Clinical and nursing managers in hospitals and clinics must ensure that the above policies, protocols and practices are in place and implemented. This must be part of their key performance areas.

Monitoring:
- Audit of records
- Perinatal audit meetings (morbidity and mortality). Minutes of the meetings must be kept and decisions taken must be implemented
- It is recommended that PPIP should be used to monitor perinatal mortality
- Health workers who under-perform must be appropriately and sensitively counselled
- Equipment must be regularly checked, and replaced or repaired if not functioning. New equipment must be purchased as needed.
- Clear referral routes for patients must be established and monitored

Responsibility
Clinical and nursing managers of hospitals and clinics
Unit managers of maternity and newborn care units.
District MCWH co-ordinators
District managers

Clinical practice

Staff must be able to:
- Resuscitate very low birth weight infants
- Identify problems in, and manage, the initial and long term care of these infants. This must include keeping the infant warm, maintaining a normal blood sugar level, giving oxygen appropriately, monitoring for and treatment of neonatal jaundice, and preventing and treating infections
- Do and record the appropriate observations

- Know when, where and how to refer newborns appropriately to higher levels of care.
- Institute and maintain KMC

Responsibility:
Unit managers (medical and nursing)
Regional paediatricians and midwives

Education

1. Undergraduate medical and nursing students must be trained to provide essential clinical care for very low birth weight infants.

Responsibility:
Heads of medical schools and nursing colleges, specifically the heads of paediatrics / neonatology
Health Professions Council of South Africa / South African Nursing Council

2. Medical and nursing staff, when starting work with newborns, must be:
- Orientated to the needs of very low birth weight infants
- Given training on the care of these infants.
- Supplied with management guidelines / protocols for newborn care

The Newborn Care Guidelines must form the basis of internship training in newborn care.

Responsibility:
Clinical and nursing managers of maternity / neonatal units
Regional paediatricians / midwives
Human resources and development heads in province, district and facility

3. All clinical staff working with very low birth weight infants should study either the Newborn Care Manual, or the Primary Newborn Care Manual, of the Perinatal Education Programme (PEP).

Responsibility:
Clinical and nursing managers of maternity / neonatal units
Human resources managers in districts and facilities

4. Outreach education and training of newborn care to the staff at level 1 facilities in that district / region must be the responsibility of the regional paediatrician / midwife. Training must be seen as a primary responsibility at outreach visits. his must be one of the key performance areas for regional paediatricians / midwives. Outreach education and support to regional

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centres must be provided by neonatologists and neonatally trained nurses from the tertiary centres.

Responsibility:
Regional paediatricians / midwives
Clinical managers at level 1 health facilities
Neonatologists / neonatal nurses in academic and tertiary centres

Recommendation 5a.

The incidence of perinatal hypoxia must be reduced

Action
The care of women in labour, and of asphyxiated infants must be improved

Intrapartum care

Intrapartum care recommendations have been made above under Intrapartum Care Challenges.

Care of asphyxiated infants

Implementation strategy

Policy
• Infants with birth asphyxia must be properly resuscitated
• Infants who have required intensive resuscitation, or who have low Apgar scores, must be appropriately managed
• Newborn resuscitation areas in theatres and labour wards must be fully equipped and stocked with the necessary equipment and drugs at all times
• Management protocol for newborn resuscitation must be available and used
• A management protocol for the post-resuscitation care of an asphyxiated infant must be available

Responsibility:
Clinical and nursing managers of hospitals and clinics
Regional paediatricians and midwives

Staffing
Staffing norms must be established, and maternity units, especially labour wards, must be adequately staffed with midwives, doctors and auxiliary staff.

Responsibility:
Heads of national MCWH and human resources directorates
Provincial health service and MCWH managers
Hospital / clinic management

Administration

These policies must be implemented and practice monitored. Appropriate action must be taken when substandard care is being provided.

1. Monitoring must be by means of:
- Record audit
- Perinatal audit meetings (morbidity and mortality). Minutes of the meetings must be kept and decisions taken must be implemented
- Regular purchasing, checking, and replacement or repair of neonatal resuscitation equipment

Responsibility:
Unit managers of maternity units (medical and nursing)
Regional Midwife / Paediatrician

2. There must be simple and appropriate audit tools available for auditing the records. National and provincial training facilities within the country and provinces must train enough health workers in order to ensure that staffing needs can be met.

Responsibility:
Provincial and national MCWH Managers
Provincial and national human resources and development managers

Clinical practice

- All doctors and nurses working in labour wards and doing deliveries must be able to resuscitate asphyxiated infants
- Protocols for neonatal resuscitation must be available in all resuscitation areas and newborn nurseries

Responsibility:
Regional paediatricians and midwives
Medical and nursing unit managers at delivery facilities.

Education

1. Medical and midwifery students, on completion of their studies, must be able to resuscitate newborn infants.

Responsibility:
Heads of paediatrics and nursing at medical schools
Heads of nursing colleges
National and provincial heads of human resources and development

2. In service education of medical and nursing staff in the maternity and neonatal units must cover newborn resuscitation. All medical and nursing staff allocated to the maternity ward or neonatal unit must undergo training in neonatal resuscitation as part of their orientation.

Responsibility:
Medical and nursing managers of facilities and maternity units.
Regional paediatricians / midwives

3. Outreach education and training of newborn care to staff at level 1 facilities in districts or regions must be the responsibility of the regional midwife / paediatrician. Training must be seen as a primary responsibility at outreach visits. Outreach must be one the key performance areas of regional paediatricians and midwives.

Responsibility:
Regional midwives / paediatricians
Clinical managers at level 1 health facilities

Essential equipment list for newborn care

Level 1 facilities

1.   Resuscitation

- *General*
- ▪ Overhead radiant warmer with surface for the infant (resuscitaire)
- ▪ Clock
    - ▪ Clean towels or receiving blankets (warm)
    - ▪ Stethoscope
    - ▪ Gloves
    - ▪ Scissors
    - ▪ Syringes: 1, 2.5, 5, 10 and 20 mL
    - ▪ Needles: 18, 21, 25 G
    - ▪ IV cannulae: 24 G
    - ▪ Feeding tubes: 5 and 8 F
    - ▪ Alcohol swabs
    - ▪ Scalpel blades
    - ▪ Sterile gauze / alcohol (for umbilical catheterization)
    - ▪ Adhesive tape
    - ▪ Intravenous solutions: Neonatalyte   200 mL
    - ▪ Intravenous giving sets and buretrol (100 mL)
    - ▪ Intravenous rate controller or "dial-a-flow"

- *Suction*
    - ▪ Suction apparatus: either wall unit or mobile / portable unit with pressure manometer and tubing
    - ▪ Suction catheters: gauge 10 F or larger

- *Bag and mask*
    - ▪ Self inflating resuscitation bag (Ambu / Laerdal): Neonatal size, with oxygen reservoir
    - ▪ "Bennett" type round face masks: 3 different sizes for term / preterm infants
    - ▪ Oxygen supply with flow meter and tubing

- *Intubation*
    - ▪ Laryngoscope with straight neonatal blades, sizes 00 and 0
    - ▪ Extra bulbs and batteries for laryngoscope
    - ▪ Magill's forceps
    - ▪ Endotracheal tubes: 2.5 to 4 mm sizes
    - ▪ Introducer (stylet)

- *Drugs*
  - Adult naloxone (Narcan): (0.4 mg/mL)
  - Adrenaline (1:1000):   1 mL ampoules
  - Normal (0.9%) saline: 10 mL ampoules
  - Sterile water for injection: 5 or 10mL ampoules
  - NO OTHER DRUGS ARE NEEDED

> **All this equipment is required at every resuscitation area in labour ward, theatre and the nursery.**

2.   Nursery / baby care area

- *Hand washing*
  - Hand wash basin, preferable with elbow operated taps
  - Antiseptic soap / solution (e.g. chlorhexidine)
  - Alcohol hand lotion (e.g. D-germ) for each infant
  - Paper hand towels

- *Place for infant*
  - Bassinettes
  - Incubators (closed)
  - Linen for these
  - Mattresses for incubators and bassinettes

- *Oxygen*
  - Source of oxygen (wall point or cylinder)
  - Source of medical air in all hospitals delivering more than 100 babies per month
  - Head boxes for oxygen administration
  - Nasal cannulae
  - Nasal prongs
  - Venturis: range   23 – 80%
  - Tubing for oxygen administration
  - Pulse oximeter with neonatal probe
  - Apnoea monitor
  - CPAP apparatus at all hospitals delivering more than 100 babies per month.

- *Intravenous fluids, feeds and fluid monitoring*
  - Intravenous giving sets (60 drops / mL)
  - Intravenous fluids: Neonatalyte (200 mL)
  - Dextrose 5% (200 mL)

- Dextrose 50% ampoules
- Intravenous cannulae   24 G
- Buretrol (100 mL)
- IV infusion rate controllers. Minimum requirement is "dial-a-flow"
- Syringes: 1, 2.5, 5, 10, and 20 mL
- Needles for injection: 18, 21, 25 G
- Alcohol swabs
- Strapping
- Feeding tubes: 5 and 6 F
- Urine bags

- *Phototherapy and Capillary Blood Sampling*
  - Phototherapy lights
  - Blood lancets
  - Heparinised capillary tubes
  - Reagent strips for measuring blood glucose
  - Glucometer
  - Microtainers for blood sampling

- *Suction*
  - Suction apparatus: either wall unit or mobile / portable unit with pressure manometer and tubing
  - Suction catheters: 6 to10 F

- *Temperature monitoring*
  - Thermometers (low reading)

- *Transport incubator*

- *Resuscitation Area*
- Resuscitaire
- Full equipment, as in labour ward
- This equipment is also required in theatre, if caesarean sections are being done

- *Records*
  - Infant record charts / observation charts
  - KMC discharge score charts
  - HIE score charts
  - Scoring charts for gestational age
  - Road to Health charts

- *Measuring*
  - Tape measure
  - Infant scale – a digital scale (to measure 10 g intervals) is ideal

Level 2 facilities

All of the equipment for level 1 must be in place

In addition:
- *Place for infants*
  - Open incubators (servo controlled)

- *Oxygen*
  - CPAP is essential. Source of medical air is needed.
  - Oxygen / air blenders
  - Ventilator capacity (short term)

- *IV fluids*
  - IV flow regulators / infusion pumps
  - Syringe drivers

Recommended bed numbers for newborn care

These are based on the National recommendations as quoted in: Robertson BA (ed): *Norms and Standards for Newborn Care in Limpopo Province*, LINC, February 2004.

They conform to the needs calculated for the Western Cape Province

Level 1: 3 – 4 beds per 1000 deliveries

Level 2: 2 – 3 beds per 1000 deliveries

Level 3: 0.5 – 1 bed per 1000 deliveries

Essential drug list for newborn care

Ceftriaxone	50 mg / kg / day	Single dose daily IVI (or IMI)	
Cloxacillin	50 mg / kg / day	given bd	IVI
Flucloxacillin	10 – 50 mg / kg / day	3 – 4 × / day	Orally
Gentamicin	5 mg / kg / day	single dose daily	IVI
Iron (ferrous lactate)	0.6 mL	daily	orally
Multivitamin drops	0.6 mL	daily	orally
Naloxone	0.1 mg / kg	single dose	IVI or IMI
Nystatin drops	1 mL	6 hourly	orally
Penicillin G	50 000 u / kg / day	12 hourly	IVI
Procaine penicillin	50 000 u / kg / day	daily	IMI only
Benzathine penicillin	50 000 u / kg	single dose	IMI only
Phenobarbitone	10 – 20 mg / kg	single dose	IMI or IVI
Theophyllin	5 mg	stat	orally
	2 mg / kg / day	12 hourly	orally
Vitamin K_1	1 mg	single dose	IMI

12 Steps to successful
Kangaroo Mother Care

Every facility providing maternity services and care for newborn infants should:

1. Have a written Kangaroo Mother Care (KMC) policy that is routinely communicated to health care staff and displayed.

2. Train healthcare staff in skills necessary to implement this policy
.

3. Inform pregnant women about the benefits and management of KMC

4. Help mothers to initiate KMC as soon as it is feasible.

5. Show mothers how to place the infant and secure him/her in the kangaroo position.

6. Give no milk feeds or fluids other than breast milk, unless indicated for a medical reason.

7. Establish breastfeeding as soon as possible. Encourage breastfeeding frequently and on demand.

8. Encourage intermittent KMC while the infant is still receiving intensive or high care.

9. When the infants are big enough, admit mothers and their infants to a dedicated area for continuous KMCare 24 hours a day. The environment should be as homely as possible (e.g. reading matter, radio, TV, kettle). Mothers should be encouraged to walk around with their infants in the KMC position – even to go outside.

10. Provide ongoing observation of the infants, and support and instruction to mothers in the KMC unit.

11. Use the evaluation chart to assess suitability for discharge.

12. Ensure adequate support at home and arrange for appropriate follow-up.

6. Quality of care and recommendations

The need for improving the quality of care is implicit in the findings of this report. One of the most important ways of improving the quality of care is by performing reviews of perinatal deaths. This section deals with the recommendation, an implementation strategy and gives principles and guidelines for performing perinatal death reviews.

Recommendation

All sites involved in the care of pregnant women must be involved in perinatal review

Implementation strategy

Policy

- All sites conducting births should submit the minimum perinatal data set to their provincial Health Information System
- All sites conducting births should be involved in maternal, perinatal and child mortality and morbidity reviews

Responsibility
National and Provincial Departments of Health

Administration

- The minimum perinatal data set must be submitted to the provincial Health Information System (HIS)
- Maternal, perinatal and child morbidity and mortality review meetings must be held at all institutions conducting births. Minutes must be kept of the decisions made at such meetings
- Holding such meetings must be part of the relevant administrators' KPAs
- The relevant administrators must attend at least half of the morbidity and mortality review meetings
- Time must be allocated to such meetings
- At least two meetings must be held per year with the whole district and relevant information must be presented
- Data from these meetings should be used to decide on priorities for resource allocation within the district and institution
- Appropriate action must be taken when substandard care is being provided

- There must be feedback to the review meeting on the success or otherwise of the implementation of decisions taken at review meetings
- Information from the morbidity and mortality meetings must be linked with other quality assurance activities with the institution, such as adverse events committees. Key areas must be monitored and reported on.

Responsibility
District managers and institutional CEOs

Clinical Practice

- All clinicians involved (midwives, nurses and doctors, including sessional staff) should attend these morbidity and mortality review meetings. If it is not possible for sessional staff to be present at the meetings, they should receive feedback from the meetings.
- A standardised format should be used to report at the review meetings based on the minimal data set. The Maternal Death Notification Form, Maternal Death Assessors form, the Perinatal Problem Identification Programme and the Child Health-Care Problem Identification Programme are tools that can facilitate such meetings. The Perinatal Education Programme Manual 5 – Saving Mothers and Babies and the WHO publication "Beyond the numbers" are useful training manuals to implement and manage the meetings.
- A standardised "minute tool" related to decisions made at the meetings should be developed and used
- Staff should be informed of a debriefing service available to them such as the Employee Well-being Programme provided by the Department of Health.
- A community obstetrician, paediatrician, or midwife would be the ideal person to manage these processes, and these aspects should be written into their job descriptions

Responsibility
Unit managers and nursing managers, clinical manager

Education

- Nursing colleges and medical schools must incorporate audit, data interpretation, and morbidity and mortality review meetings into the relevant curricula
- Tools for quality improvement must be taught by the relevant educational bodies

Deans of nursing colleges and medical schools

Institutional morbidity and mortality review meetings

A facility-based perinatal deaths review is a "*qualitative, in-depth investigation of the causes of, and circumstances surrounding, perinatal deaths which occur in health care facilities*".

A facility-based perinatal deaths review is a form of audit. Clinical audits are used throughout the world to improve quality of care in different fields of medicine. Audit can be defined as

Audit is a potent method of identifying problems in the healthcare service and enables changes to occur in the health service.

 "*Audit is seeing whether the right thing is being done*".

Once performed the information obtained from the audit must be fed back to the health workers involved. This linking of **review** to **feedback** is very important if any improvement is to be achieved. Often the facility-based perinatal death reviews get stuck on describing the problem and are not able to translate the findings into strategies to change the system or to implement the strategies. To facilitate these last two steps health workers involved should participate actively in this feedback. Review and feedback will not be effective if barriers to changing practice are not analysed and addressed. This is illustrated by the action (implementation) cycle.

The cycle consists of the following main steps:
• Structure and process
• Identification (defining, identifying, finding the case)
• Data collection (quantitative and qualitative)
• Analysis (analyse the problem and its root causes)
• Action (develop and implement a solution. Health workers providing the care must be involved in finding a solution to the problem. The action taken may be remedial – addressing the symptom, corrective - correcting the problem and the system, or preventive)
• Evaluate and monitor the change. Re-audit. Has the problem been resolved?

A database should be kept of reviews and regular reports should be written and circulated to relevant authorities along with recommendations to

improve the service. If the same database is used in a district, region, province or country it would be possible to amalgamate the data to get an overview of what is happening in the district, region, province or country.

The primary aim of facility-based perinatal death review is to improve the quality of care received by pregnant women and their babies. The audit approach is one of the most effective methods to improve the performance of health workers and can bring about changes to reduce maternal and perinatal deaths in health-care facilities.

The explanation of how perinatal death reviews improve the quality of care is based on the following assumption: *The same types of avoidable factors associated with perinatal deaths are present in the care of all pregnant women and their neonates.* Therefore, once the avoidable factors related to the deaths have been identified and publicised, remedial action can be taken with a consequent reduction in mortality. Further, because the problems are not specific to the death, but occur in general care as well, the care of all pregnant women and their infants will improve. Although not extensively researched there is evidence that the assumption is valid. Deaths are easy to identify, and there is no confusion as to the definition, hence by analysing a few, easily identifiable cases the problems in a health system can be readily diagnosed and potentially corrected. This makes the task feasible and, importantly, extra expertise does not have to be brought in to run facility-based perinatal death reviews. Hence it is a practical tool to improve the quality of care.

Improvement in quality of care is dependent on action being taken following identification of the problems by those involved in the reviews. Inherent in the review process must be a commitment to act to solve the problems. Solutions are developed by discussions and consensus with the relevant stakeholders based on the problems identified. Having a solution however, is insufficient; the solution must be *implemented* if there is to be improvement in the quality of care. The implementation of the solution is reliant on creating a plan such that there is a clear set of actions and responsibilities allocated for those involved. These plans are called recommendations.

Hence, the primary aim of perinatal death reviews namely to improve the quality of care can be divided into three critical parts:
- Identify the problem
- Develop a solution
- Implement that solution

All three aspects are necessary to improve the quality of care.

Additional aims of the review are education and maintenance of accountability. When cases are discussed the opportunity should be used to expand on the discussions to teach or revise aspects of care brought forward by the case. Implicit in the knowledge that each case where death occurred will be discussed is the awareness by the health workers that their actions will be scrutinised. This knowledge that someone is watching is probably a potent motivator for health workers to ensure they do the right thing. However, in all meetings a no name-no blame policy should be adopted. The focus is on changes in the system, not on victimising the staff. This requires that meetings must be conducted sensitively, and these meetings should be seen as educative experiences, rather than witch-hunts.

The key principles of a review are:
1. Non-threatening and confidential, that is the problem is discussed, not the staff involved. Names must be removed from all discussions. This also means that discussions are not repeated outside the group. If sensitive details are to be discussed, it is better to discuss them with the individuals concerned privately and in an environment that is considered safe by the individuals involved.
2. Inclusivity. Midwives, nurses, obstetricians, neonatologists, administrators, and healthcare workers from the referral area should all be present. This is to ensure ownership by the group involved. The support of the administration and clinical staff for the process is essential.
3. Transparency. In other words, all must have access to the results of the discussion, and understand the basis for the recommendations.
4. Educational value for all staff members.
5. The goal is action - trying to identify the most important problems that can be solved at facility and community level and by related services or programs. The meeting must discuss each perinatal death in a *systematic* way so that the problems are identified. Thus, for each death:
    a. the primary and final cause of death must be allocated
    b. the areas of sub-standard care, avoidable factors or missed opportunities must be identified and modifiable factors should be listed under clear categories such as family related, administrative related and health worker related.
6. Every perinatal review should include information on the mother – her health, pregnancy, delivery.
7. Having a time schedule to complete the steps
8. Ongoing – meetings must occur on a regular basis

An essential component of the facility-based perinatal death review is that action must be taken on the problems identified. Actions could be at the

facility, within the rest of the health care delivery system or in other sectors, e.g. education. For this is reason it is essential to have the relevant stakeholders present at the meetings or, at the very least, present when the findings of the quarterly/six-monthly or annual reviews are presented. Further, they should be kept informed by distributing the minutes of the meeting. The mechanism for achieving implementation of the recommendations is given below.

1. **Identify the problem.** There must be an analysis of the data from the review meetings and the priority problems identified. The problems identified must be founded in fact so that recommendations can be justified. The problems should be listed according to the level of care or focus area so that the solutions can be targeted at those levels. For example, if there is a problem with neonatal tetanus, the programme dealing with immunisations can be targeted. If a problem such as a lack of response to poor fetal movements by pregnant women is identified, there would need to be an action aimed at the community, educating on the importance of responding to fetal movements. If there are problems related to the referring hospital or the referral hospital these would also need to be targeted.
2. **Agree on a solution.** Solutions need to be negotiated for problems identified. It is important to have the key stakeholders present at the meetings so there can be general agreement and buy-in to the solutions.
3. **Phrase the recommendations** such that they can be classified into an action, and identify the person responsible for implementing that particular part of the recommendation. An example of classifying the types of recommendations is given below:
   a. Policy/management. For example, laboratory staff must be available 24 hours of the day or there must be direct supervision of labour ward staff at night. These are management decisions and will have to be negotiated with the trade unions, the respective workers etc., and payment will be necessary. This has budgetary implications.
   b. Administrative, e.g. specific functions of specific people within the institution.
      i. Infrastructure. Renovating an area for example for a Kangaroo Mother Care ward.
      ii. Equipment, e.g. buying more ventilators.
      iii. Staffing, e.g. ensuring staff is available is often a roster problem and the relevant people must construct the rosters so that there is sufficient cover at all times.
      iv. Drugs and supplies. The pharmacy must ensure an uninterrupted supply of critical drugs.

c. Clinical practice – protocols. Clinical staff is usually responsible for ensuring that protocols are kept up-to-date.

d. Training – skills etc. to staff. Clinical staff is usually responsible for this. As this is the easiest action and is easily incorporated into the review meetings, this has often been the only action taken as a result of the perinatal death review. Unfortunately, without the other aspects, little change will be achieved.

4. **Minute agreement**. Agreements must be minuted so that they can be referred to when there is any dispute, or be used to call people to account.

5. **Get regular progress reports**. People responsible for the changes must be available to give report backs on their progress. This is a way to hold people accountable.

6. **Evaluate** what was agreed to, and implemented and not implemented. After a time, usually for the annual report, a formal evaluation can be carried out to assess what has been accomplished and what has not. In situations where the agreed action was not achieved, the reason can be sought and further action planned.

7. **Document results in report**. Finally, the results must be published in the annual report for all to see.

If PPIP is used, the system can be up-scaled to get data for a district, region, province or country. The same process can be followed in each area, thus for example, the district can meet to identify the major problems. They can then debate and agree on a solution, make recommendations and work to implement them. This can be extended up to country level as is the case with the *Saving Babies* reports.

Perinatal Statistics from the District Health Information System: 2003-2005

L Bamford

Introduction

Data on key perinatal outcomes, such as stillbirth, perinatal mortality and low birth weight rates, are now available for every district and sub-district in South Africa through the District Health Information System (DHIS). Many health workers and health service managers however are not aware of, or do not have access to, this valuable source of information.

The DHIS which is a system for collecting, collating and analysing routine facility-based health information is implemented in all public sector health facilities in South Africa. Data are collated at district, provincial and national levels.

Systems for ensuring that information flows up the system from facility to national levels are in place. For the 2006/7 financial year the DHIS contained data on 1 097 072 births, which indicates excellent coverage. The quality of the data is variable, however the best way to address concerns regarding data quality is for health workers and managers to start interrogating and using the data.

Other aspects of the system such as provision of feedback to lower levels of the system are much weaker. Data from the DHIS are often not readily available to health managers, policy makers, researchers and other stake-holders. As a result the data are not used to identify problems regarding the quality of service delivery, nor to monitor the effectiveness of efforts to improve service delivery.

Perinatal statistics

Stillbirth and perinatal mortality rates

Figures for 2003-2005 are shown in Table 1.

Table 1. Stillbirth and perinatal mortality rates from the DHIS

	Stillbirth Rate	Perinatal Mortality Rate
2003	28 per 1000	38.4 per 1000
2004	25 per 1000	38.2 per 1000
2005	25 per 1000	34.9 per 1000

It should be noted that these figures include all deliveries regardless of weight category. The figures correlate well with those collected in sentinel sites through the Perinatal Problem Identification Programme (PPIP) and presented in this report.

Figures for each province are shown in Figure 1. Perinatal mortality rates are highest in the Eastern Cape, Mpumalanga and Kwazulu-Natal.

Figure 1. Stillbirth and perinatal mortality rates in provinces, and in South Africa as a whole
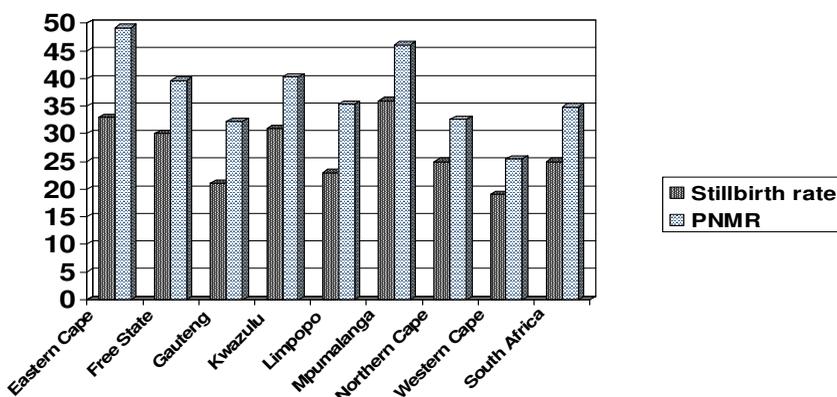
The perinatal mortality for metropolitan areas was 34.5 per 1000 births compared with a rate of 44.7 per 1000 for the rural nodes, which represent the 13 poorest rural districts in the country. Once more, these figures are consistent with those collected through the PPIP, which also demonstrate higher perinatal mortality rates in rural as compared with urban areas.

Low Birthweight Rates

Low birth weight (LBW) rates reported through the DHIS appear to be unrealistically low with rates of 10% or more being reported in only three provinces, namely Western Cape, Northern Cape and Eastern Cape. The problem appears to be that in a number of provinces low birth weight neonates born at some hospitals are not included in the numerator, although all births in those hospitals are included in the denominator. Review of

LBW rate data for each district and facility should assist provincial coordinators in identifying where the data collection problems lie and addressing these problems.

Access to the data

Data for all districts are available from a number of sources including the South African Health Review and the District Health Barometer which are both published by the Health Systems Trust (http://www.hst.org.za). Health workers, managers and others should also be able to obtain data directly from the DHIS from health information officers at district, provincial and national levels. DHIS software is all open-source and easy to use, so that users should be able to access and manipulate data contained on databases.

Conclusion

Perinatal data contained in the DHIS provides a reasonably accurate picture of perinatal mortality and morbidity in South Africa.

The challenge is to ensure that the quality of data is improved, and that the data are used to identify facilities and districts which require support in improving the quality of care they provide, and in monitoring the impact of interventions which aim to improve the quality of maternal and neonatal care.

The effect of maternal HIV infection on perinatal deaths in southwest Tshwane

L Van Hoorick, RC Pattinson

MRC Maternal and Infant Health Care Strategies Research Unit, Department of Obstetrics and Gynaecology, University of Pretoria,

Maternal HIV infection is the most common underlying cause of maternal and infant deaths in South Africa. AIDS is the single most common cause of maternal death, reported as being responsible for 20.1% of all deaths.[1] Eighty percent of the children who died and their or their mothers' HIV status was known were either infected or HIV exposed.[2]

The effect on perinatal deaths in South Africa is less clear. A review of the worldwide literature has demonstrated a clear association between HIV infection and stillbirth, the latter being almost four times more likely in an HIV-infected pregnant woman than in one who is not.[3] An association has also been found with low birth weight babies.[4,5,6]

To help determine this relationship in our region, a study was carried out in southwest Tshwane. The aim was to examine the relationship between maternal HIV infection and perinatal death, and to determine the primary obstetric causes responsible for these perinatal deaths.

Methods

Southwest Tshwane has a low to middle income urban population and is served by Pretoria West and Laudium Midwife-Obstetric Units (MOUs) and Kalafong Hospital. Fourteen primary care clinics refer to those institutions. Only data from women from southwest Tshwane between 1 January and 31 December 2006 was used in the study.

As part of routine audit, the maternal HIV status was recorded as HIV negative, infected or unknown in all women who gave birth from the area. All perinatal deaths were also recorded in the Perinatal Problem Identification Programme (PPIP)[7,8] and the primary obstetric cause and HIV status was allocated to each death. The causes of perinatal deaths from HIV infected, negative and unknown were analysed.

Standard statistical techniques were used to analyse the data. All forms of patient identification were removed after data cleaning had been completed. The hospital superintendent inspected the security of the databases and was satisfied with the anonymity of the women.

Results

There were 6272 births in southwest Tshwane in 2006, of which 4585 mothers (73.1%) were counselled and 4187 (66.8%) were tested. Table 1 illustrates the results of HIV testing in the pregnant women. The HIV positive rate was 21.2% in the women tested. The HIV positive rate for Gauteng in 2005 was 32.4% in anonymous antenatal testing. Thus the prevalence of HIV infection must have been about 50% for the group that was not tested (32.4% of 6272 = 2032; minus 888 = 1144; 1144/2085 = 54.8%); 9.9% of the 888 HIV positive women were taking highly active antiretroviral therapy (HAART). Because of the small number we did not compare the perinatal outcome between mothers with or without HAART, nor did we include CD4 count as a criterion.

Table 1. Maternal HIV testing in southwest Tshwane

	Number	%
HIV +	888	14.2
HIV -	3299	52.6
Not Tested	2085	33.2
Declined	398	19.1% of not tested
Total	6272	100

The mean birth weight of the babies from the HIV infected women was 2808.7 ± 707 g, and for the HIV negative mothers was 2942.4 ± 675 g (p<0.0001). The low birth weight (LBW) rate for HIV infected women was 19.9% compared with 13.3% with HIV negative women (p<00001; OR 1.62, 95% confidence intervals 1.33 and 1.97) and 16.8% for the unknown status group.

The mortality rates are shown in Table 2 and the mortality rates per primary obstetric cause are shown in Table 3.

Table 2. Mortality rates (500g+) for HIV status

	HIV +	HIV -	Unknown	Odds Ratio[*]	95% Confidence Intervals[*]
SBR	26.3	17.2	27.4	1.54	0.93-2.54
NNDR	17.2	4.7	7.4	3.61	1.76-7.44
PNMR	40.5	22.7	36.9	1.81	1.21-2.72

[*] Comparison between HIV positive and HIV negative groups

Table 3. Perinatal mortality rate per primary obstetric cause (500g+)

Primary Obstetric Cause	HIV +	HIV -	Unknown	P[*]	OR, 95% CI[*]
Unexplained stillbirth	11.3	7.6	8.6	0.28	1.5, 0.71-3.11
Spontaneous preterm birth	12.4	3.6	12.9	0.004	3.43, 1.51-7.81
Infection	4.5	0.0	1.4	0.0012	-
Intrapartum asphyxia	4.5	0.9	1.0	0.02	5.0, 1.1-22.2
Trauma	1.1	0.9	0.0	NS	
Antepartum haemorrhage	1.1	1.2	4.8	NS	
Hypertension	3.4	4.2	3.4	NS	
Medical Disease	0.0	1.2	1.0	NS	
Congenital abnormalities	1.1	1.2	1.0	NS	
IUGR	0.0	0.3	1.0	NS	
Other	0.0	0.3	0.0	NS	
No Obstetric cause	1.1	1.2	1.9	NS	
Total	40.5	22.7	36.9	0.0049	1.81, 1.21-2.72

OR, 95% CI – Odds Ratio and 95% confidence intervals
[*] Comparison between HIV positive and HIV negative groups

Discussion

Infants of HIV infected women had a significantly lower mean birth weight than HIV negative women, but this appears to be due to more premature deliveries rather than growth restricted babies.

A recent study performed by researchers in KwaZulu-Natal has found similar results. They showed a 75% increased risk of an HIV infected woman having an adverse pregnancy outcome (antepartum death, spontaneous abortion or stillbirth).[9]

The PNMR was significantly higher due to an excess of unexplained stillbirths, spontaneous preterm delivery, intrauterine infection and intrapartum asphyxia. The lack of significance of unexplained stillbirths in the HIV infected group was most likely due to the lack of HIV testing in women who delivered unexplained stillbirths. Most of these women delivered macerated stillbirths and the clinicians were reluctant to request women to have HIV tests at that time. This is supported by the high prevalence of unexplained stillbirths in the unknown HIV status group. The relatively low rate of unknown HIV status in women with neonatal deaths is due to clinicians being more active in counselling women for HIV testing where infant feeding choices become urgent and relevant.

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The finding of more preterm births in HIV infected women has been well recorded and it appears that these babies are mostly appropriately grown premature infants than growth-restricted infants. Three other studies in South Africa have failed to show an association between growth restriction and the HIV positive status.[10,11,12] Preterm labour can be explained by the probable greater prevalence of amniotic fluid infection in HIV infected women.

The significant increase of intrapartum asphyxia in HIV infected babies was unexpected and unexplained. A possible explanation is that these fetuses had severe congenital infections that were mistaken for intrapartum asphyxia. Alternatively, previous intra-amniotic infections made the fetus more susceptible to hypoxia during labour. The numbers of fetuses involved are small and this observation will need to be confirmed by other studies.

Conclusion

In southwest Tshwane an HIV positive mother has a doubled risk of having a perinatal death compared to an HIV negative mother. There was also a different pattern of primary obstetric causes of perinatal deaths in HIV infected pregnant women. Unexplained stillbirth, spontaneous preterm labour, infection and intrapartum asphyxia occur more frequently in HIV infected women. With the knowledge that 24.3% of all perinatal deaths in South Africa remain unexplained,[13] these findings can open new perspectives on the underlying causes.

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Child PIP 2005: A survey of child healthcare in South Africa, with particular emphasis on under-one deaths

C Stephen, M Patrick, A Krug

Introduction

The Child Healthcare Problem Identification Programme (Child PIP or ChIP) was developed in South Africa in 2001, and is a mortality audit tool for children, based on PPIP. It provides a system for healthworkers and managers to collect and analyse data to assess the quality of care children receive in the health system. Using this information, interventions at local, provincial and national level can lead to improvements in care that may ultimately reduce child mortality. Such a mortality review process could contribute to reducing child mortality by two thirds in children under 5 years of age, by 2015, the fourth Millennium Development Goal.

Child PIP contributes to improving the continuum of care offered to mothers, babies and children by providing data describing the outcomes for infants, and thus the longer term impacts of perinatal care.

Methods

Data from 15 hospitals in 6 provinces of South Africa were collected for all or part of 2005 (duration of participation varied from 3 to 12 months), and were entered onto the Child PIP software programme. The survey population included all infants and children from birth to 18 years of age that were admitted to children's wards, and all deaths were reviewed in detail. The cause of death and the social, nutritional and HIV contexts were determined, as well as the presence or absence of modifiable factors that may have contributed to the child's death. The mortality review process was carried out in regular meetings or by individuals conducting folder reviews.

Results

Baseline data

There were 20 891 admissions and 1543 deaths reviewed in detail during 2005, in which 3610 modifiable factors were identified. The inpatient mortality rate was 6.8% and the average number of modifiable factors per death was 2.3.

Information about children who died

Almost 90% of deaths occurred in children under 5 years of age and over one half in children under one year of age. Sixteen percent of the deaths were in the neonatal age group (0-1 month). These were babies who were admitted after birth into a children's ward.

Demographics

Age	Number	*% of all deaths*
0-1 month	240	15.6
1 month-1 year	622	40.3
1-5 years	493	32
5-13 years	8	0.5
13-18 years	172	11
Unknown	8	0.51
Total	1543	100

Social context
In 58% of child deaths, the mother was the primary caregiver, and in 13%, a grandmother was the primary caregiver. The father was the primary caregiver in only 0.4% of cases, and information about the primary caregiver was unknown in 20% of the cases.

Health context
The nutritional status of the under-one year age group showed that 55% were underweight and nearly half of these had severe malnutrition.

The *HIV status* of the children who died is shown in the following table:

Age \ Laboratory	*0-1m*	*1m-1 year*	*1-5 years*	*5-13 years*	*13-18 Years*	*Unknown*	Total
Negative	11	56	38	18	2	0	125
Exposed	78	175	51	1	0	0	305
Infected	8	153	151	85	4	1	402
Not tested (but indicated)	33	92	69	16	1	0	211
Not tested (not indicated)	0	10	8	1	0	0	19
Unknown / No result	110	136	176	51	1	7	481
Total	240	622	493	172	8	8	1543

m - month

For infants under one year of age the HIV status for almost 50% was unknown. Of those tested, nearly one-third were infected and a further one-half were exposed.

Data describing children's experiences of the PMTCT programme is shown in the following table:

Nevirapine prophylaxis	Number	% of all deaths
Given	111	7.2
Not given	292	18.9
Mother negative	131	8.5
Unknown	1009	65.4
Total	1543	100

For the under one year age group (infants), information about nevirapine administration was unavailable in 60%. For those with information, nearly two thirds of babies eligible for NVP prophylaxis did not receive it. Data from all children confirmed that many children became HIV infected and died from preventable diseases.

Infant feeding	0-1 month	1 month-1 yr	1-5 yrs	Total	%
Exclusive breast	38	95	36	169	12.5
No breast, ever	36	114	32	182	13.4
Mixed	36	125	94	255	18.8
Unknown / No data	130	288	331	749	55.3
Total	240	622	493	1355	100

There was no information on feeding practices in the first 6 months of life in 55% of deaths. Only 56% of babies who were eligible to receive perinatal NVP practised safe feeding (i.e. either exclusive breast or exclusive formula). Data showed that if infants on the PMTCT programme did not receive NVP, they were more likely to be mixed fed.

Causes of child deaths
Acute respiratory infection was the main cause of death in all children. The proportion of PCP deaths was higher in infants than in children. Information about PCP prophylaxis (cotrimoxazole) was unavailable in over half of infants dying from PCP and a further one quarter never received it.

The leading causes of death in infants are shown in the following table:

Diagnosis	2005 (number)	*2005 (%)*
Pneumonia/ARI	312	20.8
Septicaemia	197	13.1
Acute diarrhoea	180	12.0
PCP (suspected or confirmed)	220	15.0
TB: pulmonary/extrapulmonary	75	5.0

The profile of deaths for the neonates recorded in the Child PIP data is very similar to that for infants, with over 80% of neonatal deaths being due to infection.

Information about quality of care
Records
Review of clinical records revealed that 58% were incomplete, inadequate or missing, and 42% were considered adequate.

Modifiable factors
Overall, for each child who died there were more than two occurrences of substandard care that may have contributed to that child's death (a rate of 2.3 per death).

- *Where do they occur?*
  Seventy-eight percent of modifiable factors occurred within the *health system*, and 22% at *home*. At clinic level the majority of modifiable factors showed a failure to successfully implement the IMCI programme. Most modifiable factors were identified in hospital, both during emergency care at the time of admission and in the ward.
- *Who is responsible?*
  There were 908 modifiable factors relating to the *caregiver* (59 per 100 deaths) and a total of 1891 *clinical personnel* modifiable factors were reported (123 per 100 deaths). Thus, for each death there was more than one instance of substandard/modifiable care attributable to clinical personnel, and most were due to insufficient case assessment, monitoring and management.

A total 807 *administrator*-related modifiable factors were identified in the 1543 deaths resulting in a rate of 52 per 100 deaths. Most of these described inadequate facilities and a lack of personnel, particularly professional nurses.

Discussion

Child PIP, as a clinical audit programme, analyses child deaths with the aim of improving the quality of care for all sick children. During 2005 the programme continued to expand with increasing participation by South African hospitals.

About children who died

Demographics and social context

The 2005 Child PIP findings showed that younger infants have a higher risk of dying. More than a quarter of these children were not cared for by their mothers. In a further quarter, information about the mothers' health was lacking, and thus the impact on child deaths may have been underestimated. Mortality among young adults, and particularly young women, has increased dramatically as a result of the HIV pandemic. This mortality as well as the illness preceding it has a devastating effect on infants and children, leading to increased mortality and morbidity.

Health context

Over half of the infants dying were underweight and it is well described that this fact alone doubles the risk of dying from infectious diseases. Deaths of children with severe malnutrition are the tip of the iceberg that represents the malnutrition epidemic in South Africa. The 2005 data thus highlights the vulnerability of young, underweight infants.

Results from the Saving Children 2004 report showed that 59% of under-5 deaths were HIV-related. In 2005, 46% of all deaths were known to be HIV-related and in a further 46% the HIV laboratory status was not known. Only 8% of children who died tested negative and in 46% of deaths the child was not tested for HIV. Appropriate care plans for children (both sick and well) can only be made if they are properly assessed for HIV, which includes laboratory testing and clinical staging. The low testing rate in the sickest children (those who die) is therefore a cause for great concern. Lack of testing is also a serious barrier to accessing holistic HIV care.

The Child PIP 2005 data provided new and important detail on HIV prevention and treatment strategies. In all child deaths, only 19% of mothers did not get PMTCT prophylaxis (nevirapine) but PMTCT information was not provided in two-thirds of the cases. Nineteen percent of under-5 deaths had been on mixed feeding, but in 55% information about infant feeding was lacking. Only 19% of children dying with PCP had been on cotrimoxazole prophylaxis.

There are serious problems with PMTCT, including inadequate counselling and the continued lack of universal testing for mothers, gaps in nevirapine prophylaxis to mothers and babies, poor feeding choices and follow-up/identification of infants requiring PCP prophylaxis or ART. The 2005 Child PIP data also showed that a breakdown in one component of the PMTCT programme increased the likelihood of a breakdown in other components.

The information provided by Child PIP should lead to rapid and effective responses to strengthen PMTCT programmes and PCP prophylaxis for all eligible mothers and children in South Africa.

Causes of child deaths
The pattern of disease causing child deaths as described in Saving Children 2005 was similar to that experienced in other sub-Saharan African countries. Many of these deaths are preventable.

The profile of neonatal deaths was similar to that for all children, with 80% being due to infection. It is important that these neonatal deaths be included in the PPIP national data to complete the information about perinatal care, as data from neonates after discharge from hospital is often lost to PPIP.

About quality of care
Analysis of the modifiable factors identified by Child PIP indicated various problems with the quality of care delivered by healthcare providers at all levels. Changes outlined in the recommendations that follow should be implemented and their impact monitored.

Recommendations
The 2005 Child PIP data highlighted five areas of importance from which the recommendations were developed:

1. HIV/AIDS
    - Prevention: PMTCT services
    - Identification and treatment: ART services
2. Nutrition
    - At clinic level, underweight children must be identified, assessed and referred earlier
    - At hospital level, severe malnutrition must be managed effectively
3. Gold standards
    - At clinic level, IMCI needs to be strengthened and sustained

- At hospital level, standard paediatric guidelines must be adopted or developed, and implemented
4. Norms to be established and implemented
  - Staffing for sick children
  - Equipment for sick children
  - Transport of sick children
5. Improve paediatric quality of care
  - Paediatric mortality review (Child PIP) at every institution

Conclusion

It is clear from the review of the 2005 Child PIP data that too many children die from treatable or preventable conditions, particularly HIV infection. Overall improvement of child health, and infant survival in particular, will not change until the HIV pandemic is controlled and reversed. Treatment for HIV-infected mothers and children as well as strategies to prevent HIV infection in young adults must be urgently strengthened.

The impact of shortfalls in perinatal care is far-reaching. Thus, the priority must be to expand and strengthen strategies aimed at the prevention of HIV transmission from mother-to-child and to ensure that the PMTCT programme is an integral part of the continuum of mother-baby-child care. Prevention of paediatric HIV infection, although a complex process, is potentially the most effective lifesaving programme in South Africa today.

'Every antenatal HIV diagnosis represents the chance to save the life of a child'

PMTCT in South Africa:
Using Botswana as a comparison

L Treger

SA National program background

The South African national PMTCT Program started in June 2002, as a 2 year pilot project. The pilot project started with 2 sites per province, one rural and one urban, yielding a total of 18 sites. At the time of the pilot, a PMTCT site was defined as a hospital and its adjacent feeder clinics. The pilot phase focused on the identification of HIV positive women and the provision of ARV prophylaxis (nevirapine) to the pregnant HIV positive woman and her newborn infant, with the aim of reducing vertical transmission. The purpose of the PMTCT pilot was not to assess the efficacy or safety of nevirapine, as this had already been established in HIVNET-012, but rather to assess operational challenges inherent in the introduction of ARV treatment into routine MCWH service delivery, and to determine strategies to address challenges that arose during implementation.

Midway through the pilot phase, the program was expanded to ensure that every pregnant woman would have access to nevirapine. This resulted in rapid scale up, but as a result of the pace at which provincial expansion took place, there was no time to address many of the operational challenges that arose during the pilot implementation. Furthermore, expansion occurred prior the availability of the pilot evaluation results, and when these results were finally available, service delivery had expanded to more than 60% of health facilities. With rapid expansion, the focus of the program shifted to ensuring availability of nevirapine for women, by counting the number of sites that were able to administer nevirapine rather than addressing operational challenges inherent in the introduction of a new service within the context of routine maternal and child health services.

The primary goal of the national PMTCT program is to reduce mother-to-child HIV transmission by improving access to HIV testing and counseling in antenatal clinics, improving family planning services to HIV positive women, and implementing clinical guidelines to reduce the transmission of HIV during childbirth and labour. In order to achieve this goal, the current PMTCT program consists of the following elements:

- Service delivery as part of existing maternal and child care services
- Group education session on PMTCT
- Opt-in voluntary counselling and HIV testing, including pre- and post-test counselling

- Counselling on safe infant feeding practices, allowing mothers to make informed choices
- Provision of formula for those mothers that choose to formula feed (6 month supply)
- Nevirapine (mothers and babies):
  - Maternal dose is self-administered at the onset of labour
  - Neonatal dose is given at the health facility within the first 72 hours of life, only if the mother has self-identified as being HIV positive or in the PMTCT program
- Multivitamins (mothers and babies)
- Treatment for opportunistic infections including TB
- Post delivery follow-up for women
- Cotrimoxazole for infants from 6 weeks
- Testing of infants at 12 months, PCR pilot (2 sites per province)
- Referrals to ARV services

National program targets
At its outset, based on international guidelines and evidence-based research, the national program set the following targets:
1. Universal Coverage by March 2006
2. 80% of all pregnant women receive VCT during ANC by March 2006
3. 75% of HIV positive pregnant women receive nevirapine by March 2006
4. Reduce vertical transmission by 50% by 2008
5. Vertical Transmission is reduced to less than 10% by March 2008

Data from the fiscal year 2004/5 indicates just how far the national program is from achieving these targets.

Target 1: Universal coverage by March 2006
Although expansion has been successful and PMTCT service delivery is available in 3064 facilities around the country, this translates into 78% of facilities offering PMTCT around the country. Coverage varies by province, with WC, KZN and GP achieving almost universal coverage. At the end of the 2004/5 fiscal year, PMTCT services were available at all hospitals, almost all community health centres and most clinics. Expansion to mobile clinics still needed to take place. Coverage data only gives an indication of designated PMTCT sites and is not a measure of functionality of PMTCT facilities. It does not take into an account how often services are available at the designated facilities.

Target 2: 80% of all pregnant women receive VCT during antenatal care by March 2006

During the fiscal year 2004/5, approximately 1 112 240 babies were born. In order to achieve the above mentioned target, 889 792 pregnant women should have received VCT during pregnancy. Data from the National program indicates that during 2004/5, 533 610 pregnant women (47.9%) received VCT services. This means that at entry point into the PMTCT program, more than 50% of women were missed. Missed opportunities at entry into PMTCT further hinder achievements of the national program targets 4 and 5 listed above, namely the reduction in transmission rates.

Target 3: 75% of women who test positive receive nevirapine by March 2006

In achieving this target, the nevirapine coverage rate should be 75%. The nevirapine coverage rate is a measure of antenatal prevalence and nevirapine administration to mothers. During 2004/5 not all of the women that tested positive for HIV during pregnancy and were enrolled into the PMTCT program received nevirapine. The national nevirapine coverage rate was around 30%, indicating further missed opportunities in PMTCT. It is important to note, since nevirapine is self-administered, that the coverage rate only measures nevirapine dispensed, not nevirapine taken.

The inability to achieve targets 1, 2 and 3 above has had severe consequences for the achievement of targets 4 and 5. This is further compounded by high loss to follow-up of infants born into the PMTCT program and poor data management patient tracking systems, and it is extremely difficult to measure the impact that PMTCT has had on the reduction of vertical transmission.

A closer analysis reveals a number of weaknesses in PMTCT. These are as follows:

In terms of the program goal, the focus is not on improving child survival for HIV exposed infants and children, but only on reduction of vertical transmission. By shifting the focus of the program goal to include child survival, this would ensure that PMTCT does not stop at delivery but extends to follow-up support visits including IMCI, support for infant feeding practices, HIV testing at 6 weeks using PCR or 12 months using ELISA, and referral for ARV where indicated.

In terms of operational challenges to service delivery, PMTCT still operates as a vertical program, and integration into existing maternal and child health services has not occurred. Opt-in voluntary counselling and testing

hinders participation in the PMTCT program as it requires women to agree to testing based on individual counselling. Anecdotal evidence suggests that women do not opt in to counselling for fear of stigmatization or being labelled as HIV positive. Nevirapine is given to women at 28 weeks gestation, to self-administer at the onset of labour. This poses many challenges as a woman needs to understand the signs and symptoms of early labour, remember to take the nevirapine, and tell the healthcare worker that she has taken it to ensure that her baby receives nevirapine within 72 hours of birth. Furthermore, the inability of the healthcare worker to identify HIV exposed infants prevents infants from receiving cotrimoxazole at 6 weeks and results in high rates of loss to follow up and low rates of HIV testing in HIV exposed infants. In addition, a poor linkage with ARV therapy for pregnant women has resulted in many who are eligible for HAART during pregnancy not being able to access it. The South African Comprehensive Plan indicates that all pregnant women with CD4 counts below 200 are eligible for HAART. However, in order for this to happen, CD4 testing needs to take place at antenatal care sites, and eligible women should be referred appropriately. Women not eligible for ARV should be referred after delivery for monitoring. Further challenges to implementation include:

- The prevalence of mixed feeding and women not being able to comply with feeding choices
- Problems with provision of formula, including formula being out of stock at some localities, forcing women to mix feed

The above-mentioned challenges manifest at the facility level in the following way:

- Midwives are not responsible for establishing the HIV status of a woman at her antenatal care visit. Counselling of pregnant women is often seen as the responsibility of the lay counsellor. Many midwives do not see it as their responsibility to encourage pregnant women to know their status.
- Not enough women opt in for testing, and as a result many positive pregnant women are missed at the entry point. Opt-in counselling services require women to choose to undergo VCT. Many women choose not to opt in as they fear this will identify them as being HIV positive.
- The comprehensive plan makes provision for HAART for pregnant women with CD4 counts below 200. However, most in antenatal clinics, ARV eligibility criteria are not well established. Pregnant women are frequently not staged and not referred during antenatal care or after delivery for monitoring.

- During well-baby visits, or immunization visits, nurses do not take responsibility for establishing the HIV status of the mothers. This results in too few infants receiving cotrimoxazole, and failure of follow-up of HIV-exposed infants
- There is limited participation of mothers in infant feeding decisions immediately after birth, resulting in mixed feeding practices, and increased transmission rates

In order to address some of these challenges, an examination of the Botswana PMTCT program offers an example as to how some challenges can be overcome and vertical transmission can be minimized. Botswana's 2003 surveillance data showed that 37.4% of women attending antenatal clinics were HIV positive. In the absence of any interventions, 30% of infants born to HIV positive mothers become infected during pregnancy, delivery and breastfeeding. In 2001, Botswana implemented a national PMTCT program and an expanding antiretroviral program in 2002. The implementation of these programs ensured that all pregnant women were able to receive HIV counselling and testing. By 2004, PMTCT services were established in all public facilities. This means that all hospitals, antenatal clinics and delivery sites were offering a full package of PMTCT services. At the inception of the program, HIV testing was conducted after pretest counseling with pregnant women, who actively chose to be tested. However, in 2003, two years after initiation of the program, uptake rates were still low, with only 52% of pregnant women receiving antenatal care learning their HIV status. In 2004, in order to increase uptake and ensure that people needing ARV therapy could assess services, Botswana began to implement routine, non-compulsory opt-out HIV screening in antenatal care and other health settings. This increased uptake dramatically and the current uptake of PMTCT services is around 92%. This has had a significant impact on the identification of HIV positive pregnant women at entry point into the PMTCT program, as well as on the number of eligible women being referred to treatment programs. It is important to note that the introduction of routine testing did not lead to reductions in the number of women attending antenatal care. In addition to increase of uptake, ARV prophylaxis uptake has also increased significantly from a 40% national coverage rate to 80% during the same period. The current protocol for PMTCT is zidovudine from 28 weeks to the mother and nevirapine at the onset of labour and 4 weeks of zidovudine to the infant. Recent reports indicate that vertical transmission rates are below 6.7%.

Based on the above example the following recommendations can be made in order to strengthen PMTCT service delivery:

Antenatal Care

There is a need for provinces to take ownership of the program at the provincial level. There needs to be a more decentralized and participatory rapid appraisal process at the provincial level. This needs to be done with an integration lens by setting up provincial task teams to identify gaps in service delivery (provincial peer-to-peer model) and make strategic, relevant and specific recommendations to the national and provincial plans of action to specifically address improving the quality of care. In addition, it is necessary to re-examine the actual roles and tasks of midwives with respect to antenatal care and come up with suggestions on how antenatal tasks can be reorganized with the focus on ensuring that midwives make HIV in pregnancy a priority.

It is essential that uptake of PMTCT is increased. This can be achieved through an opt-out approach whereby all women receive individual counselling and have to choose not to be tested. This would also play a role in the reduction of stigma, and the normalization of HIV testing and care for pregnant women. Evidence from Botswana, as well as the Western Cape and Witbank hospital, has shown how the implementation of routine opt-out testing significantly improves PMTCT uptake and reduces vertical transmission rates.

Post-test counselling for pregnant women who test negative during antenatal care needs to be strengthened in order to ensure that they do not seroconvert during pregnancy of breastfeeding. In addition, both negative and positive women need to be encouraged to have their male partners tested.

The strengthening of linkages and referral networks between PMTCT and the ARV program is essential. All pregnant women who test positive during antenatal care need to be staged at that time. To do this, CD4 testing of positive pregnant women at the time where her status is determined should be conducted. Pregnant women eligible for HAART should be fast tracked into treatment programs. This will result in a decrease in transmission rates and improve the well-being of the mother. PMTCT needs to be integrated into all MCWH services, particularly family planning services. Women requesting family planning services should be encouraged to know their status and they should be provided with information about HIV and AIDS, including information on PMTCT. This will ensure that more women know their HIV status prior to becoming pregnant. It would ensure that HIV

positive women can make informed choices about fertility and, if indicated, be referred to ARV programs.

Child Health Care
Health care workers need to improve the quality of infant feeding counselling, and assist mothers in making infant feeding choices that are appropriate to the mother's situation. In addition, women need to be supported to sustain their infant feeding choices after delivery and at all follow-up encounters in the health system.

There is an urgent need to hold a technical infant feeding meeting to develop strategies to support maternal infant feeding choices. Strategies may include strengthening linkages with the national community health worker initiative, so that community health workers can conduct home visits and support mothers.

There is a need to identify HIV positive infants early. This can be done by linking early infant diagnosis with the six-week immunization visit. This will decrease loss to follow up, and ensure that children needing ARVs are referred timeously. In order for this to happen, health care workers need to be able to identify HIV exposed infants and ensure they receive the appropriate care, including administration of cotrimoxazole at 6 weeks.

Integration
The PMTCT program needs to be mainstreamed into routine MCWH services at national, provincial, district and facility levels. This will ensure strong linkages with family planning, ARV programs, nutrition programs, IMCI, immunization programs, etc. The diagram below illustrates how reproductive and child health and PMTCT can be integrated at the facility level.

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Integrated Reproductive and Child Health and PMTCT

Pre-conception	Antenatal Care	Intrapartum Care	Postnatal/ Newborn Care	Child Care
For All Peripartum Women, Newborns, & Children				
•Counseling on prevention of HIV & STI (safer sex, partner involvement) •VCT and disclosure to partner •Family planning	•STI, including syphilis detection and treatment •Intermittent preventive treatment for malaria & insecticide treated nets •Tetanus toxoid •Micronutrients •Deworming •Testing and counseling for HIV (opt out) and disclosure to partner •Counseling on: ➤Infant feeding ➤Birth preparedness ➤Nutrition ➤Breast care ➤Family planning ➤Prevention of HIV & STI (safer sex, partner involvement)	***Woman:*** •Clean delivery (including prophylaxis and treatment for infection, e.g., chlorhexidine, antibiotic) •Minimize invasive procedures (artificial rupture of membrane, episiotomy) •Active management of the third stage of labor •Partograph •Emergency obstetric care •Universal precaution •Counseling & testing for HIV (if not done earlier) •***Newborn:*** •Resuscitation if necessary and minimize invasive suctioning •Prevention/management of newborn hypothermia/kangaroo care if LBW •Appropriate infant feeding •Prophylactic eye care	***Woman:*** •Identify/treat puerperal infections •Vitamin A •Counseling on: ➤Self-care (breast care, clean perineum, maternal nutrition) ➤Family planning/birth spacing and provide method ***Newborn:*** •Special care of LBW baby (warmth, prevent infections) •Detect/treat infections •Immunization •Growth monitoring •Counseling on basic newborn care (clean cord care, warmth, infant feeding, insecticide treated nets)	•Growth monitoring •Immunization •Detect/treat infections •Insecticide treated nets •Testing for HIV for symptomatic children •Counseling on: ➤Infant and child feeding ➤Hygiene •Link with IMCI
For HIV Infected Peripartum Women, Exposed Newborns, & Infected Children				
Woman: ARV prophylaxis, disease staging and ARV treatment for woman and partner when indicated, psycho-social support ***Exposed newborn***: ARV prophylaxis, early diagnosis, cotrimoxazole prophylaxis to prevent PCP ***Infected child***: Cotrimoxazole prophylaxis to prevent infections, disease staging, ARV treatment when indicated				

L I N K   T O   C O M M U N I T Y

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Provincial Reports

Eastern Cape Province

Introduction

The Eastern Cape has 37 community health centres, 65 district hospitals and 3 hospital complexes, serving a population of 7 051 540. The District Health Information System (DHIS) for 2006 recorded the PNMR as 33/1000 births with a stillbirth rate at 25/1000 births.

Perinatal data presented in this report is from the 33 PPIP sites reporting data electronically to the provincial office. A number of sites have data for only a few months, whereas some sites that previously reported data have no data for this period. The reporting period is October 2004 to March 2006, including a total number of 38 615 births.

Provincial Indices

	≥500 g	≥1000 g
Total number of births	38615	38269
SB rate	21.3	17.4
NNDR	11.3	8.2
PNMR	32.3	25.5
LBWR	13.0%	
PCI	2.0	
SB:NND	1.9:1	
C/S rate	12.9	
Assisted delivery rate	1.0%	
Proportion teenage pregnancies	<18 = 9%	
	18-19 = 13.3%	
Syphilis prevalence	3.3%	
Proportion of women attended antenatal care	83.0%	
Maternal HIV: positive	9.1%	
Maternal HIV: negative	13.9%	
BBA rate	5.4%	

Primary Obstetric Causes of Death:
1. Unexplained intrauterine death - macerated = 14.1% (20.1% in 2002)
2. Labour related intrapartum asphyxia = 13.5% (11.8% in 2002)
3. Idiopathic preterm labour = 6.6% (14.2% in 2002)
4. Proteinuric hypertension = 6.4% (6.4% in 2002)
5. Abruptio placentae = 2.5% (5.4% in 2002)

Final Causes of Neonatal Death
1. Hypoxic ischaemic encephalopathy = 19.8% (29.1% in 2002)
2. Hyaline membrane disease = 12.7% (13.2% in 2002)

3. Meconium aspiration = 9.1%
4. Extreme multi-organ immaturity = 4.1% (17% for 2002)
5. HIV infection = 3.6%

Avoidable Factors for a total number of 519 deaths
1. Patient associated: 39.8%
    1.1. Inappropriate response to poor fetal movements = 11.5%
    1.2. Delay in seeking medical attention = 9.9%
    1.3. Never initiated antenatal care = 7.7%
    1.4. Booked late in pregnancy = 3.7%
2. Medical personnel associated: 31.0%
    2.1. Management of 2nd stage: prolonged with no intervention = 5.4%
    2.2. Poor progress in labour but partogram not used = 3.8%
    2.3. Fetal distress not detected intrapartum; fetus monitored = 2.6%
    2.4. Delay in referring patient for secondary/tertiary treatment = 2.1%
3. Administrative problems: 27.7%
    3.1. Inadequate facilities/equipment in neonatal unit/nursery = 9.9%
    3.2. Inadequate resuscitation equipment = 3.5%
    3.3. Insufficient nurses on duty to manage patient adequately = 3.1%
    3.4. No on-site syphilis testing available = 2.1%
    3.5. Result of syphilis screening not returned to hospital/clinic = 1.9%

Issues related to data collection
New sites are still in the process of learning the system and the PPIP computer software. Computer access seems to be improved, however no e-mail connection results in a delay of registration of programmes. Some hospitals previously doing well are no longer reporting deaths. Appointment of data capturers resulting from the Saving Mothers Saving Babies project at selected hospitals has improved support.

PPIP Sites
Baziya HC, Butterworth Hospital, Cala Hospital, Cofimvaba Hospital, Cradock Hospital, Dordrecht Hospital, Port Alfred Hospital, Sundays Valley Hospital, Settlers Hospital, Cloete Joubert Hospital, Empilisweni hospital, Lady Grey Hospital, Central MOU, Livingstone Hospital MOU, Motherwell MOU, Uitenhage Hospital, West-end MOU, Umtata General hospital, Frere Hospital, Glen Grey Hospital, Indwe Hospital, Komga HC, Martjie Venter hospital, Mqanduli HC, Nessie Knight Hospital, Ngangelizwe HC, Taylor Bequest Hospital, Umlamli Hospital, Victoria Hospital, Wilhelm Stahl Hospital.

Discussion

Comparisons of PPIP Data

Indicator	2000 (estimated)	2001	2002	2003-2006
NNDR ≥1000 g	24.7	14	14	8.2
PNMR ≥1000 g	50.1	37	37	25.5
C/section rate	-	17.3%	12.5%	12.9%*
SB:NND	-	1.7:1	1.53:1	1.9:1
PCI	-	2.86	2.32	2
LBW rate	-	16.4%	15.0%	12.6%

*No data included for Dora Nginza and Cecilia Makiwane hospitals

In the data comparison a decline is noted in NNDR, PNMR, PCI and LBW rate. C/sections declined from 17.3% in 2001 to 12.5% in 2002 and then remained constant. Data should be viewed and interpreted with caution considering the number and level of hospitals currently providing PPIP data. The NNDR declined from 14 (2001) to 8.2(2006), the PNMR from 37 (2001) to 25.5 (2006) and the PCI from 2.86 (2001) to 2(2006). The SB:NND ratio remained fairly constant at 1.7:1 (2001) and 1.9:1 (2006).

Causes and Avoidable Factors
The top five primary causes of perinatal death were identical to the 2002 report with changes only in the percentages. Unexplained intrauterine death – macerated, declined from 20.1% in 2002 to 14.1%. Labour related intrapartum asphyxia decreased by 2%. Idiopathic preterm labour declined from 14.2% in 2002 to 6.6%. Proteinuric hypertension remained the same and Abruptio placentae halved from 5% in 2002 to 2.5%.

In the final causes of neonatal death, meconium aspiration (9.1%) overtook extreme multi-organ immaturity, as number three. Hypoxic ischaemic encephalopathy remains number one but has declined by 10%. HIV infection came in at number five (3.6%).

Patient associated avoidable factors remain the largest category at 39.8%. Are these factors indicating a gap in providing antenatal services? Medical personnel associated factors (31%) relate to patient monitoring and referral and administrative problems (27.7%) highlight inadequate equipment and staffing.

Future Plans
Saving Mothers Saving Babies Project

Case Studies

The two sites where data is available for a longer period of time are Uitenhage and Settlers Hospital.

Uitenhage Hospital

Despite the increase of deliveries from 250 per month in 1998 to 400 in 2006, the PNMR ≥1000 g remained constant.

PNMR>1000gm Uitenhage Hospital
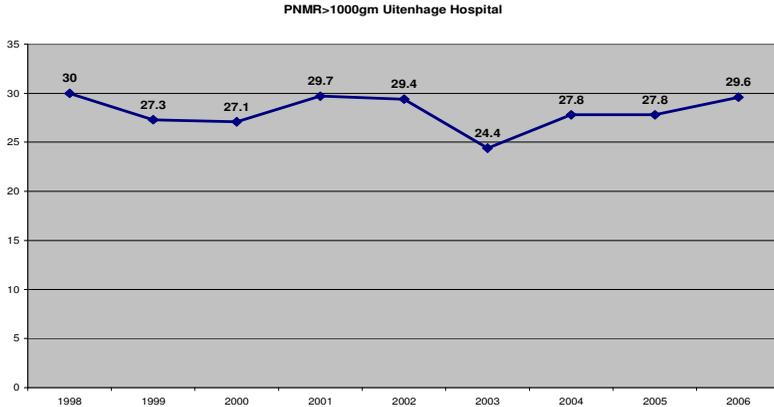
Settlers Hospital

The number of deliveries remained at an average of 150 but a decline is noted in the PNMR from 34.1 in 1999 to 21.8 in 2006.

PNMR>1000gm Settlers Hospital
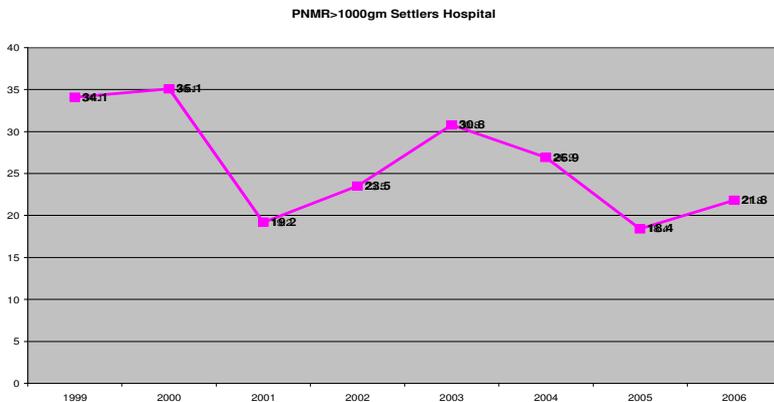
Free State

Provincial basic minimum data set

The perinatal data presented in this report is data collected from all 30 Free State provincial hospitals (25 district hospitals, 4 regional hospitals and one tertiary hospital), and community health centres (CHC) via the intranet database, and is stratified per health district (5 in the Free State). This data is collected "passively" on a monthly basis with regular maintenance and occasional spot-checks performed. Data from the community health centres was collected via the Primary Health Care (PHC) basic data set. Data from the private health facilities in the Free State has not been included in this report. The data presented in this report is that collected for the following periods:

a) 1 July 2003 to 30 June 2004
Of the 47 423 births registered in these public facilities over this period, 8835 (**18.6%**) were from CHCs, 26 396 (**55.6%**) were from level one hospitals, 11 637 (**24.5%**) from level two hospitals and 555 (**12%**) from the tertiary hospital.

b) 1 January 2005 – 31 December 2005
There were 52 854 births registered in these public facilities for the year 2005. When analyzing the first six months of data (January – June 2005) it is apparent that **17.4%** of these births were supervised in CHCs. Level one hospitals supervised **49.7%** of all births in the Free State, level two hospitals **15.2%** and the level three hospital **0.3%.**

With the format in which the data was received it was not possible to include in this analysis the deliveries for the second part of the year, as the method of collection changed slightly. However there is little reason to believe that these proportions have changed during the latter half of the year.

c) 1 January 2006 – 31 December 2006
There were 57 976 births registered in these public facilities in the Free State for the year 2006. This shows an increase of 9.7% from the previous year's reported figure of 52 854. From this data it is apparent that **18.4%** of these births were supervised in CHCs of the province. Level one hospitals supervised **55.8%** of all births in the Free State, level two hospitals **24.7%** and the level three hospital **1%**. Of the births counted, 5223 (9%) were born before arrivals (BBAs).

	Deliveries	C/S %	Ass Del %	PNMR /1000[*]	NNMR /1000[*]	LBW %	Teen/preg %	Above 35 yrs %
Free State Total	*47423*	*15.7*	*1.8*	*44.8/ 31.4*	*17.4 / 13.4*	*17.7*	*25.6*	*14.3*
Xhariep DC 16	1649	1.5	1.3	31.5 / 26.1	10.5 / 9.3	13.8	44.1	8.7
Motheo DC17	14192	20.6	3.6	42.0 / 24.5	16.4 / 12.6	17.3	20.2	9.9
Lejweleputswa DC 18	10484	13.4	1.0	50.2 / 38.9	20.9 / 15.5	15.9	19.7	19.6
Thabo Mofutsanyane DC 19	12774	14.1	0.7	48.3 / 35.8	17.2 / 13.9	17.4	27.7	19.5
Northern Free State DC 20	8324	15.6	1.5	40.0 / 28.0	15.5 / 12.1	21.8	35.4	8.4

[*] - ≥500 g /≥1000g

Note:
The upper figures in the perinatal and neonatal mortality rates columns are the rates per 1000 births, whereas the lower figures are calculated for the ≥ 1000 g category only.

Table 2: Perinatal Data: Free State Province Per district. January-December 2005

	Deliveries	C/S %	Ass Del %	PNMR /1000[*]	NNMR /1000[*]	LBW %	Teen/preg %	Above 35 yrs %
Free State Total	*52 854*	*15.1*	*1.6*	*335/ 24.5*	*14.2 / 9.8*	*13.3*	*18.7*	*8.9*
				≥ *1000g*	≥ *1000g*			
DC 16 Xhariep	1718	5.3	2.1	20.5	7.8	18.5	27.0	7.3
DC 17 Motheo	15517	18.9	2.8	37.7	15.6	15.2	18.8	10.5
DC 18 Lejweleputswa	11378	14.1	0.9	39.4	16.3	13.3	21.9	11.3
DC 19 Thabo Mofutsanyane	14781	13.3	1.0	33.3	21.4	15.3	24.6	13.8
DC 20 Northern Free State	8228	15.3	1.3	22.0	7.0	13.6	25.8	7.4

[*] - ≥500 g/≥1000 g

Note:

1. The upper figures in the perinatal and neonatal mortality rates columns are the total rates per 1000 births, whereas the lower figures are calculated for the ≥1000 g category only.

2. The caesarean section rates as calculated above do not include the reported BBAs. Should they be included in the rate calculation, then the Free State caesarean section rate drops to 13.7%.

Table 3: Perinatal Data: Free State Province, per district, January-December 2006

	Deliveries	C/S %	Ass Del %	PNMR /1000 ≥1000 g ≥500 g	ENMR /1000 ≥1000 g ≥500 g	LBW %	Teenage delivery rate %	Above 35 yrs del rate %
Free State Total	*57 976*	*15.4*	*1.3*	*24.1* *33.0*	*8.9* *11.9*	*136*	*16.4*	*9.5*
Xhariep DC 16	2153	0.3	1.5	20.0 *23.7*	10.4 *11.8*	13.4	19.7	8.8
Motheo DC 17	17 001	20.5	2.0	21.1 *34.9*	9.4 *12.2*	14.9	15.7	10.6
Lejweleputswa DC 18	12 752	14.0	0.8	26.8 *35.4*	7.5 *10.8*	14.1	18.0	10.2
Thabo Mofutsanyane DC 19	16 480	13.5	0.9	27.0 *32.8*	7.6 *9.8*	12.7	19.5	9.4
Fezile Dabi DC 20	9 590	14.7	1.0	22.7 *28.6*	3.8 *5.6*	14.4	18.3	8.7

The caesarean section rates as calculated above include the born before arrival (BBA) figures and therefore are lower than previously reported, but in all likelihood reflect a picture closer to the true figure.

The high caesarean section rate and slightly higher PNMR in the Motheo district is explained by the fact that two hospitals in this district act as referral hospitals, and that the majority of patients in the Xhariep district needing caesarean sections are referred to Motheo district. This in turn explains the low caesarean section rate in Xhariep.

It is clear that the overall PNMR is high in the Free State but the rate becomes more favourable if only babies ≥1000 g are considered. It is encouraging to see that the PNMR in the Free State has decreased steadily over the last few years. This may well reflect a true overall trend over the years. These figures are slightly lower than the national figures from the PPIP data. The decrease in PMNR seems slightly greater than could be explained simply by the additions to the denominator that have been mentioned as the databases became more developed over the years.

As the format in which the PHC data was received does not have the detailed weight categories, all deliveries have been included in the calculation of perinatal and early neonatal mortality rates, even in those calculations for the mortality rate ≥1000 g. This assumes that very few babies below ≥1000 g are born in the community health centres.

The BBAs have now been added to the denominator in the calculations of the perinatal mortality rates reported for this period. A separate calculation of the perinatal mortality rate for the BBA babies reveals a higher rate, especially so in the Motheo district, of 88.5/1000.

Table 4: Comparison of the teenage delivery rates over the years per Free State districts

	2001	*2002*	*2003*	*2004*	*2005*	*2006*
Free State Total	**20.4**	**17.7**	**22.0**	**25.6**	**18.7**	**16.4**
DC 16 Xhariep	24.8	19.0	31.0	44.1	27.0	19.7
DC 17 Motheo	18.6	15.1	21.0	20.2	18.8	15.7
DC 18 Lejweleputswa	19.2	19.0	20.0	19.7	21.9	18.0
DC 19 Thabo Mofutsanyane	22.0	20.7	25.0	27.7	24.6	19.5
DC 20 Northern Free State	20.8	14.9	20.0	35.4	25.8	18.3

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The teenage delivery rate has shown an upward trend over the years. The sharp rise reported in the 2004 report especially for the Xhariep district was subsequently found to be due to a coding error. However, even after correction, the high rates persist in this district

PPIP sites only

As the majority of the PPIP sites in the Free State have been operational for three years it was thought useful to present them for that entire period. The primary cause of perinatal deaths for each site is reflected in Table 5. The timeframe for the dataset used for this analysis was mainly January 2003 to December 2005. For Pelonomi Hospital the period is January – December 2005. Data of Thusanong and Diamond Hospitals are not included in this report due to incomplete PPIP databases. Universitas Hospital data is also not included due to the tertiary nature of the service provided at that facility, painting a very different picture. That latter site will be included in future reporting, once the program has run for a meaningful analysis period.

In Table 5 it can be seen that many of the district hospitals show neonatal asphyxia as the most common cause of perinatal mortality. This may well be a function of the fact that there are insufficient midwives allocated to district hospitals to supervise patients in labour. Training in the early recognition and rapid management of fetal distress may well improve this situation. Unexplained intrauterine death remains a disturbingly frequent cause of perinatal deaths. In many sites it appears as among the top two causes. The third most common cause of perinatal deaths is spontaneous preterm delivery. In district hospitals a preventable cause of deaths of these newborns is the lack of facilities to look after very low birth weight infants. Should kangaroo care be available with sufficiently staffed and supported units, many of these babies should survive the neonatal period.

Table 5: The primary cause of perinatal deaths for each PPIP site in the FS (Jan 2003 – Dec 2005).

Bongani	Botshabelo District	Pelonomi	Dr JS Moroka	Embekweni	Katleho	Mantsopa	National District	Stoffel Coetzee
IUD (24%)	Asphyxia (26%)	APH (24%)	Asphyxia (30%)	Spon preterm labour (37%)	IUD (41%)	IUD (33%)	Asphyxia (30%)	Spon preterm labour (40%)
HT (24%)	IUD (23%)	Spon preterm labour (21%)	Spon preterm labour (19%)	IUD (23%)	Spon preterm labour (20%)	Asphyxia (30%)	IUD (16%)	Asphyxia (32%)
Spon preterm labour (20%)	Spon preterm labour (22%)	IUD (11%)	HT (16%)	Asphyxia (21%)	Asphyxia (14%)	Spon preterm labour (17%)	HT (11%)	IUD (15%)
Asphyxia (13%)	APH (10%)	HT (10%)	IUD (16%)	APH (9%)	HT (13%)	APH (8%)	Spon preterm labour (11%)	HT (6%)
APH (12%)	HT (8%)	Asphyxia (10%)	APH (7%)	Trauma (3%)	APH (7%)	HT (3%)	IUGR (11%)	Birth Defects (6%)

Table 6: Avoidable factor per PPIP site in the Free State (Jan 2003 – Dec 2005).

	Bongani	Botshabelo District	Pelonomi	Dr JS Moroka	Embekweni	Katleho	Mantsopa	National District	Stoffel Coetzee
Patient related	43%	14%	26%	12%	8%	48%	24%	30%	30%
Admin related	16%	33%	16%	22%	44%	20%	15%	20%	30%
Health worker related	40%	34%	50%	42%	32%	22%	34%	50%	43%

When analyzing the figures of the Botshabelo District, considering hospital and community facilities separately, the value of looking at a district as a whole is clearly demonstrated. The hospital perinatal mortality rate seems very high when examined in isolation, yet when viewed as the entire district served, the indicators fall into acceptable ranges. This supports the argument that referrals to the hospital are appropriate within the local context.

In analysing the avoidable factors that <u>probably</u> have lead to the deaths in these facilities, the variation in factors found is of interest (Table 6). The different institutions experience different dynamics. Yet the most common avoidable factors could be found with the health care workers, mostly related to inadequate intrapartum observation and poor recognition of antenatal risk factors. The patient related factors vary between institutions, the main reason being late presentation to the health service. Administrative factors are being identified more frequently as the analysis progresses, and mainly relate to the lack of facilities for specific care e.g. neonatal care facilities. Lack of transport is not that commonly identified as a preventative factor, however it could make up a significant amount of those "late presentation of patients to facilities" if categorized differently.

One PPIP site

For the period <u>January to December 2006</u> it was difficult to amalgamate the data from the PPIP sites for the Free State due to technical reasons. However, a secondary hospital that has collected good data is worth looking at as an institution. In the past, the Free State reports have had a strong bias in reporting on level one institutions. This report now contains the data of a level 2 institution for comparison. This site covered 4156 deliveries during this period. The perinatal mortality rate was 63.3/1000 from the PPIP database (84/1000 if calculated from the provincial basic minimum data set). The ENMR was calculated as 26.6/1000. This is higher than previously reported but reflects a service provided by a referral institution.

In this hospital:
The top 5 primary obstetric causes of perinatal deaths:
- ➢ Spontaneous preterm births   31.0%
- ➢ Hypertensive disorders   19.5%
- ➢ Ante-partum hemorrhage   14.0%
- ➢ Infections   8.0%
- ➢ Intra-partum asphyxia   6.6%

The top 3 final neonatal causes of death:
- ➢ Hypoxia   32.2%
- ➢ Infection   32.2%
- ➢ Immaturity related   20.7%

Proportion of deaths with avoidable factors:
- ➢ Patient related   31.2%
- ➢ Administrative related   30.0%
- ➢ Health worker related   33.2%

The top 3 avoidable factors:
- ➢ Inappropriate response to poor fetal movement   13.3%
- ➢ Never initiated antenatal care   13.3%
- ➢ Insufficient notes   6.7%

As this is a referral institution, it is not surprising that the most common primary cause of perinatal death is spontaneous preterm labour. Also, hypertensive disorders are referred to this institution and this is reflected in the relatively high rate of perinatal deaths. It is of note that the top causes of neonatal deaths were recorded as hypoxia and infection. Having a paediatrician-run service at this facility reporting such a high incidence of infections in neonates, it seems likely that the low rate reflected in previous reports is more a reflection of underreporting than the absence of the disease. When considering the avoidable factors, this institution has a similar breakdown as the rest of the PPIP sites countrywide, with inappropriate response to fetal movements being the most frequent.

Summary

In recent years, there has been a slight decrease in the reported perinatal mortality rates in the Free State health districts. The perinatal indicators for the ≥1000 g category compare favourably with other areas in the country. Intrapartum asphyxia still contributes to a high proportion of deaths of babies in the Free State PPIP sites, especially in level one institutions. The majority of avoidable factors found for perinatal deaths in the Free State remain in the domain of the health care workers themselves.

Gauteng Province

Introduction

This is an attempt by the province to assess progress towards the implementation of MDG-4 in Gauteng. The target of the MDG-4 is a two-thirds reduction in under-five mortality between 1990 and 2015. In order to meet the MDG-4 more attention is needed to reduce perinatal and neonatal deaths.

Policy and implementation

Number of PPIP sites

Hospitals	22
Districts	6
Number of baby-friendly hospitals	14
Number of KMC hospitals	22
Percentage of PHC facilities implementing IMCI	84[1]
Elimination of neonatal tetanus	Yes
Maternal Neonatal and Child Health Framework Group	Yes

PPIP sites with electronic data

Reg.	District	Hospital	MOU
A	Johannesburg Metro	Johannesburg	
	West Rand District	Carltonville	-
		Leratong	
B	Ekurhuleni Metro	Far East Rand	
		Pholosong	
		Thembisa	
			J Dumane
			Kwa-Thema
			N Ngwenya
			P Moyo
			Phola Park
			Sangweni
	Sedibeng District		Boipatong
			Levai Mbatha
C	Tshwane Metro	Kalafong	
		Dr G Mukhari	
		Pta West	
	Metsweding District		-

Population

Total population   8 837 178[1]
Annual births   44 278[2]

Mothers

Proportion of women who attended antenatal care   120.1[3]
Proportion of teenage pregnancy *(%)*   6.2[3]
Syphilis serology[3]

       Positive   2.5%
       Negative   71.3%
       Unknown   26.0%

Maternal mortality *per 100 000 live births*   *167 (2004)*

Mode of delivery

Mode	2006 (*2005*)
Spontaneous Vaginal	74.1% (*69.2%*)
Caesarean Section	23.0% (*27.3%*)
Assisted Vaginal	0.8% (*1.1%*)
Vaginal Breech	1.6% (*1.3%*)

Neonates (≥1000 g)

PNMR   25.5 / 1000
NNDR   9.4 / 1000
Stillbirth Rate   18.2%
SB to NND ratio   1.7 to 1
Low Birth Weight Rate   16.3%
PCI   1.60

Birthweight g	PNMR 2006	*PNMR 2005*	NNDR 2006
500 – 999	759.9	*713.9*	639.0
1000 – 1499	308.6	*327.1*	173.6
1500 – 1999	148.1	*154.0*	60.7
2000 – 2499	50.6	*64.3*	13.1
>2500	9.7	*11.5*	3.4

Primary obstetric causes of death

Cause	No.	%
Unexplained intrauterine death	196	28.5
Spontaneous preterm labour	93	13.5
Intrapartum asphyxia	92	13.4
Hypertensive disorders	78	11.3
Antepartum haemorrhage	72	10.5
Fetal abnormality	51	7.4
Infections	42	6.1
Trauma	26	3.8
Maternal disease	16	2.3

Final causes of neonatal deaths

Cause	No.	%
Hypoxia	80	32.1
Immaturity related	69	27.7
Congenital abnormalities	42	16.9
Infection	41	16.5
Other	11	4.4

Avoidable factors

Category	%
Never initiated antenatal care	18.3
Inappropriate response to poor fetal movements	13.2
Booked late in pregnancy	11.1
Delay in seeking medical attention during labour	6.9
Fetal distress not detected intrapartum; fetus monitored	3.7

Provincial achievements on programmatic activities

Planned:	Continue district training programme
Actual:	12 training sessions held: 2 per District with 25 participants attending
Planned:	Community capacity building programme
Actual:	Dissemination of Saving Mothers 2002 – 2004 report workshop held
Planned:	District to conduct focused perinatal mortality meetings based on draft provincial pmm – finalize 2007 / 2008
Planned:	District to hold district PPIP workshop 3 months before provincial workshop – 5 held
Actual:	Provincial workshop held on 2 August 2006 and attended by 36 participants

Future plans

Assess progress on implementation of PPIP / KMC and MBFHI in the former North West Province health facilities (hospitals and midwifery-obstetric units)
Continue District-based follow-up community dissemination of the Saving Mothers Report 2002 - 2004
Coordinate the Maternal Neonatal and Child Health Framework Group
Continue and institutionalize district training and audit programmes

References

1   Census 2001

2   Perinatal Problem Identification Programme (PPIP) 2005 / 2006

3   District Health Information System (DHIS) 2005 / 2006

KwaZulu-Natal

From October 2003 to March 2006, there were 59 495 deliveries at the PPIP sites which were collecting data and sending it to MCWH. The co-ordination of the PPIP process was taken over by MCWH after Dr Raymond emigrated at the end of 2005.

To date, there are 29 PPIP registered sites in KZN. However, only 13 continue to collect and send their data, and even then, some of it is fragmented. These stalwart sites are located in Metropolitan (3), City & Town (3), and rural areas (7).

Throughout 2006, four workshops were held to recruit more sites – some 16 new sites were trained. For various reasons, most are not submitting data to MCWH. After the first workshop, it was decided that 3 different categories of staff needed to be invited to each workshop – the FIO (facility information officer), an MO working in maternity, and a midwife (preferably an advanced midwife). The PPIP v2.1 program was installed in their computers. It was also decided to register the new sites **before** the respective workshop, to ensure their smooth entry into the program. **Midway** through 2006, the KZN e-mail address changed, but this information was communicated to all registered sites.

In addition, a very obscure problem relating to data entry was encountered, in which data from some sites could not be imported into the program. Consultation was extensive, and fortunately the problem was solved around the time of the deadline, so this data could be included in the present report. One or two sites are sending data in a format different from the acceptable format, and will need to be contacted to correct this. Some sites, viz. KEH, Stanger and EG Usher Memorial hospitals, submitted data, but this was found to be outside the stipulated time period, and so was not included. Other sites, it appears, are collecting data but not submitting it.

No provincial workshop was held in 2006 to amalgamate the PPIP data because so few sites appeared to be capturing data. Some sites still seem to be using PPIP v1.0 – these need to be upgraded to PPIPv2.2. At some sites, the persons previously capturing the data, have moved on, **taking their laptops and the program with them.**

Perinatal Outcome

Data from **Port Shepstone, GJCrookes, Mahatma Gandhi, Murchison, Mseleni, Mosvold, Addington, Catherine Booth H, KEH, Stanger**

and EG Usher Memorial, was imported into the program, but Montobello and St Andrews are the sites submitting data in the unacceptable format.

Perinatal Indicators
Total deliveries (≥500g) were 59 495, of which 58 921 deliveries weighed ≥1000g (99% of the total).

	Oct 2003 – Mar 2006 (≥1000 g)	≥500 g	Oct 2002 – Sept 2003 (weight category not stated)
Total births	58 921	59 495	37 018
Total deaths	1169	1575	
Total NND	381	513	
PNMR/1000 births	19.8	26.5	34.1
NNDR/1000 live births	6.6	8.8	15
SB rate/1000 births	13.4	17.9	25
SB:NND ratio	2.1 : 1	2.1 : 1	1.4 : 1
LBWR/100 births	12.0	12.8	14.9
PCI	1.7	2.1	2.3

Table 1. Comparison between current data (both ≥1000 g and ≥500 g) and data for the previous provincial report

PNMR by Weights	500 – 999 g	1000 – 1499 g	1500 – 1999 g	2000g – 2499 g	2500+ g
	707.3	413.4	128.0	41.6	8.9

1. **Syphilis serology**
   - Result unknown **93%** of births
   - Negative **7%**
   - Positive **<1%** (44 cases)
2. **HIV serology:**
   - Result unknown **86.7%** of births
   - Negative **9.1%**
   - Positive **4.2%**
3. **Antenatal care:**
   - Attended ANC **51.1%**
   - No ANC **2.5%**
   - Unknown **45.9%**
4. **Maternal age:**
   - <18 y **5.5%**
   - 18 – 19y **12.6%**
   - >34y **5.1%**

5. Multiple pregnancies:

Total of multiple pregnancies   **641** (1.1% of all pregnancies)
Total number of babies   **1349** (2.3% of all babies)

6. Born before arrival: **2.8%**

7. Mode of delivery:
     a. Spontaneous vaginal **68.0%**
     b. Caesarean section **24.2%**
     c. Assisted vaginal **1.4%**
     d. Vaginal breech **0.6%**
     e. Unknown **5.7%**

8. Obstetric causes of perinatal deaths (≥1000 g)   **(≥500 g)**

	(≥1000 g)	(≥500 g)
Intrauterine death	**26.1%**	**(25.9%)**
Intrapartum asphyxia	**20.1%**	**(15.5%)**
Spontaneous PTL	**13.7%**	**(21.7%)**
Antepartum haemorrhage	**11.4%**	**(9.7%)**
Hypertension	**8.7%**	**(9.7%)**
IUGR	**5.1%**	**(4.0%)**
Infections	**4.7%**	**(4.5%)**
Abnormalities	**4.7%**	**(4.1%)**

9. Final causes of neonatal deaths (≥1000 g)   **(≥500 g)**

	(≥1000 g)	(≥500 g)
Hypoxia	**44.4%**	**(34.4%)**
Immaturity	**26.1%**	**(41.8%)**
Infections	**13.9%**	**(11.7%)**
Cong. Abn.	**6.9%**	**(5.5%**
Unknown	**5.8%**	**(4.5%)**

10. Avoidable factors (≥500g; % of deaths – probable cause):

Patient-associated   **18.5%** - (concerning ANC **11.7%**)
Administration   **6.0%** - (shortage of MO/ADMs **1.9%**;
                 - lack of transport **1.4%**)
Medical Personnel   **19.5%**
         - (fetal distress not detected intrapartum **3.6%**;
         - Response to poor fundal height or HT **3.7%**)
Unclassified   **5.9%**

11. Ten commonest probable avoidable factors, (≥500 g - % of deaths):

Booked late	**7.7%**	(Patient-related- ANC**)**
Inappropriate response to decreased FM	**3.2%**	(Patient-related-ANC)
Unbooked	**2.6%**	(Patient-related-ANC)
Fetal distress not detected, was monitored	**2.0%**	(Intrapartum care)
No response to IUGR	**2.0%**	(Antenatal care)
Staff shortage	**1.9%**	(Administrative)
Delay in seeking medical help	**1.8%**	(Patient-rel -?intrapatum)
No response to hypertension	**1.7%**	(Antenatal care)
F/D not detected intrapartum, not monitored	**1.6%**	(Intrapartum care)
Prolonged Second stage – no intervention	**1.4%**	(Intrapartum care)

Recommendations:

   a. **Get existing PPIP sites functioning properly**

   b. **Ensure PNMMs (audits) at all hospitals**

   c. **Outreach programs -** It is proposed that in 2007, each site be visited individually, for on-site, hands-on, in-service training, in addition to convening a provincial workshop to encourage all PPIP sites to resurrect their practices of submission of data and to improve the care in each institution.

   d. **To save more babies:** The commonest avoidable factors fall into 3 groups, and it is to these 3 groups that recommendations should be directed:

            Antenatal care
            Intrapartum care
            Administrative factors

    1. **Antenatal care:** The BANC (Basic antenatal care) program should be continue to be rolled out. Health care professionals and the community should be educated about booking early, and monitoring of fetal movements. Also, the importance of making alternative transport arrangements (in case of emergency) should be emphasized.

    2. **Intrapartum care:** The aim to have one nurse per 1labouring ward bed should be the ideal. This would ensure better monitoring and management in labour. In the short term, in-service training is essential.

    3. **Administrative factors:** The staff shortage, both of midwives and medical officers, should be addressed, to ensure better overall care of the pregnant woman.

Comment:

1. Syphilis and HIV results may not be complete as some may have been omitted.

2. The number of teenage (<18 y) pregnant women is almost double the >34 y category. Family planning strategies may need to focus on contraception for the teenage group.

3. The top 5 obstetric causes of perinatal deaths are the same as in the national figures, while hypoxia as a cause of neonatal death (44.6%) is higher than the national figure.

4. KZN HIV results are higher than in other provinces, but are the same as a cause of perinatal deaths nationally, so the role of HIV as a cause of death amongst **neonates** may not be as significant as it is amongst children.

While there may be a lack of emphasis on neonatal care in the assessment of cases, neonatal care is important to reduce the negative effects of preterm labour. Kangaroo mother care, CPAP, and protocols of management should be promoted.

Limpopo Province

Introduction

Limpopo Province has a surface area of 123 000 km², making up 10% of South Africa's land area. Its population is just above 5.5 million, constituting 12.8% of the country's population. It is mainly a rural province. Women of reproductive age are estimated to number above 1.4 million.

There are 35 level 1 hospitals, 7 level 2 hospitals and one level 3 hospital, the Polokwane-Mankweng Complex. Private institutions are not included in this report. Each provincial sub-district has numerous local clinics where nearly a third of the total deliveries occur. The estimate home delivery rateis 19%. Limpopo Province has been understaffed, mostly in numbers of doctors in general, with a particular shortage of obstetricians and paediatricians.

PPIP current situation

Every hospital in the province has the latest PPIP version installed and running. Several workshops and training sessions were conducted during 2006. Personnel from IT Departments in nearly all institutions were trained on the use of the program and they assist with the implementation, data entry, data submission and reports. Nurses and doctors working in maternity units were also trained on the use of the program. District, hospital and unit managers were requested to implement the program and use it during their Perinatal review meetings. Personnel in level 2 hospitals are working to become district coordinators who will receive electronic data from sub district institutions and produce district reports. PPIP will be the standard format for presenting perinatal statistics during maternity outreach programs which are conducted on a monthly basis at every district by the MCWH directorate.

PPIP sites and data collection

Data used in this provincial report was collected from 15 PPIP sites, as the remaining submissions were inconsistent or unreliable. One is a level 3 hospital, three are level 2 hospitals and nine are level 1 hospitals. Reporting periods varied from institution to institution but most included January 2005 to August 2006. Data collected are institutional only.

Data analysis

Rates were calculated using detailed perinatal death data.

Total deliveries data according to weight categories:

Weight Categories	Stillborn	Neonatal death	Alive on discharge	Total
500-999 g	136	99	180	415
1000-1499 g	177	131	492	800
1500-1999 g	153	74	1344	1571
2000-2499 g	179	54	3949	4182
2500+ g	336	193	42874	43403
Total	981	551	48839	50371

Other indicators for all births ≥1000 g:

C/S rate:	12.8%	SB/NND ratio:	1.8:1
Assisted delivery rate:	0.4%	BBA:	2.6%
LBWR:	13.8%		
Attended antenatal care:	89.6%		
PCI:	1.90		
Teenage pregnancy:	19.5%		

Provincial perinatal care indices according to weight categories per 1000 births:

Weight category	PNMR	NNMR	ENNMR	FD ratio	FD rate
All	30.4	11.2	10.4	19.9	19.5
All ≥1000 g	26	9.2	8.6	17.2	16.9
500 – 999 g	566.3	354.8	333.3	487.5	327.7
1000 – 1499 g	385	210.3	179.8	284.1	221.3
1500 – 1999 g	144.5	52.2	47.2	107.9	97.4
2000 – 2499 g	55.7	13.5	13.2	44.7	42.8
2500+ g	12.2	4.5	4.4	7.8	7.7

Primary obstetric causes of perinatal deaths (≥1000 g)

Description	% of total
Unexplained intrauterine death - macerated	24
Labour related intrapartum asphyxia	11.5
Idiopathic preterm labour	10.7
Unexplained intrauterine death - fresh	7.8
Meconium aspiration	4.5
Proteinuric hypertension	4.2
Abruptio placentae	2.5
Cord prolapse	1.9
Cord around the neck	1.5
Eclampsia	1.2

Final causes of neonatal deaths (≥1000 g)

Description	% of total
Hyaline membrane disease	15.5
Meconium aspiration	14.6
Hypoxic ischaemic encephalopathy	13.1
Extreme multi-organ immaturity	2.9
Chromosomal abnormality	2
Hypothermia	2
Respiratory (incl. diaphragmatic hernia)	1.8
Aspiration pneumonia	1.5
Sudden Infant death Syndrome (SIDS)	1.5
Other (incl. multiple & skeletal)	1.1

Avoidable Factors

Avoidable factors in stillborns (≥1000 g)

Description	% of total
Patient associated	61.7
Inappropriate response to poor fetal movements	32.3
Delay in seeking medical attention during labour	12.6
Never initiated antenatal care / Booked late in pregnancy	9.5
Inappropriate response to antepartum haemorrhage	1.9
Failed to return on prescribed date	0.9
Medical personnel associated	18.9
Fetal distress not detected intrapartum; fetus monitored / not monitored	3.3
Delay in referring patient for secondary / tertiary treatment	2.4
No response to maternal hypertension	2.2
Management of 2nd stage: prolonged with no intervention	0.8
Medical personnel underestimated fetal size	0.8
Administrative problems	10
No syphilis screening performed or result not returned to hospital / clinic	2.4
Personnel not sufficiently trained or too junior to manage the patient	2.2
Lack of transport - Home to institution / Institution to institution	2
Insufficient nurses on duty/doctors available to manage the patient adequately	1
Inadequate facilities/equipment in neonatal unit/nursery/theatre/resuscitation	0.9

Avoidable factors in neonatal deaths (≥1000 g)

Description	% of total
Patient associated	41.2
Delay in seeking medical attention during labour	17.8
Unbooked / Booked late in pregnancy / Infrequent visits to antenatal clinic	13.8
Inappropriate response to rupture of membranes	2
Inappropriate response to APH / poor fetal movements	1.2
Delay in seeking help when baby ill	0.6
Medical personnel associated	37.8
Neonatal care: inadequate resuscitation / monitoring / management plan	6.6
Delay in calling for expert assistance / referring for secondary/tertiary treatment	5
Fetal distress not detected intrapartum; fetus monitored/not monitored	4.8
Poor progress in labour, but partogram not used / not used correctly	4
Medical personnel underestimated fetal size	1.8
Antenatal steroids not given	1.6
Administrative problems	33.2
Personnel not sufficiently trained to manage the patient adequately	9.8
Inadequate facilities/equipment in neonatal unit/resuscitation/neonatal transport	8.4
No accessible neonatal ICU bed with ventilator	4
Lack of transport - Home to institution / Institution to institution	4
Personnel too junior to manage the patient	2.8
Insufficient nurses on duty/doctors available to manage the patient adequately	1

Future Plans

PPIP usage
1. Strengthening current PPIP sites to ensure sustainability.
2. Train current users and newly recruited personnel on PPIP usage.
3. Create a stable electronic PPIP data flow to a district and provincial coordinator.
4. PPIP format and data to be the standard when perinatal statistics are presented and analyzed.

Improving perinatal mortality
1. Promote early booking and initiating antenatal care on confirmation of pregnancy.
2. Implement syphilis serology rapid testing at all levels of antenatal care.
3. Use of standard management protocols in general and the use of the partogram in particular in all institutions performing deliveries.
4. In-service training on neonatal care and resuscitation of the newborn.
5. Staffing and equipment norms must be addressed.
6. To develop and implement referral criteria protocols and referral routes. Availability of transport must be addressed.
7. To implement monthly quality checks of antenatal and labour records
8. To hold regular perinatal review meetings in every institution performing deliveries.

Institutions included in this report

Unit	Period reported	Total deliveries
Dilokong Hospital	Jan 2006 - Aug 2006	1968
Ellisras Hospital	Apr 2005 - Jun 2006	1303
George Masebe Hospital	Jan 2005 - Jul 2006	1804
Helene Franz Hospital	Jan 2005 - Jun 2006	4359
Jane Furse Hospital	Jan 2006 - Jul 2006	2636
Malamulele hospital	Jan 2005 - Aug 2006	5120
Matlala hospital	Jan 2006 - Aug 2006	1258
Mecklenburg Hospital	Jan 2006 - Aug 2006	1750
Mankweng Hospital (L-3)	Jul 2005 - Jun 2006	6068
Maphutha Malatjie Hospital	Jan 2005 - Mar 2006	2981
Mapulaneng Hospital (L-2)	Jan 2005 - Jan 2006	4645
Nkhensani Hospital	Jan 2006 - Aug 2006	3056
St Ritas Hospital (L-2)	Jan 2005 - Aug 2006	7850
Warmbaths hospital (L-2)	Jan 2005 - Jul 2006	5119
WF Knobel Hospital	Jan 2005 - Jul 2006	3204

Mpumalanga Province

Introduction
Mpumalanga Province is situated in the eastern part of South Africa and is bordered by 4 of the 9 provinces: namely Gauteng, Free State, KwaZulu-Natal and Limpopo. It also shares international borders with two countries: Mozambique and Swaziland. The location of the province subjects itself to cross-border influx of patients from the neighbouring provinces as well as the two neighbouring countries. The Province is made up of three district municipalities, namely Ehlanzeni, Nkangala and Gert Sibande.

With the disestablishment of cross-boundary areas, the Bushbuck Ridge local municipality from the former Bohlabela district municipality (Limpopo Province) is included into the Ehlalzeni District. As part of this process, Mpumalanga province inherited the district management area South of the Olifants river in the Kruger National Park. In addition, the former Sekhukhune cross-boundary district has been transferred to Limpopo Province and the former cross-boundary area of Kungwini has been transferred to Gauteng.

Mpumalanga Province has an estimated population of 3.5 million (7.4% of the country's population). The population of the province is relatively young, with 35% <15 years of age. The Province is mostly rural, 66% of the population living in rural areas, with all the problems associated with a rural environment. The largest rural population is in Ehlanzeni district because of the addition of Bushbuck Ridge. In general, rural areas have a lower rate of formal employment and therefore a lower per capita income, which results in higher dependency on the public health system for health needs. The Provincial unemployment rate is 26.9% and the total dependency ratio is 64%. These levels in the province place a high demand on public health resources.

PPIP sites
The province has 26 hospitals of which 25 are collecting PPIP data (Table 1). In 1996 it started with 5 PPIP sites, in 2002 there were 10 sites and this increased to the current 25 hospitals and 2 CHC. The goal for 2006 is to make all CHCs in the Province PPIP sites.
The level of care is as follows:
> Level 3: n=1
> Level 2: n=3
> Level 1: n= 22

For this chapter, a comparison was made between 2005 and 2006, and data from only 19 hospitals and 2 CHCs data was used. The reason for not using all sites may be seen in Table 1.

The total deliveries per annum in this report (Table 2) make up about two thirds of the total annual deliveries recorded in the province (about 65 000).

Staff component
In the province there are 5 paediatric consultants, 4 paediatric MOs, and 2 obstetric consultants. Overall there are 1.3 specialists per 100 000 population. No neonatal bed plan.

Table 1: PPIP sites included for 2005 – 2006

Ehlanzeni (n=6)	Gert Sibande (n=7)	Nkangala (n=6+2 CHC's)
Rob Ferreira – Level 2 Themba – Level 2 Barberton – Level1 Lydenburg – Level 1 Sabie – Level 1 Matibidi – Level 1	Ermelo – Level 2 Standerton – Level 1 Embhuleni – Level 1 Carolina – Level 1 Piet Retief – Level 1 Bethal – Level 1 Evander – Level 1	Witbank – Level 3 Middelburg – Level 1 Belfast – Level 1 Waterval Boven Level 1 KwaMhlanga - Level 1 Bernice Samuel – Level 1 Phola clinic Siposensimbi CHC
Not included Shongwe – Level 1 (only 1 year data) Tonga – Level 1 (Only 1 year data) Mapulaneng - from Limpopo Matekwane – from Limpopo Tintswalo – from Limpopo	**Not included** Amajuba – Level 1 (Not a PPIP site yet)	**Not included** Mmametlake – Level 1 (only 1 year data)

Table 2: PPIP basic data

	2005	2006	TOTAL
Total number of births	41 041	40 437	81 478
PNMR	35.5	37.6	36.5
PNMR ≥1000 g	28.8	30.7	29.7
NNDR	11.9	12.6	12.3
NNDR ≥1000 g	9.4	9.7	9.5
LBWR	14.4%	14.6%	14.5%
PCI	2.00	2.10	2.00

Table 3: PPIP data by hospital level

Data source	PNMR <2.5 kg	PNMR ≥2.5 kg	NNDR <2.5 kg	NNDR ≥2.5 kg	NNDR 1-1.5 kg	LB W%	PCI
Level 1 hosp *No. births = 47 532*	193.5	14.7	80.1 (60-100)	4.3	300.7	12.4	2.6
Level 2 hosp (n=3) *No. births = 21 954*	178.3	12.1	**178.3**	12.1	**234.5**	14.9	1.9
Level 3 hosp (n=1) *No. births = 8 165*	127.4	14.3	30.4	2.9	59.6	**27.3**	1.1
Mpumalanga total *No. births = 81 478*	**27.3**	13.5	65.1	4.3	221.8	14.5	2.0
Nat PPIP 2003-2006 *No. births = 576 065*	178.4	11.7	75.2	4.1		75.2	1.8

Table 4 Top five primary obstetric causes of death (≥1000 g)

	2005	2006	TOTAL
1. Intrauterine death	27.4%	26.3%	26.8%
2. Intrapartum asphyxia	19.3%	17.4%	18.3%
3. Spontaneous preterm labour	14.1%	14.7%	14.4%
4. Hypertensive disorders	13. 3%	14.4%	13.9%
5. Antepartum haemorrhage	10.9%	11.1%	11.0%

Table 5: Top three final neonatal causes of death (≥1000 g)

	2005	2006	TOTAL
1. Immaturity related	36.8%	39.2%	38.0%
2. Hypoxia	36.5%	35.0%	35.8%
3. Infections	7.5%	10.1%	8.7%

Table 6: PROPORTION OF DEATH WITH AVIODABLE FACTOR (≥1000g)

	2005	2006	TOTAL
Patient related	**40.4%**	**37.9%**	**39.2%**
1. Inappropriate response to poor fetal movement	9.4%	8.8%	9.1%
2. Never initiated Antenatal Care	9.3%	9.7%	8.6%
3. Delay in seeking medical attention during labour	7.7%	8.0%	7.7%
Health worker related	**33.8%**	**35.3%**	**34.5%**
1. Delay referring patient for secondary/tertiary treatment	3.5%	3.8%	3.6%
2. Fetal distress not detected Intrapartum - fetus monitored	2.8%	3.0%	2.9%
3. No response to maternal hypertension	2.7%	2.8%	2.8%
Administrative related	**18.0%**	**18.8%**	**18.4%**
1. Inadequate facilities /equipment in neonatal unit	3.0%	4.5%	3.7%
2. Lack of transport – home to institution	2.2%	2.6%	2.4%
3. Personnel not sufficient trained to managed patient	2.2%	1.7%	2.0%
No information/could not be assessed	**7.9%**	**8.0%**	**7.9%**
1. File missing	3.8%	4.7%	4.2%
2. Insufficient notes	2.8%	2.1%	2.4%
3. Antenatal card lost	0.5%	0.4%	0.4%

Table 7: Burden of neonatal deaths

	Level 1 hospitals		Level 2 hospitals		Level 3 hospitals	
	2005	**2006**	**2005**	**2006**	**2005**	**2006**
<1000 g	40	67	50	45	19	13
1000 – 1499 g	82	87	33	39	3	14
1500 – 1999 g	47	50	12	17	2	6
2000 – 2499 g	25	15	6	8	3	1
≥2500 g	99	79	40	48	11	6
TOTAL	**293**	**298**	**141**	**147**	**38**	**40**

Critical newborn health issues

From the data in the following tables the following is evident:

1. Top avoidable neonatal deaths in Mpumalanga (Tables 5) fall into 2 main groups:
   a. Full-term babies with birth weights ≥2.5 kg - as a result of intrapartum asphyxia: <u>preventable</u> by good obstetric care, in particular correct use of the partogram by midwives and doctors and good neonatal resuscitation.
   b. Viable low birth weight babies with birth weights ≥1kg, especially 1-1.5 kg: <u>preventable</u> by basic neonatal care, including Kangaroo Mother Care and appropriate oxygen therapy including nasal nCPAP, within a well-planned regional neonatal care referral service.
2. Death rates for low birth weight infants (1-1.5 kg) vary significantly between levels of hospital, the rate being 5 times higher for the same birth weight group at level 1 vs. the level 3 hospital, and about 4 times higher at level 2 hospitals vs. the level 3 hospital, reflecting the lack of adequate neonatal care and facilities at those levels (Table 3).
3. The burden of disease for both the above priority groups (≥2.5 kg and 1-1.5 kg) is of equal importance in terms of the total number of babies dying each year, with the greatest proportion in both groups dying at Level 1 hospitals. (Table 7).

Table 8: Challenges and recommendations

Component	Challenges	Recommendations
ANC	Unbooked/late booking	Ongoing health education & awareness campaigns
IPC	Resources: staff, equipment, infrastructure	Midwife retention strategy (National & Provincial), refresher courses, partogram training
	Referral care and routes	Maternal Health /MINCC teams: audit to identify gaps in perinatal care, develop referral system & guidelines
	Transport	EMS is part of Maternal health team
Neonatal & post-neonatal care	Decrease deaths: VLBW & asphyxia *Norms/Standards: beds, staff, facilities, equipment, standard protocols. KMC	MINCC: Provincial neonatal care plan*, awareness, skills training, QI teams, etc. Develop standard protocols & records Implement & strengthen KMC, etc.
All levels	VCT and PMTCT uptake Rapid test	Strengthen integration of HAST & all existing programs Procurement of rapid test equipment
Quality Improvement	Locate PPIP into QIP, link ChIP & Maternal deaths	District PPIP workshops, PPIP fact sheets (with ChIP & maternal deaths); collaborative (program integration at district level)

Future considerations
- Optimise PPIP through linking audit into QIPs: improve documentation (e.g. proforma, package), set targets, graphic reporting, communicating key messages from PPIP (fact sheets, district workshops), etc.
- Develop continuum of care concept: linking PPIP, CPIP, maternal data and recommendations; consider need for provincial coordinator post
- Standardisation of NDR/NNDR to enable comparisons between hospitals (using LBW)

Northern Cape

The Northern Cape population in 2006 was approximately 1 094 500, with an estimated 20 990 births per year. The province is renowned for its vast area. The Northern Cape now has 9 PPIP sites, namely Kimberley, Kuruman, Jan Kempdorp, Calvinia, Springbok, Galeshewe Day, De Aar, Prieska (recently added) and Douglas (recently added) Hospitals.

Total data for Northern Cape (HIS)

Weight Category	Stillborn	ENND	LNND	Alive on discharge	Total
500-999 g					409 (1.9%)
1000-1499 g					541 (2.5%)
1500-1999 g					976 (4.9%)
2000-2499 g					2515 (12%)
2500+					16 549 (78.8%)
Total	626	275	8	20 081	20 990

Provincial data (≥1000 g) for 2005 and 2006

	2005	2006
Stillbirth rate	297 (2.9%)	626 (3.05%)
Neonatal death	13.5/1000	14.3/1000
Perinatal mortality rate	41.7/1000	44.9/1000
Low birth weight rate	21.4	21
Perinatal care index	1.30	1.50
Stillbirth: reonatal ratio	2.2:1	2.2:1
C/s rate	15.5%	15.5%
Assisted delivery rate	1.1	1.1
Teenage pregnancy	6.1	6.2
Booking rate		74%

Primary obstetric causes of death	%
Spontaneous premature labour	28.7
Intrauterine death	22.0
Hypertensive conditions	12.9
Antepartum haemorrhage	12.7
Intrapartum asphyxia	9.8
Infections	6.7

Final causes of neonatal death	%
Immaturity related	59.3
Infection	13.3
Hypoxia	11.9
Congenital Abnormality	7.4
Other	4.4
Unknown	2.2
Trauma	1.5

Avoidable Factors	%
Patient Related	66.8
Administrative	9.0
Health worker Related	20.8

Comments on problems related to data collection

There are several problems related to data collection and they include communication difficulties, timeous collection and forwarding of data, staff having difficulty with finding time to do the work, and understanding of avoidable factors.

Future Plans

- Intensify neonatal resuscitation training
- Strengthen the use of the maternity guidelines and proper use of the partogram.
- Strengthen antenatal care and encourage early booking
- Develop and implement a rigorous management protocol for PMTCT.
- Improve the referral policy and its proper use.

Perinatal indices per site

	PNMR	NNDR	LBWR	PCI	SB:NND Ratio
Northern Cape	**43.3**	**13.9**	**21**	**1.40**	**2.21**
Kimberley	42.2	16.3	28	1.50	3.71
Kuruman	32.0	14.4	14.4	2.20	1.4:1
Upington	36.4	19.5	20	1.80	1.3:1
De Aar	25.5	5.0	24.6	1.00	2.3:1
Springbok	21.2	6.3	13.8	1.50	2.8:1
Jan Kempdorp	23.4	14.4	18.9	1.20	0.8:1
Calvinia	25.3	19.9	25.7	1.00	1.4:1

North West Province

Ms M Malgas, Dr AB Njie.

Period: April 2005 – March 2006
Total number of deliveries: 70186
PPIP Sites: Rustenburg, Mafikeng and Klerksdorp Provincial Hospitals
District Hospitals: Thusong and General Delarey complex, Gelukspan Taung, Zeerust, Potchefstroom, George Stegman, Tshwaragano, Jubilee, Christiana / Bloemhof, Brits

Total Provincial Data (DHIS)

Weight Category (g)	Stillborn	Neonatal death Early	Late	Alive on discharge	Total
TOTAL	1636	734	137	67 745	69381

The new DHIS 1.4 system does not categorise data by birth weight

Provincial Data
SB Rate: 23.6 /1000   NNDR: 12.4/1000   PNMR: 34/1000
LBWR: 12.4%   PCI: 2.7   SB: NND = 1:8
PNMR >1000g 30.2/1000 NNDR >1000g 12/1000
C/s rate: 10.3%

Perinatal indices per PPIP site (1000g+)

Hospital	PNMR	NNDR	LBWR	PCI	SB:NND Ratio
PROVINCIAL					
Mafikeng	52.5	18.9	28.6	1.80	2.0 / 1
Klerksdorp	38.7	16.3	22.1	1.70	0.3 / 1
Rustenburg	36.2	9.1	14.4	2.20	3.3 / 1
DISTRICT					
Thusong/Gen delarey Complex	34.6	15.4	14.2	2.4	1.2 /1
Gelukspan	17.9	17.9	10.2	1.2	1.0 / 1
Zeerust	39.8	25.5	17.4	2.30	1.0 / 1
Taung	50.2	14.9	10.9	4.30	2.0 / 1
Tshwaragano	50.6	22.2	12.7	3.90	1.4 / 1
Christiana / Bloemhof	82.8	16.4	20.3	3.90	3.4 / 1
Brits	22.6	12.4	10.1	2.10	1.2 / 1
George Stegman	26.1	9.6	11.8	2.1	1.5 / 1
Jubilee	39.1	84.9	12.4	2.8	0.3 / 1
Potchefstroom	30.8	0.8	14.5	1.80	4.5 / 1

Primary obstetric causes of death

Provincial Picture
1. Unexplained intrauterine deaths (23.2%)
2. Spontaneous preterm labour (19.7%)
3. Intrapartum asphyxia (19.7%)
4. Maternal hypertensive disorders (14.1%)
5. Infections (9.3%)

Comparison of disease profiles

Provincial Hospitals		District Hospitals	
1.	Unexplained intrauterine deaths	1.	Spontaneous preterm labour
2.	Antepartum haemorrhage	2.	Intrapartum asphyxia
3.	Spontaneous preterm labour	3.	Unexplained intrauterine deaths
4.	Maternal hypertensive disorders	4.	Maternal hypertensive disorders
5.	Intrapartum asphyxia	5.	Infections

Final causes of neonatal death

Provincial Picture
1. Hypoxia (37%)
2. Prematurity related (31.7%)
3. Infection (9.8%)

The Provincial and District Hospitals have the same pattern of neonatal deaths

Avoidable factors	<u>All %</u>	<u>Probable %</u>
Patient related	40.5	36.2
Health worker related	39.9	26.2
Administrative	28.0	23.5
Missing files	5.8	3.4

Top 5 individual items in the avoidable factors
1. Related to patients' access (17.2 %) Either patients are unbooked, late booked or delayed in seeking help
2. Fetal distress not detected intrapartum (7.4%)
3. Lack of transport for transfers (5.2%)
4. Unavailability of skilled staff (4.3%)
5. Poor response to maternal hypertension (3.2%)

Major problems

1. Suboptimal intrapartum monitoring of patients
2. Delay in referring clinents for accessing life saving interventions
3. Outcomes of PPIP meetings are not communicated to inform decisions and planning

Solutions to these problems
1. Continuous in service education and training on the correct use of the partogram

2. Managers to take interest and ensure recommendations made at PPIP meetings are implemented
3. Continuous PPIP training as some of those trained leave the service
4. Support visits to be conducted to all 17 sites (including old sites)
5. Quarterly Provincial PPIP meetings to be introduced and conducted regularly
6. Senior management support on implementation of recommendations from "Saving Babies" reports
7. Involvement and participation of the community in maternity and neonatal care through campaigns
8. Regular PPIP and PMMR meetings to identify problem areas, solutions discussed at the meetings to be communicated to the management of the facilities
9. Improved response time from the Emergency medical services

Achievements
1. PPIP training conducted in July 2006: 23 participants from the 10 new PPIP sites (one doctor and one midwife per site)
2. Provincial PPIP launch in July 2006: 250 attended (Managers doctors and midwives)
3. Expansion of sites: 10 additional hospitals. Total sites 17/20 (3 level-2; 14 level-1)
4. Provincial support with resources: Computers and printes to new PPIP sites
5. PPIP minimum data set discussed and accepted by Knowledge Management
6. Revised minimum data set used at facilities
7. PPIP data capturer at Provincial office – Maternal and neonatal on one year contract expiring in October 2007
8. Neonatal resuscitation training: 345 Trained (2005-2007) i.e. doctors and midwives

Challenges
- High unexplained stillbirths
- High neonatal deaths due to hypoxia – this may be reduced by continuous training on neonatal resuscutation

Western Cape Province

DH Greenfield, EL Arends
MCWH Programmes, West Cape

Information collected needs to be used to advise policy and action. This study was done in order to assess the current situation regarding perinatal mortality in the Province, and to assess needs and propose actions to improve perinatal care.

Methods

The data used is that collected on the Perinatal Problem Identification Programme (PPIP). The time period for the data collection was from October 2003 to March 2006, to conform to the data collection period to be used in the next National "Saving Babies" Report. Only data collected on PPIP was used. The data was compared at the different levels of care. The emphasis was on the outcomes in infants ≥1000 g. Data was available from the Cape Town Metropolitan District, the Boland / Overberg District, and the all the level 2 District Hospitals. The Regional Hospitals provide level 2 care and the District Hospital and Midwife Obstetric Units (MOUs) provide level 1 care.

Results

Delivery statistics, all infants ≥500 g

	W Cape	Tertiary	Reg.	District	MOU
Total births	166261	27897	62845	15867	50247
Live births	162522	26511	61321	15596	49689
FSB	2575	1178	901	178	318
MSB	1164	208	623	93	240
Total SB	3739	1386	1224	211	558
ENND	1371	403	556	174	238
LNND	176	32	63	22	19
Low birth weight	18.1	34.1	17.9	19.9	10.0
SB : NND	2.5 : 1	2.9 : 1	2.5 : 1	1.4 : 1	2.3 : 1
PCI	1.78	2.04	1.88	1.48	1.59

Comment:

The majority of births occur in MOUs and Level 2 (Regional) hospitals.
The district hospitals are mainly in the rural towns. The overall low birth
weight rate is higher than the national average. The SB:NND ratio is high
suggesting that newborn care is generally good. The exception is in District
hospitals and to a lesser extent, in the MOUs.

Mortality rates by level of care

	W Cape	Tertiary	Reg.	District	MOU
PNMR (≥500 g)	32.2	69.6	33.6	**29.4**	**15.9**
PNMR (≥1000 g)	18.6	36.8	20.5	**18.0**	**9.6**
SBR (≥1000 g)	23.0	51.8	24.1	**17.4**	**11.0**
SBR (≥1000 g)	13.8	28.0	15.7	**11.1**	**6.8**
ENNDR (≥1000 g)	8.4	16.0	8.8	**10.9**	**4.6**
ENNDR (>1000 g)	4.2	7.7	4.2	**5.9**	**2.6**

Comment

The rates are highest at the tertiary Hospitals and lowest in the MOUs. Of
concern is that the rates are higher in the District Hospitals than in the
MOUs. This is particularly so as the management in District Hospitals is
mainly the responsibility of doctors.

Mortality in birth weight categories

	1000 - 1499	1500 - 1999	2000 - 2499	2500+	Total
Total births	3777	6844	16137	136214	162972
Live births	3134	6307	15740	135292	160774
MSB	258	216	143	180	**797**
FSB	385	321	254	**441**	1401
ENND	**204**	**110**	86	**291**	691
LNND	55	17	12	10	94

Comment:

There were nearly 800 macerated stillbirths. This is probably related to
problems during antenatal care.

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There were a further 732 fresh stillbirths and early neonatal deaths in the 2500 g + birth weight category. These would be mostly term infants, and their deaths were mainly due to hypoxia occurring during labour.

There were over 300 neonatal deaths in infants with a birth weight of 1000 – 1999 g. Two thirds of these were in the 1000 – 1499 g birth weight category.

Top 5 primary obstetric causes

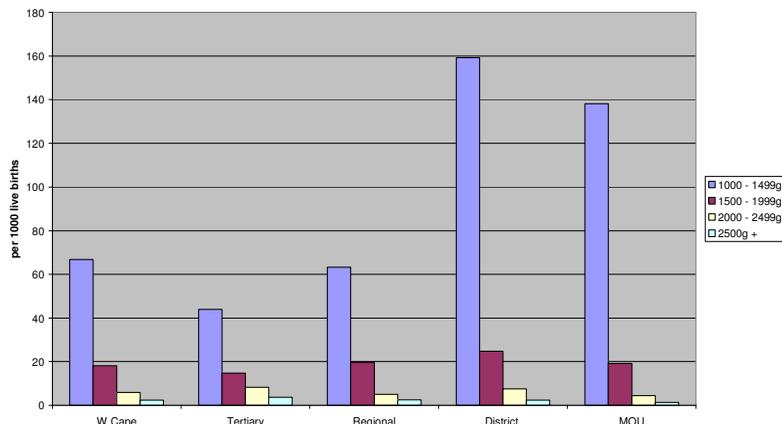|	BW ≥500 g		BW ≥1000 g	
1. Spontaneous preterm labour	25.3%	Antepartum haemorrhage	20.7%
2. Unexplained intrauterine death	16.4%	Unexplained intrauterine death	19.5%
3. Antepartum haemorrhage	15.6%	Intrapartum hypoxia	12.8%
4. Hypertensive disease	11.9%	Spontaneous preterm labour	9.2%
5. Intrapartum hypoxia	7.5%	Infections	8.3%

Primary obstetric cause of death: Fresh stillbirth and Early neonatal death, Birth weight 2500 g +

	n	%
Intrapartum hypoxia	274	38.4
Intepartum haemorrhage	114	16.0
Intrauterine death, unexplained	84	11.8
No obstetric cause / not applicable	50	7.0
Fetal abnormality	49	6.9

Primary Obstetric Cause of death: Early neonatal death, birth weight 1000 – 1999 g

	n	%
Spontaneous preterm labour	115	56.9
Antepartum haemorrhage	21	10.4
Hypertensive disorder	14	6.9
Fetal abnormality	13	6.4
Infection	13	6.4

Top 3 final neonatal causes

	BW ≥500 g	BW ≥1000 g	
1. Immaturity related	51.7%	Hypoxia	30.6%
2. Hypoxia	16.3%	Cong. Abn.	20.2%
3. Infection	12.5%	Immaturity related	19.9%

Proportion of deaths with avoidable factors

	BW ≥500 g	BW ≥1000 g
Patient-related:	45.1%	49.1%
Administrative-related:	11.0%	15.0%
Health-worker related:	19.4%	27.2%
No information / could not be assessed:	3.8%	4.3%

Top 3 avoidable factors

1. Never initiated antenatal care
2. Booked late in pregnancy
3. Inappropriate response to decreased fetal movements

Major problems

1. High ENNDR for 1000 – 1499 g birth weight, more at level 1 facilities
2. High ENNDR and SB rate for FSBs in BW 2500 g + group, more at level 1 facilities
3. Large numbers of MSBs – cause unknown. Possibly related to problems in antenatal care
4. Avoidable factors

- Medical personnel: Management in labour is the most important. Others were delays in taking action, and substandard neonatal care.
- Administrative: Transport delays, inadequate neonatal facilities, insufficient or inadequately trained personnel.
- Patient related: As above. They are mainly associated with the macerated stillbirths and low birth weight infants.

Plans to solve these problems

1. Visiting and assessing neonatal facilities, training staff in newborn care
2. Training in monitoring and managing of labour – progress and fetal condition
3. Improving screening for IUGR, infection and post dates at antenatal clinics