



# Ministry of Health and Child Welfare Zimbabwe

## Maternal and Perinatal Mortality Study 2007







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## Preface

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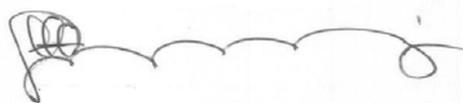
The health of the nation begins with mothers and newborns. Recognising this, the post-independence government invested heavily in health, especially primary health care and the health of mothers and children. As a result, Zimbabwe recorded good progress in family planning, maternal and child health in the period 1980-1995. Thereafter, economic challenges, loss of skills and the HIV pandemic affected the health service delivery system and the progress could not be maintained. Women and children, being more vulnerable, have been the most affected by the deterioration of some aspects of the health system.

The Ministry of Health and Child Welfare therefore conducted a maternal and perinatal mortality study in 2007, to establish precisely the national estimates for indicators relating to mothers and newborns. These are also the indicators used to assess progress in achieving the Millennium Development Goals. Prior to this study, national estimates for Zimbabwe were being provided through surveys and censuses, though it is well known that these are imprecise. The methodology chosen by Zimbabwe in this study allows monitoring of national indicators to be conducted every 10-15 years.

As the results show in this report, the maternal and perinatal mortality levels in Zimbabwe are at unacceptable levels. The majority of maternal and newborn deaths are avoidable, and can be prevented with affordable interventions. The next task is to follow up this study by strengthening the implementation of the Road Map for Maternal and Neonatal Health of Zimbabwe together with the recommendations in this report. These affordable and cost effective interventions, which can reach **every** woman and newborn need to be implemented, monitored and evaluated. The Minister of Health and Child Welfare, Dr. H. Madzorera and his Ministry look forward to the co-operation of other ministries, partners and health workers in achieving better health for mothers and newborns.

I would like to thank the following for their contribution towards the implementation of the study: Dr. P. D. Parirenyatwa (Former Minister of Health and Child Welfare), Dr. E. Xaba (Former Secretary of Health and Child Welfare) and Dr. E. T. Mabiza (Former Secretary of Health and Child Welfare). Dr. G. Mhlanga (Principal Director Preventive Services) and Ms. M. Nyandoro (Deputy Director Reproductive Health) were the main motivators throughout the study. I also would like to thank Dr. Stephen Munjanja (Principal Investigator) for leading the study team. The head office, provincial medical directors and provincial nursing officers assisted with the supervision of 80 enumerators and 2000 village health workers in 11 districts of the country. To all of them I say well done!

The study was conducted at a time when Zimbabwe was facing a lot of economic challenges, hence the study could not have been successful without the financial support from the Department for International Development UK (main sponsor of the study), UNFPA, WHO and UNICEF. I also would like to extend my profound gratitude to the Universities of Zimbabwe and Umea (Sweden) for their technical support.



Dr. G. Gwinji  
Permanent Secretary  
Ministry of Health and Child Welfare  
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## List of abbreviations

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AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
APH	Antepartum Haemorrhage
ARV	Ante Retro-Viral drugs
BEOC	Basic Emergency Obstetric Care
BEONC	Basic Emergency Obstetric and Neonatal Care
CEOC	Comprehensive Emergency obstetric and Neonatal Care
DFID	Department for International Development (United Kingdom)
DH	District Hospital
DMO	District Medical Officer
DNO	District Nursing Officer
EMONC	Emergency Obstetric and Neonatal Care
FGD	Focus Group Discussion
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
InterVA-M	Interpreting Verbal Autopsy Maternal
M&E	Monitoring and Evaluation
MDG	Millenium Development Goals
MMR	Maternal Mortality Ratio
MoHCW	Ministry of Health and Child Welfare
MWH	Maternity Waiting Home
PIH	Pregnancy Induced Hypertension
PMD	Provincial Medical Director
PMDF	Proportion of Maternal Deaths Among Females of Reproductive Age
PNMR	Perinatal Mortality Rate
PNO	Provincial Nursing Officer
PPH	Postpartum Haemorrhage
RAMOS	Reproductive Age Mortality Study
RHC	Rural Health Centre
SSA	Sub-Saharan Africa
TB	Tuberculosis
TBA	Traditional Birth Attendant
UN	United Nations
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund
VA	Verbal Autopsy
VA-M	Verbal Autopsy Maternal
VHW	Village Health Worker
WHO	World Health Organization
ZDHS	Zimbabwe Demographic Health Survey
ZMPMS	Zimbabwe Maternal and Perinatal Mortality Study

## **1.1 Background to maternal and perinatal mortality in Zimbabwe**

### **1.1.1 Maternal mortality**

The problem of maternal mortality remains an international concern because of the large number of women who die from avoidable causes, especially in developing countries<sup>1</sup>. Women in Zimbabwe suffer a high risk of dying during pregnancy, childbirth and the puerperium. Studies of maternal mortality levels have been done at facility level within Zimbabwe in the past 30 years. One study collected data at community level in a rural province (Masvingo) and an urban province (Harare) of Zimbabwe. The maternal mortality ratio (MMR) was 85 and 168 per 100,000 live births in Harare and Masvingo respectively<sup>2</sup>.

The World Health Organization (WHO) and other international organisations have produced periodic reports of MMR estimates at global, regional and country levels. In the latest report, the MMR for Zimbabwe in 2005 was 880 per 100,000 live births, with a range of uncertainty between 300 and 2000<sup>3</sup>. For countries with no vital registration data, such as Zimbabwe, the estimates are produced by statistical modelling, which produces large confidence intervals. They cannot therefore be used for monitoring trends or comparison with other countries.

The other methods used to establish the estimates in countries with poor data are the direct and indirect sisterhood methods and the census. The Demographic and Health Surveys, which use the sisterhood methods, reported the MMR of Zimbabwe to be 695 in 1999 and 555 in 2005-06, but these estimates were not precise<sup>4,5</sup>.

In Zimbabwe, vital registration is not operational due to lack of resources, although the legal instruments to implement it have been in place for many years. These are the Births and Deaths Registration Act (1986) and the Medical, Dental and Allied Professions Act (Statutory Instrument 93 of 1993).

### **1.1.2 Perinatal mortality**

Perinatal mortality is now receiving great attention, and the avoidable deaths of neonates has been highlighted recently<sup>6</sup>. In Zimbabwe, documentation of the perinatal mortality rate (PNMR) has been reported in both urban and rural areas but not at national level. The urban study showed that the PNMR for the Greater Harare Maternity Unit fell during 1980-85 (from 45 to 35 per 1000), then rose during 1986-89 (from 41 to 47 per 1000)<sup>7</sup>.

### **1.1.3 Justification for conducting a maternal and perinatal mortality study in Zimbabwe**

Maternal and perinatal mortality constitute a significant burden of disease in Zimbabwe, and it is an important national challenge to reduce this burden. The estimates of MMR and PNMR must be known precisely in order to monitor progress in safe motherhood and newborn health. Zimbabwe signed, along with most other countries the Millennium Declaration, which created goals (MDGs) for maternal and child health. The MDGs require countries to have reduced by 2015, the maternal mortality ratio by 75% compared to that of 1990. To achieve the MDG for child health, it will be necessary to reduce newborn deaths substantially.

It is implicit in the Millennium Declaration that precise estimates must be established to monitor trends. The quality of information needed for such assessments of programmes cannot come from statistical modelling, sisterhood methods or censuses as they are currently conducted.

The need to know the impact which HIV and AIDS has had on maternal and newborn health was further justification for doing the study. Between 1988 and 1997 there was a significant increase in indirect maternal deaths due to HIV and AIDS at institutional level<sup>8</sup>, but there has been no national documentation of the impact.

## 1.2 Zimbabwe: The country profile

In the last census in 2002, the population was 11.6 million people of whom 65% lived in rural areas. Table 1.1 shows some indicators of interest from recent local and international publications.

**Table 1.1: Socio-economic characteristics of the population**

Characteristic	Estimate
Population size (million)	11.6
Crude birth rate (per 1000)	31.0
Crude death rate (per 1000)	20.0
Total fertility rate	3.8
Female literacy (%)	91.0
Contraceptive prevalence rate (%)	60.0
Life expectancy females (years)	38.0
Life expectancy males (years)	36.0
Prevalence of HIV (%)	18.0
Gross national income (GNI) per capita (US\$)	340.0

## 1.3 Aims and objectives of the study

A study proposal to establish the national maternal and perinatal health indicators, and also to identify factors that facilitate or prevent access to skilled care by pregnant women and newborns was developed. The need to establish a precise MMR, and to monitor trends led Zimbabwe to consider a cross-sectional population-based study. A precise estimate was defined as one in which the 95% confidence intervals around it did not exceed  $\pm 15\%$ <sup>9</sup>.

The aim of the study was to determine with precision the national MMR and PNMR of Zimbabwe in 2007.

### 1.3.1 Objectives of the quantitative study

The objectives of the quantitative study were to establish the following indicators:

- national maternal mortality ratio
- major causes of maternal mortality
- proportion of births attended to by skilled health personnel
- national perinatal mortality rate
- major causes of perinatal mortality

### 1.3.2 Objectives of the interview study

The objectives of the interview study were to study the barriers and facilitators to skilled care among pregnant women and newborns. Specifically the objectives were to study:

- the causes of the first, second and third delay in obstetric care
- the causes of the first, second and third delay in neonatal care
- facilitating factors among those who accessed skilled care

## 2.1 Situation analysis

A situation analysis was conducted to determine completeness of national data collection under the regulations of the maternal death notification system. The aim of the situation analysis was to find out how many maternal deaths were being reported under this system, and the causes of deaths.

### 2.1.1 Study design

This was a retrospective, descriptive study of all maternal deaths notified nationally in Zimbabwe in 2006.

### 2.1.2 Data collection

All notification forms sent to the MoHCW head office of women who had died between 1st January and 31st December 2006 were collected for analysis. The form contains a section to be entered on the cause of death by the attending practitioner(s). This was the diagnosis entered in the database. However all the forms were also examined by a clinician reviewer who could change the cause of death if there was compelling evidence to do so. The reviewer was also asked to comment on the quality of information on the form, and to rate it as good, fair or poor.

## 2.2 Quantitative study

### 2.2.1 Study design

This was a population-based descriptive and cross-sectional study of maternal and perinatal deaths. It was a combination of a survey of births and a reproductive age mortality study of maternal deaths (RAMOS)<sup>10</sup>. The aim of this combined approach was to collect accurate information on the denominator (live births) and nominators (number of maternal and perinatal deaths).

### 2.2.2 Sampling

#### Target population

The target population for the study were pregnant women in Zimbabwe, followed up for six weeks from the end of a pregnancy.

#### Study population

A study subject was a woman aged 12-49 years resident in the sampled districts. She must have been alive at the start of the study period, and during that period she might have died, delivered one or more living or dead babies, or survived; if she had a pregnancy ending less than 42 days before the end of the study period, her survival (or otherwise) up to 42 days after the end of her pregnancy was followed up.

Stillbirths were all babies born dead after 22 weeks or where the mother died undelivered after 22 weeks. Neonatal subjects were all babies born alive after 22 weeks of gestation in the study districts; they were born during the study period and lived up to 28 days.

#### Sampling method

The subjects were sampled the province as a cluster. Within each cluster one district was selected using a random number table. As a weighting procedure to adjust for Harare's larger population, an extra district was chosen in that city.

## Sample size

An estimate of 695 per 100,000 as used to calculate the sample size<sup>4</sup>. If the true MMR was 700/100,000, then a sample of 22,500 live births would correspond to around 160 maternal deaths, and the resulting 95% confidence interval (CI) would give an MMR between 600 and 800. A design effect of 2 was used to take into account cluster sampling. This meant 45,000 live births were needed to achieve the desired precision.

## Geographical distribution

Table 2.1 shows the 11 districts selected and population size of each, according to the census of 2002. The live births expected from each district were calculated as a proportion of the district's population compared to the total population of the 11 districts (Table 2.1).

**Table 2.1: Population size in the 11 randomly selected district from the ten provinces**

Province	District(s)	Population		Expected no. of live births
		Number	Proportion	
Bulawayo	Nkulumane	208,463	0.09	4,106
Harare	South Eastern	97,000	0.04	1,911
Harare	Western	243,777	0.10	4,802
Manicaland	Mutare	389,988	0.17	7,681
Mashonaland Central	Bindura	147,492	0.06	2,905
Mashonaland East	Mutoko	149,678	0.06	2,948
Mashonaland West	Zvimba	297,797	0.13	5,865
Masvingo	Chivi	192,126	0.08	3,784
Matabeleland North	Tsholotsho	137,621	0.06	2,711
Matabeleland South	Matobo	107,408	0.04	2,116
Midlands	Kwekwe	313,310	0.13	6,171
Total		2,284,660	1	45,000

### 2.2.3 Registration of data

#### Instruments

The study developed three questionnaires to record information on maternal and perinatal outcomes. These were:

- A questionnaire to be used on all pregnancies ending beyond 22 weeks, and all maternal and perinatal deaths
- A maternal verbal autopsy form called InterVA-M downloaded from the website [www.interva.net](http://www.interva.net)<sup>11</sup>
- A neonatal verbal autopsy form developed by WHO.

The study adopted the recommendations from the WHO Maternal Mortality and Morbidity Systematic Review as 'best practices'<sup>12</sup>, and included as many of the variables from the data extraction form of that review as possible. We added other variables whose purpose was designed to assess the quality of care provided by the health system.

#### Registers

Registers were created for the recording of data at facilities and in the community. These were the:

- District register for deaths of women of reproductive age
- Ward register for deaths of women of reproductive age
- Village death register
- Village birth register

## **Procedures**

### *Births, maternal and perinatal deaths in health facilities*

The maternity registers and pregnancy records of the women, recording details of the delivery, 10 day and 6 week postnatal visits, were the main source of information in facilities. The enumerators captured this information up to the 6-week visit, or up to the time of maternal or perinatal death. Special care was taken to inspect the registers in the medical surgical and gynaecological wards of hospitals for maternal deaths.

### *Community births, maternal and perinatal deaths*

For community births, maternal and perinatal deaths, the study created village birth and death registers. Adult deaths in villages were reported to the village head verbally, and it was the duty of the village health worker to record the deaths in the register, and on a monthly basis take it to the RHC where the same information was recorded in the ward death register. The reports which were recorded in the village register came from the following sources:

- Village heads
- Women who had delivered
- Village health workers
- Traditional birth attendants
- Family members
- Police
- Community members

In urban areas, details of home deliveries or deaths were obtained from postnatal visits, health facilities for those admitted postnatally or from the local authority register.

### *Individual identification, reconciliation and follow up of outcomes*

The full names and Zimbabwe identity numbers (ID) were used to identify the women. This was very important so data from various sources regarding one individual could be reconciled. All health facilities recorded these details on admission, and at every birth and death. Neonates are given the mother's names and ID if they die before a birth certificate is issued. The families of women who died at home were asked to produce their ID document by enumerators.

### *Maternal and neonatal verbal autopsy*

To identify non-institutional maternal deaths in the community, all deaths of women of reproductive age were identified from the village, ward and district death registers. If the registers or the facilities did not have records with the cause of death, then the family were visited and were asked to produce any medical records on the illness of their deceased relative. If there were no records, a maternal verbal autopsy was conducted. A neonatal verbal autopsy was conducted in similar circumstances, except that they were restricted to deaths in the first seven days after birth.

The cause of death was assigned by two out of three clinical reviewers, and in the case of maternal deaths, was also compared with a probability method developed for this purpose.

### *Classification of Data*

The study followed the International Classification of Diseases and Related Health Problems (ICD-10) definitions and classifications<sup>13</sup>. The main definitions used are found in Annex 1.

### *Data Storage*

Data was entered onto the forms and this was stored in computer files using Microsoft Access software.

## **Field work**

### *Period of fieldwork*

Fieldwork started on the 1st May 2007, but took longer than 9 months in several districts. Instead of finishing recruitment on the 31st January, fieldwork took an average of 10 months. The last participants were entered on the 14th March 2008 and were followed up until 29th of April. The study therefore lasted 1 year.

### *Research enumerators*

The study team in each district consisted of 4 research enumerators employed full time, one district community nurse, employed part time and one provincial supervisor (the provincial nursing officer). All 49 enumerators were qualified midwives with at least 10 years appropriate working experience within the system.

### *Training of enumerators*

Training of enumerators, district community nurses and the provincial supervisors started on the 24th April 2007 at Kadoma Conference Centre and lasted six days. The training consisted of three parts:

- An introduction to the ZMPMS-2 days
- Piloting of instruments in Kadoma district-2 days
- Revision of instruments and discussion of logistics-2 days

### *Pilot study*

The pilot was done to test the questionnaires and to determine the logistics of the fieldwork. The instruments were amended after the pilot and fieldwork procedures were refined. The pilot study also confirmed that information from various sources could be reconciled for individual women.

### *Preparation for fieldwork*

The preparation for the fieldwork consisted of social mobilisation in the selected districts, informing health facilities about the study and messages to the public.

Social mobilisation involved informing all the administrators, chiefs and councillors in the district about the study, and contacting the VHWs. Health institutions were informed of the study through the usual channels. The mass media was used to sensitise the public about the survey. The messages were in all the major languages in both radio and print.

### *Verification of maternal deaths*

A verification exercise was done to determine how many deaths had been missed at the end of the fieldwork. Enumerators went into randomly selected wards in every rural district and conducted a door to door enquiry about maternal deaths.

## **2.3 The interview study**

### **2.3.1 Introduction**

The aim of the interview study was to investigate barriers and facilitators to care. Barriers had been studied before in Zimbabwe<sup>14</sup>. The three delay model was chosen as the basis for investigation.

- First: delay in recognising a problem and deciding to seek care
- Second: delay in reaching a facility after the decision to seek care
- Third: delay in getting effective treatment at the facility

### **Study participants**

There were four groups of participants for the interview study:

- women who had recently delivered, grouped into ‘attenders’ if they had delivered in a facility and ‘non-attenders’ if they had delivered at home

- key informants from the community (community leaders, traditional birth attendants, focus group participants)
- nurses and other health workers at facilities
- enumerators

### **Study sites**

The participants were drawn from all the districts in the study. In each district, the enumerators chose one RHC at random, in addition to the DH as the sites for the interviews. Key informants were interviewed on an opportunity basis, and at different sites (home, offices, shopping centres, clinics, etc.).

### **Study instruments**

There were four main instruments for the interview study, developed from a list of indicators.

- A questionnaire for recently delivered mothers assessing the first two delays in obstetric care
- A questionnaire for recently delivered mothers assessing the third delay in obstetric care
- A questionnaire for mothers of neonates assessing all three delays in neonatal care
- Key informant guides for community leaders, traditional births attendants and facility staff

### **Fieldwork**

#### *Methods of data collection: interviews of individuals*

The enumerators identified prospective participants, and after describing the intention of the interview, asked for permission to continue. If the participant agreed, they administered the interview, from the questionnaire which were a combination of quantitative variables and qualitative inquiries whose responses the enumerator wrote down in long hand. There was space on the form and encouragement to explore the issues under discussion. The interviews were conducted from December 2007 to the end of February 2008.

#### *Focus group discussions*

Focus group discussions (FGD) which were held in four districts drew upon participants' attitudes, feelings, beliefs, and reactions to maternal and neonatal mortality. About 15-25 women of childbearing age attended each one, and the discussions were taped in three of them.

#### *Debriefing of enumerators*

At the end of the fieldwork, all 49 enumerators and the district community nurses were invited to a debriefing workshop in Harare. The aim was to use their unique experience to enrich the qualitative part of the study. Enumerators shared their views with the study investigators and the findings were summarised in a workshop report.

## **2.4 Ethical considerations**

The Births and Deaths Registration Act (1986) already covered the collection and use of vital registration data. However, informed consent was sought individually from all respondents before the interview, for both routine and non-routine collection of data. The Medical Research Council of Zimbabwe gave approval for the study to be conducted (reference number MRCZ/A/1368).

## Results of the situation analysis

### 3.1 Description of maternal death reports

A total of 364 maternal death notification forms were submitted to the MoHCW head office in 2006. Officially, this is the total number of maternal deaths that occurred in Zimbabwe in 2006. The districts selected for the study recorded 64 deaths in 2006 (Table 3.1).

**Table 3.1: Number of notified maternal deaths by province and by the selected study district in each province**

Province	Number	(%)	District	Number
Bulawayo	25	6.9	Nkulumane	4
Harare	105	29	Harare South-Eastern	4
			Harare Western	6
Manicaland	28	7.7	Mutare	23
Mashonaland Central	25	6.9	Bindura	5
Mashonaland East	54	14.8	Mutoko	9
Mashonaland West	54	14.8	Zvimba	3
Masvingo	18	4.9	Chivi	2
Matabeleland North	31	8.5	Tsholotsho	3
Matabeleland South	11	3.0	Matobo	1
Midlands	13	3.6	Kwekwe	4
Total	364	100		64

### 3.2 Personnel completing the notification form

The health worker completing the notification form was known in 307 cases. Altogether 10 grades of health workers completed the form. Eighty three (27%) were completed by general medical officers, 35 (11.4%) by district medical officers, 12 (3.9%) by medical superintendents, 52 (16.9%) by specialists, 49 (15.3%) by registered general nurses/midwives, 15 (4.9%) by sisters-in-charge of maternity, 11 (3.6%) by clinical officers, 2 (0.61%) by matrons and 1 (0.31%) by a district nursing officer.

### 3.3 Quality of recording

There were five different versions of the notification form which were identified. The differences were in the number of pages, the number of questionnaires, and the order in which the questions came. This made coding of variables from the form to digital files very difficult.

The legibility of the form was very variable. The name of the health officer who signed the document was only legible in 218 (60%) of forms. Reviewers tasked to assess the forms rated only 139 (38%) as being good, 150 (41%) as being fair and the rest 72 (21%) as being poor. The quality of the information on the form was affected by the large number of missing values on many variables. The percentages of missing values for demographic characteristics were: 59% for level of education, 27% for employment status, 32% for occupation, 12% for marital status, and 46% for religion. As a result the information was not useful for the assessment of demographic characteristics or quality of care during the antepartum, intrapartum and postpartum periods.

### 3.4 Causes of death

The cause of death was entered for 292 of the 364 women. The notification forms were also given to clinician reviewers who assigned a cause of death.

Despite the fact that the reviewers were using the information available to the notifier on the form, they were able to provide a cause of death in 58 more cases. HIV and AIDS was the leading cause of death among the notified cases. As expected, pregnancy induced hypertension/eclampsia, postpartum haemorrhage and puerperal sepsis were in the top five causes of maternal deaths. Table 3.2 lists the causes of death in decreasing order of frequency as assigned by the original notification and the clinician reviewer.

**Table 3.2: Causes of death among the 364 notified maternal deaths of 2006**

Cause	Notification diagnosis	Percentage	Assessor's diagnosis	Percentage
HIV and AIDS related	87	29.7	94	26.9
PIH/Eclampsia	50	17.1	55	15.7
Postpartum haemorrhage	43	14.7	65	18.6
Puerperal sepsis	41	14.0	43	12.3
Malaria	23	7.9	26	7.4
Cardiac disease	16	5.5	16	4.6
Antepartum haemorrhage	9	3.1	15	4.3
Abortion related	5	1.7	9	2.6
Ruptured uterus	5	1.7	2	0.6
Diabetes mellitus	5	1.7	4	1.1
Obstructed labour	3	1.0	4	1.1
Anaesthetic complications	2	0.7	2	0.6
Suicide	2	0.7	2	0.6
Caesarean section related	1	0.3	1	0.3
Unknown	72	19.8	14	3.8
Total	364	100	364	100

### 3.5 Avoidable factors in the maternal deaths

Only 247 of the cases had an assessment of whether the death was avoidable or not. Of these 115 (47%) were considered avoidable. In 130 records, there was information on the causes of delays in treatment. In 86 (66%) deaths the cause was the first delay, in 10 (8%) it was the second and in 34 (26%) it was the third delay.

## 4.1 Sample size and district distribution

A total of 45,240 women were recruited into the study in the eleven districts. Among these were 45,052 births and the remainder were 58 women who died without delivering and 129 women who miscarried before 22 completed weeks of gestation.

## 4.2 Demographic characteristics

The median age of the women was 24 years (range 12-49) and the median parity was 2 (range 0-15). Most of the women were in monogamous marriage (87.9%) and were of the Christian faith (63.7%). The vast majority (79.2%) were either housewives or peasant farmers. A very significant percentage was made up of one religious sect, the Apostolic Faith church (29.2%). Table 4.1 shows the distribution of these demographic characteristics within the eleven districts. There were significant differences in the demographic characteristics between rural and urban women.

**Table 4.1: Demographic characteristics of the total sample, and stratified by district**

District/ Area	Sample size	Median age (yrs)	Median Parity	Married monogamous (%)	Christian faith (%)	Apostolic Faith (%)	Housewives/ peasant farmers (%)
<i>District:</i>							
Bindura	2,963	24	2	87.9	42.9	42.6	83.9
Chivi	3,809	24	2	94.3	68.3	29.0	94.5
Harare S. Eastern	1,878	26	2	94.3	86.7	11.1	48.5
Harare Western	4,780	24	2	92.7	69.8	29.0	77.7
Kwekwe	6,309	23	2	94.0	90.6	5.9	86.1
Matobo	1,952	23	2	63.2	89.9	3.6	63.8
Mutare	7,948	24	1	96.0	79.3	18.8	84.0
Mutoko	3,039	23	1	86.4	36.4	58.9	89.3
Nkulumane	4,009	24	2	80.8	67.2	28.9	60.3
Tsholotsho	2,692	22	1	63.8	43.5	50.2	59.5
Zvimba	5,836	24	2	92.6	46.5	25.9	91.5
<i>Area:</i>							
Rural	28,058	24.6	2	85.7	55.2	34.3	83.8
Urban	17,100	25.1	2	91.3	76.2	21.6	71.8
p-value		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total		24	2	87.9	63.7	29.2	79.2

## 4.3 Antenatal care

A high percentage of women were booked for antenatal care (91%). The median gestation at booking was 24 weeks (range 6-42 weeks). The median number of antenatal visits was 4 (range 0-18). Among these, only 4.7% knew their HIV status before pregnancy. The percentage tested during pregnancy was 34%. Altogether the percentage of women known to be HIV positive was 5.4%, which is much lower than the percentage of this status in the country (17.5%) from the ZDHS of 2005-6. The median gestation at the time of the HIV test was 26 weeks. The number of women who took antenatal ARVs was 712 or 1.8%, instead of the expected percentage of 17.5%.

The number of women who experienced antenatal complications was 2774, 6.2% of the sample. The commonest occurring complications were in order of decreasing frequency: pregnancy induced hypertension

**Table 4.2: Distribution of antenatal processes by district, and by whether the women lived in rural or urban areas**

District/ Area	Antenatal booking	Median gestation at booking (weeks)	Median no. of antenatal visits	HIV test during pregnancy	HIV positive (%)	Median gestation at HIV test	Antenatal complications (%)	Women with complications referral (%)	Compliance with referral (%)	Non-compliance No money % (%)
<i>District:</i>										
Bindura	92.0	24	4	31.3	26.2	24	4.8	36.8	91.3	100.0
Chivi	95.1	20	4	8.3	6.9	24	1.6	77.6	93.3	66.7
Harare S. Eastern	94.2	26	6	30.3	26.4	24	20.7	33.8	96.9	20.0
Harare Western	88.0	27	3	50.3	45.3	27	15.4	53.2	94.6	47.1
Kwekwe	94.5	24	3	14.4	11.0	28	1.1	60.0	97.6	–
Matobo	96.0	27	5	32.8	24.9	28	1.2	58.3	92.9	0.0
Mutare	89.7	26	4	24.0	21.2	25	2.7	89.9	96.8	50.0
Mutoko	93.1	24	4	30.5	27.4	26	12.2	65.5	83.5	82.3
Nkulumane	91.6	28	4	72.2	58.7	28	12.5	43.7	97.6	0.0
Tsholotsho	94.4	24	4	51.0	39.1	28	1.7	50.0	100.0	0.0
Zvimba	85.1	23.5	3	42.5	35.2	24	4.1	29.7	89.4	83.3
<i>Area:</i>										
Rural	91.5	24	4	26.0	21.3	25	3.2	54.0	86.0	80.8
Urban	91.2	27	4	47.0	40.1	27	11.1	51.2	96.2	34.5
p-value	0.247	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.148	<0.001	<0.001
Total	91.4	24	4	34	28.4	26	6.2	52.2	92.4	68.2

30.8%, anaemia 7%, malaria 7%, malpresentation 6.8%, antepartum haemorrhage 5.9%, multiple pregnancy 5.8%, urinary tract infection 3.9% and AIDS defining condition 2.6%. There were only 30 cases of syphilis in the whole sample, a prevalence of less than 0.1%.

There were 1516 referrals (52%) out of the group who experienced complications. These referrals were usually to the district hospital with a few going to provincial and tertiary hospitals. The compliance with referral was high, with 1398 women (92.4%) attending the next level of care. Among the few who did not comply, the most common reason (68%) was that they did not have the user fees required at the next level.

Table 4.2 shows the characteristics of antenatal care indicators by district, and whether the women lived in rural or urban areas. There was better access to HIV testing in urban areas, and also to the diagnosis of complications and referral in urban areas compared to rural areas.

#### 4.4 Intrapartum care

The home was the initial place of labour in 84.6% of women. The second most common place was the maternity waiting home (MWH) (8.8%). The remainder of women (6.6%) were already in a facility when they went into labour because of antenatal complications. The number of women who went into labour at the home of a traditional birth attendant (250) or a faith healer (60) was a very small proportion of the total.

Among those who laboured at institutions, 4665 (10.4%) were diagnosed with labour complications and of these 2703 (6%) were referred to the next level. There was a very high compliance with referral (97.6%), and the non-compliance in the few cases was due to institutional failures (non-availability of transport). The commonest reasons for referral in labour were: obstructed labour (38.9%), fetal distress (15.6%), pregnancy induced hypertension (7.8%), abnormal presentation (4.1%), post dates (4.1%), previous caesarean section (3.7%), multiple pregnancy (2.7%), preterm labour (2.6%) large for dates fetus (2.4%) and antepartum haemorrhage (2.2%).

The vast majority of women delivered normally (93.3%). The caesarean section rate was 4.4% and the rate of assisted vaginal delivery was 0.9%.

**Table 4.3: Summary of the distribution of the place delivery**

Place	Number	Percentage (%)
Home	12,955	28.8
TBA's home	782	1.7
Faith healer's home	118	0.3
In transit	226	0.5
Maternity waiting home	38	0.1
Municipal clinic	8,915	19.8
Rural health centre	3,345	7.4
Rural hospital	2,960	6.6
District hospital	7,716	17.2
Provincial hospital	1,812	4.0
Tertiary hospital	3,148	7.0
Private hospital	1,538	3.4
Nurse practitioner's clinic	475	1.1
Doctor's private clinic	356	0.8
Unknown/not applicable	529	1.2
Total	44,914	100

For practical purposes, the percentage of women attended to by skilled attendants was 68.7%.

Table 4.4 shows the distribution of intrapartum process outcomes by district and also by whether the woman lived in a rural or urban area. In urban areas, there was better access to facility delivery, diagnosis of complications, life-saving interventions and referral than in rural areas.

**Table 4.4: Distribution of intrapartum process outcomes by district and also by whether the women lived in rural or urban areas**

District/Area	Labour started at home (%)	Labour started at MWS (%)	Complication of labour (%)	Referral in labour (%)	Median gestation at delivery (wks)	Caesarean section (%)	Assisted vaginal delivery (%)	Delivery at facility (%)
<i>District:</i>								
Bindura	96.0	0.5	5.9	4.5	40	2.1	0.3	58.4
Chivi	54.4	41.3	4.7	3.2	40	2.0	0.2	86.2
Harare S. Eastern	93.7	0.2	32.6	6.7	39	13.0	10.8	96.0
Harare Western	89.8	0.2	24.9	14.5	39	6.6	1.7	95.4
Kwekwe	92.2	0.7	7.9	5.5	40	4.3	0.1	62.8
Matobo	52.3	43.3	10.3	1.4	39	1.6	1.3	68.8
Mutare	91.4	1.6	7.1	8.2	38	3.0	0.2	50.5
Mutoko	80.6	16.2	6.3	1.3	39	2.3	0.2	59.1
Nkulumane	95.9	0.1	16.2	9.2	38	7.3	1.0	92.7
Tsholotsho	64.8	30.2	4.5	0.9	38	1.8	0.2	46.6
Zvimba	94.1	1.1	6.5	3.4	38	1.5	0.1	55.1
<i>Area:</i>								
Rural	81.6	14.1	5.0	2.2	39	1.5	0.2	51.7
Urban	91.6	0.2	19.5	12.4	39	7.7	2.0	94.3
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total	85.2	8.8	10.5	6.0	39	4.4	0.9	68.7

## 4.5 Postpartum care

The number of women who attended the 10 day postpartum visit was 32,896 (73.7%) and this increased to 35,881 (80.4%) at the six week visit. The number of women who experienced postpartum complications (1,442) represented 3.2% of the women who delivered. Among them, the commonest complications were: Third degree tear (37%), postpartum haemorrhage (31.1%), retained placenta (11.2%), pregnancy induced hypertension (8.5%), ruptured uterus (3.7%) and eclampsia (1.4%). There were two cases of urinary fistula among the 45,000 women.

In the postpartum period there were 410 cases of referral and again there was a high rate of compliance with the referral (86.1%). Lack of money was the major reason in the non-compliers.

Table 4.5 shows the distribution of postpartum process outcomes by district, and also by whether the women lived in urban or rural areas.

**Table 4.5: Distribution of post partum process outcomes by district and by whether the women lived in urban or rural areas**

District/Area	Attended 10 day, postnatal visit (%)	Attended 6 week postnatal visit (%)	Postpartum complications (%)	Postpartum referral (%)	Compliance with referral (%)
<i>District:</i>					
Bindura	62.2	77.3	2.8	1.1	100.0
Chivi	95.1	90.9	0.8	0.4	86.7
Harare S. Eastern	78.7	92.6	10.3	1.5	96.4
Harare Western	88.8	89.8	7.7	2.0	93.8
Kwekwe	68.2	64.1	1.2	0.4	89.7
Matobo	78.3	89.7	3.0	1.1	82.4
Mutare	47.0	64.8	0.9	0.2	86.7
Mutoko	72.4	71.0	3.4	0.9	96.3
Nkulumane	95.2	97.7	2.1	1.9	100.0
Tsholotsho	74.3	92.6	2.3	1.1	100.0
Zvimba	78.1	87.2	5.6	1.2	88.7
<i>Area:</i>					
Rural	67.5	75.5	2.6	0.8	92.5
Urban	84.4	88.8	4.4	1.3	94.2
p-value	<0.001	<0.001	<0.001	<0.001	0.508
Total	73.9	80.6	3.2	0.9	93.4

## 5.1 Maternal deaths in the population-based birth survey

There were 243 deaths identified by following up pregnancy outcomes through the health system and also through the community using urban and rural village health workers. Table 5.1 gives a breakdown of the outcomes out of the 45,240 pregnancies. Of these deaths two were incidental in nature leaving a total of 241 maternal deaths.

**Table 5.1: Summary of maternal outcomes in birth survey**

Status	Frequency	Percentage
Alive	44,800	99.0
Alive with morbidity	59	0.1
Dead	243	0.5
Missing/unknown	138	0.3
Total	45,240	100

## 5.2 Verification of the number of maternal deaths

The verification exercise was done in 53 out of 218 wards in the eight rural districts. In these wards 13 out of 44 deaths had been missed (29.5%) for a variety of reasons. The correction factor for the number of maternal deaths in all districts was 1.295, rounded to 1.3. The total number of maternal deaths in the study was therefore 241 multiplied by 1.3, giving a total of 313.

## 5.3 Results of Reproductive Age Mortality Study (RAMOS)

The RAMOS study whose period of data collection was exactly the same as the birth survey showed that 5,432 women of reproductive age had died in the 11 districts. The distribution of causes of death is described in Table 5.2.

HIV and AIDS was by far the commonest cause of deaths among women of reproductive age. The pulmonary TB deaths, although classified separately in the above table were also mostly due to AIDS. There were 253 maternal deaths, and the PMDF (see Table 5.3) was 4.7%.

## 5.4 Calculation of maternal mortality ratio

The names and ID particulars of the 243 deaths from the birth survey were compared with those of the RAMOS. This showed that most women belonged to both lists, but that some women belonged to only one list. The final total from both methods was 316 deaths. This figure agreed very closely with the number arrived at by multiplying the number of deaths found in the birth survey of 241 by the correction factor of 1.3 (313).

Using the figure of 316 as the number of maternal deaths, and dividing by the number of live births (43,567) gave a maternal mortality ratio of 725 per 100,000 live births (95% CI 648-810). This means there was a maternal death in Zimbabwe for every 138 live births in 2007.

**Table 5.2: Distribution of causes of death in women of reproductive age**

Cause of death	Number	Percentage
HIV and AIDS	2,763	50.9
TB (Pulmonary)	787	14.5
Malaria	293	4.8
Maternal deaths	253	4.7
Non-pregnancy related infection	195	3.6
Cardiovascular disease	183	3.4
Respiratory disease	131	2.4
Cancer	109	2.0
Injury/Surgery/Anaesthesia	93	1.7
Suicide	45	0.8
Liver disease	33	0.6
Kidney disease	27	0.5
Diabetes	26	0.5
Bowel disease	18	0.3
Unknown	533	9.8
Total	5,432	100

\* proportion that are maternal among deaths of females of reproductive age (PMDF)

## 5.5 Causes of maternal deaths

This section and subsequent ones discussing factors related to maternal mortality will describe the 243 maternal deaths which were recorded in the facility and community birth survey. These deaths have adequate data on demographic characteristics and the events which occurred during the antenatal, intrapartum and postpartum periods. The extra deaths which were identified during the RAMOS only had the following variables recorded in the district registers: name, age, physical address and cause of death. This information was not enough to use in the analysis which follows.

Of the 243 deaths in the database 87 were reported from the community by village health workers and the diagnosis was made by verbal autopsy. Table 5.3 shows the distribution of causes of death in the 243 deaths.

**Table 5.3: Distribution of the causes of maternal deaths**

Cause of death	Number	Percentage
AIDS defining conditions	62	25.5
Postpartum haemorrhage	35	14.4
Hypertension/Eclampsia	32	13.1
Puerperal sepsis	19	7.8
Abortion complication	14	5.8
Malaria	14	5.8
Obstructed labour	8	3.3
Ectopic pregnancy	5	2.0
Suicide	5	2.0
Cardiac disease	4	1.6
Antepartum haemorrhage	3	1.2
Ruptured uterus	3	1.2
Anaesthetic related	3	1.2
Domestic violence	2	0.8
Caesarean section related	2	0.8
Thrombo-embolism	2	0.8
Breast carcinoma	1	0.4
Diabetes mellitus	1	0.4
Electricity failure in theatre	1	0.4
Mushroom poisoning	2	0.8
Unknown	24	9.9
Total	243	100

The cause of death was not known in 24 cases (9.7%). Among these cases are deaths which occurred both in facilities and at home. The table shows that the major six categories of causes account for 80% of the causes of maternal death. HIV and AIDS is now the leading cause of maternal death.

## 5.6 Characteristics of the maternal deaths

The majority of deaths 153 (63%) occurred in the postpartum period, 58 (24%) in the antenatal, and 16 (6.6%) in the intrapartum periods. The place of death is shown in Table 5.4 below.

**Table 5.4: Places of death for 243 women**

Place of death	Number	Percentage
Home	103	42.3
Traditional birth attendants' home	3	1.2
Faith healers' home	4	1.6
In transit to facility	10	4.1
Primary care clinic	5	2.1
District hospital	28	11.5
Provincial hospital	12	4.8
Tertiary hospital	43	17.7
Private clinic/hospital	5	2.1
Unknown	30	12.3

The table shows that 120 women (49.3%) died outside institutions.

The maternal deaths were direct in 130 cases (53.4%), indirect in 94 (38.7%), incidental in 2 (0.8%), and unknown in the remainder (6.2%). The first delay contributed to maternal death in 137 cases (56.4%) the second to 13 cases (5.3%) and the third to 27 cases (11.1%). Altogether, the delays contributed to death in 72.8% of the deaths. The main avoidable factors in the deaths were institutional (42.8%), family (31.7%) and personal (25.5%).

## 5.7 Factors affecting the risk of maternal death

The risk of maternal death was increased significantly by delivering outside institutions, operative delivery, delivery by non-skilled persons and if the woman belonged to the Apostolic faith religious sect. These risks are shown in the Table 5.5.

**Table 5.5: Maternal deaths by place of delivery, mode of delivery, person conducting delivery and religion**

	No of maternal deaths	Denominator	Maternal deaths	p-value
<i>Place of delivery:</i>				
Institutional	86	30,172	0.3	<0.001
Non-institutional	90	13,753	0.8	
<i>Mode of delivery:</i>				
Caesarean section	21	1,942	1.1	<0.001
Non-institutional	142	42,762	0.8	
<i>Person conducting delivery:</i>				
Skilled attendant	78	23,075	0.3	<0.001
Unskilled attendant	102	13,713	0.7	
<i>Religion:</i>				
Apostolic faith sect	60	9,469	0.6	0.0001
Non-apostolic faith	76	22,460	0.3	

## 6.1 Perinatal mortality

There were 44,378 singleton births, 303 sets of twins and 5 sets of triplets in which the gestation was more than 22 weeks or the fetus weighed more than 500 grams. The mean birthweight was 3,028 grams and the male: female ratio was 109:100. There were 1296 perinatal deaths out of 45,023 births. Table 6.1 shows the distribution of outcomes, with the percentages rounded. The stillbirth rate was 17/1000 total births and the early neonatal death rate was 11/1000 live births. The perinatal mortality rate was 29/1000 total births. The 95% confidence intervals were 27.3-30.4

**Table 6.1: Birth outcomes**

Outcome	Number	Percentage
Alive	43,599	97.0
Stillbirths	781	1.7
Early neonatal deaths	515	1.1
Late neonatal deaths	113	0.2
Infant deaths (up to 6 weeks)	35	0.0
Total	45023	100

## 6.2 Factors associated with risk of perinatal death

A number of factors were investigated for their association with the risk of perinatal death. Non-institutional delivery was not significantly associated with higher risk of perinatal death (339/13,058 vs 862/29,269,  $p=0.52$ ). Neither was delivery by a non-skilled person (362/12,879 vs 662/22302,  $p=0.41$ ). However, risk of perinatal death was higher if the mother belonged to the Apostolic Faith sect. These risks are presented in Table 6.2.

**Table 6.2: Relationship of place of delivery, person conducting delivery, and religion of mother to the risk of perinatal death**

	No of deaths	Denominator	Perinatal Deaths (%)	p-value
<i>Place of delivery:</i>				
Institutional	862	29,269	2.9	0.52
Non-institutional	339	13,058	2.5	
<i>Person conducting delivery:</i>				
Skilled person	662	22,303	2.9	0.41
Non-skilled person	362	12,879	2.7	
<i>Religion:</i>				
Apostolic Faith	311	9,146	3.3	0.003
Non-Apostolic Faith	600	21,751	2.7	

The risk of perinatal death by gestational age declined from 870/1000 total births at 22-25 weeks to 14/1000 total births at 38-41 weeks before rising again after 42 weeks to 37/1000. There was a marked improvement in perinatal survival from 34 weeks onwards.

Similarly the PNMR was very high between 500 and 999 grams (908/1000) then dropped to its lowest at 4000-4499 gram (7/1000), before rising again in the babies weighing 5000 grams or more (42/1000).

### 6.3 Causes of perinatal deaths

The classification used for causes of perinatal deaths is the one proposed for developing countries shown in Table 6.3 below. Preterm birth, birth asphyxia and unexplained intrauterine death accounted for 77% of the causes of perinatal deaths.

**Table 6.3: Distribution of causes of perinatal deaths, stillbirths and neonatal deaths**

Cause of Death	Perinatal Deaths		Stillbirths		Neonatal Deaths	
	Number of deaths	(%)	Number of deaths	(%)	Number of deaths	(%)
Unexplained intrauterine death	225	17.4	228	29.3	0	0.0
Preterm birth	435	33.6	169	21.7	303	49.1
Intrapartum asphyxia and birth trauma	366	26.0	257	33.0	125	20.3
Infection	43	3.3	3	0.4	111	18.0
Intrauterine growth restriction	17	1.3	9	1.2	9	1.5
Antepartum haemorrhage	20	1.5	15	1.9	5	0.8
Congenital abnormality	21	1.6	11	1.4	10	1.6
Maternal hypertension	47	3.6	47	6.0	2	0.3
Maternal disease	16	1.2	14	1.8	8	1.3
Multiple pregnancy	60	4.6	25	3.2	37	6.0
Other trauma	5	0.4	0	0.0	5	0.8
Other	1	0.0	0	0.0	1	0.2
Unknown	40	3.1	0	0.0	0	0
Total	1,296	100	756	100	616	100

### 6.4 Causes of stillbirths

Out of the 781 stillbirths in the study, the cause of the death was known in 756 cases (Table 6.3). Unexplained intrauterine death, preterm birth and intrapartum asphyxia were the leading causes of stillbirth, accounting for 84%. The percentage of deaths due to intrauterine growth restriction was low, reflecting under-diagnosis.

### 6.5 Causes of neonatal deaths

The cause of death was known in 616 out of 628 neonatal deaths (Table 6.4). Nearly half (49.1%) of them were caused by preterm birth, followed by intrapartum asphyxia (20.3%), infection (18%) and multiple pregnancy (6.0%).

### 6.6 Duration of survival in days before neonatal death

The age at death was known for 506 neonates. There was high mortality in the first few days after delivery. Nearly half died in the first 24 hrs (49.4%) and more than two thirds (68.6%) had died in the first 72 hrs. By the end of the first 7 days, 82.6% of the deaths had occurred. Table 6.4 shows the distribution of the ages at death of the neonate.

**Table 6.4: Distribution of age at death of neonates**

Age in days	Number of deaths	Percentage	Cumulative (%)
Up to 1 day	250	49.4	49.4
Up to 2 days	66	13.0	62.5
Up to 3 days	31	6.1	68.6
Up to 4 days	13	2.6	71.1
Up to 5 days	16	3.2	74.3
Up to 6 days	17	3.4	77.7
Up to 7 days	25	4.9	82.6
Up to 28 days	88	17.4	100.0
Total	506	100	

## 7.1 Main groups of respondents

There were four groups of respondents in the interview study, namely women who had delivered either at home or in a facility (328), traditional birth attendants (20), community leaders (22) and staff working in the facilities (24). All the respondents belonged to the districts which had been selected for the quantitative study, and all the pregnancies of the women interviewed were registered in that database.

The women were interviewed using questionnaires designed to establish the contribution of each of the three delays in the access to care for the mother and neonate. According to the three delay model these are:

- First-delay in recognising the problem and deciding to seek care
- Second-delay in reaching a facility once a decision has been made to seek care
- Third-delay in getting appropriate treatment once a facility has been reached

There was one questionnaire to look at the delays 1 and 2 in the mothers, a second one to look at delay 3, and a third one to look at the 3 delays in neonatal care. All three questionnaires were administered to separate women and no respondent attended more than one interview.

For the sake of brevity, the responses of all the respondents have been summarised in table below. There was remarkable agreement between the groups of respondents about barriers and facilitators to care, advantages and disadvantages of facility deliveries and the suggested improvements to the health system.

## 7.2 Barriers and facilitators

The barriers and facilitators regarding access to care are summarised in Tables 7.1 and 7.2. Some factors were actually found to be less important as barriers than had been thought before. They have been included as non-barriers in the table.

**Table 7.1: Barriers and facilitators to the access of obstetric care**

Type of delay	Barriers	Non-barriers	Facilitators
First delay	Failure to recognise danger signs	Cultural beliefs	Most women book for ANC
	High fees at district hospitals	Ritual practices	Strong desire to deliver at facility
	Apostolic Faith church membership	Women's ability to decide	Some TBAs refuse high risk women
Second delay	Lack of communication facilities		Increasing mobile network coverage
	Lack of transport		MWH at some facilities
	No money for transport		Increasing availability of scotch carts
	Woman alone at home		
	No community effort for transport		
Third delay	Lack of drugs and supplies	Women's ability to decide	Health workers aware of challenges
	Staff shortage	Taboos and rituals	Much care still given competently
	Inadequate midwifery skills		
	Lack of communication facilities		
	Lack of transport		
	Companions not included		

**Table 7.2: Barriers and facilitators to the access of neonatal care**

Type of delay	Barriers	Non-barriers	Facilitators
First delay	Failure to recognise illness	Cultural taboos	Strong desire to get baby treated
	Apostolic Faith church membership	Cultural rituals	No fees for neonatal care
	Seek traditional healers first	Women's ability to decide	
Second delay	Lack of communication facilities		Increasing mobile network coverage
	Lack of transport		Increasing availability of scotch carts
	No money for transport		
	No community effort for transport		
Third delay	Lack of drugs and supplies	Women's ability to decide	Health workers aware of deficiencies
	Staff shortage	Taboos and rituals	Much care still given competently
	Inadequate neonatal care skills		
	Lack of communication facilities		
	Lack of transport		

### 7.3 Advantages and disadvantages of facility deliveries in 2007

The main advantages and disadvantages of facility deliveries from all respondents are presented in Table 7.3.

**Table 7.3: Advantages and disadvantages of facility deliveries**

Advantages when fully operational	Disadvantages apparent in 2007
Cleanliness	District hospitals too expensive
Proper care to mother and baby	Very little food given to clients
Complications treated	Very often no drugs or supplies
Referrals made to higher levels on time	Poor communication facilities
Staff try their best	Poor transport facilities
	Staff poorly paid and overworked
	Some nurses not trained for deliveries
	Women discharged the same day
	Poor bedside manners of some nurses
	Clients had to bring supplies even after paying fees
	No water or electricity in some facilities
	Referring clients to TBAs

### 7.4 Improvements suggested to the health system by all groups of respondents

All respondents were asked to suggest changes to the health system in order to improve the outcomes for mothers and babies. The suggestions were given randomly but have been grouped under categories below for convenience.

#### Policies

- Make deliveries free at district hospitals
- Good salary structure to retain staff

#### Infrastructure at facilities

- Maintain good roads to facilities
- Ensure enough ambulances for the district
- Install electricity at all facilities
- Give each clinic a mobile phone service
- Maintain water supplies
- Construct kitchens for maternity waiting homes
- Install generators at all district hospitals

### Services at facilities

- Ensure availability of drugs and supplies
- Staff to update and maintain midwifery skills
- Staff to treat clients with respect
- Ensure sufficient food for in patients
- Health workers to attend community meetings
- Mothers to get more health education about pregnancy
- More women to be tested for HIV in pregnancy
- Encourage male involvement in pregnancy
- More condoms and family planning methods
- Keep women for a longer period after delivery
- Have respect for Apostolic Faith religion
- Stop referring clients to TBAs for deliveries

## 8.1 Data quality

The study attempted to obtain the highest achievable data quality through several measures. Firstly it was decided to seek a 'best practices' template for the variables to be registered in the study. For this, the data extraction form for the WHO study on maternal mortality and morbidity was used. Secondly, maternal outcomes were identified using two methods, the population-based survey and RAMOS. It had been noted that neither method on its own identified all deaths completely. Thirdly, multiple sources for the outcomes were used. Lastly, the coverage of events were confirmed, through other ways, such as verification of maternal deaths, or assessments of antenatal bookings.

## 8.2 Limitations of the study

There were several limitations of the study, some of which were caused by factors beyond the control of the investigators. The study was conducted during a period of acute socio-economic deterioration, associated with hyperinflation. The documentation on which the cause of death or morbidity was based was sometimes very scanty. For facility deaths it was usually clinical information, without supporting laboratory results. For home deaths it was based on verbal autopsies. Very few post-mortems were done on the maternal or perinatal deaths.

## 8.3 Situation analysis

The assessment of the notification of maternal deaths in 2006 showed gross under-reporting of maternal deaths. This occurred in several ways; at the district level there was under-reporting of deaths in the community, at provincial and tertiary levels there was under-reporting from facilities, and losses of data as records were moved up the system from the district hospital to the MoHCW head office. The deaths notified by districts to the provincial office was an unknown fraction of the true number, and of these only 56% were reported to the central collection unit at head office. The figures cannot therefore be used to calculate the MMR or the proportions of the various causes of maternal deaths. Due to the large number of missing values in many variables, the data could not be used for any epidemiological analysis, or preventative action at national level.

The forms were filled by 10 different grades of workers, of varying degrees of skills, often in a self-justifying manner. The Act is widely misunderstood to refer only to facility deaths. No health worker has a statutory obligation to *find* community maternal deaths and it has not been made clear it is the professional duty of the DMO to do so.

Notification by itself did not make it easier to count the number of deaths, or take effective measures to prevent them. The information was unsuitable for the audit of maternal deaths. A district health worker should be assigned the duty to conduct audit of maternal deaths, and the form should be available in an electronic version.

## 8.4 Process outcomes

Selected process outcomes were analysed to establish whether there were major differences between districts and also between the urban and rural areas.

Antenatal booking rates have remained high nationally, although they are now lower than before, especially in urban areas.

There were no significant differences in antenatal process indicators if the rural or urban districts were compared among themselves. However, there were significant differences between the urban and rural districts in some indicators. Rural women booked earlier, had less visits, and fewer of them took the HIV test during pregnancy. There were fewer antenatal complications detected but this was a result of the opportunities to detect them were reduced by lack of skills and resources in rural facilities. When complications were detected, the rate of referral was similar in both settings. Compliance with referral was high, but it was less in rural women due to lack of money and transport.

The low percentage of women who were tested for HIV (34%) and the big difference in testing between rural and urban areas (26% vs 47%) are a cause for concern. HIV and AIDS was the leading cause of maternal death in this study and will remain so unless more women are tested. Vertical transmission will not be brought down, and childhood mortality from HIV infection will continue to increase.

The greatest difference between rural and urban areas in process outcomes was in the opportunity to deliver at a facility. This difference was caused mainly by the difficulty rural women face in reaching a facility. The other indicators of intrapartum care (rates of detection of complications, referrals, assisted vaginal delivery and caesarean section) were all significantly less favourable in rural areas.

The caesarean section rate (4.4%) was lower than the recommended rate of at least 5%, and is very low in rural areas. This rate dropped from 7% in 1999 to 4.8% in 2005-6, and has fallen still further. In urban areas the rate is above the recommended level, so efforts are needed to make caesarean section more available in rural areas. In both Malawi and Zambia, the national caesarean section rates were 3% in the latest DHS reports..

The number of women who attended postnatal care at the visits of 10 days and 6 weeks was higher than those who were attended facilities for delivery. Women who delivered at home also attended facilities for these visits, which is an indication that there was less barrier to access. The same pattern with rural women having significantly less access was repeated here. However compliance with postpartum referral was the same in both settings. In the few who did not comply, again lack of money for transport was the reason for non-compliance.

To summarise, indicators of access to skilled care have shown a steady decline since 1999. Access to skilled care is far less in rural areas, and is at its worst during labour.

## **8.5 Maternal mortality**

This was the first time the national MMR has been established with narrow confidence intervals in Zimbabwe. This means it was not appropriate to compare the estimate with those obtained recently using methods which report wide confidence intervals. A comparison with some of the countries in the central and southern African region could not be performed for the same reason. Their national estimates are derived from demographic health surveys, using the sisterhood methods.

Comparison with earlier estimates from Zimbabwe was not possible since they were from institutions, districts or provinces, and suffer from the same problem of precision.

This population-based estimate allows Zimbabwe to monitor time trends. Simple calculation shows that if a study with the same precision were repeated, it would be possible to demonstrate changes in the MMR of 3% annually within 10 years or 2% annually within 15 years. After the next 'plot', in 10 or 15 years, Zimbabwe will know for the first time the trend of the MMR and will be able to evaluate the national programme.

HIV and AIDS is now the leading cause of maternal death. This situation was inevitable, given the high prevalence of HIV infection, the low percentage of women whose status is known during pregnancy, and the lack of access by women to ARVs. It will be much more difficult to reduce maternal deaths from HIV and AIDS than say from eclampsia or postpartum haemorrhage, which require intensive interventions but during a predictable and restricted period in pregnancy. The interventions required to address HIV and AIDS

are a complex array, ranging from the behavioural to the clinical; before, during and after pregnancy. The Road Map for Pregnancy and Newborn Care of Zimbabwe should introduce effective interventions to address this problem and these will have to be sustained for a long time.

Haemorrhage, hypertension/eclampsia, sepsis and obstructed labour remain the four leading causes of direct obstetric deaths. Effective interventions exist to treat these complications, and deaths from them are avoidable. Successful prevention and treatment of these complications represents the potential to reduce maternal deaths by 46%. None of the interventions are complex or beyond the capacity of a functioning health system in Zimbabwe. More women will have to reach facilities, and when they do so, they should receive effective treatment. In the short term, the first and second delays can only be properly addressed if women are in a facility *before* the onset of labour. There is already a small but significant proportion of women who do so, and this acceptance should be built upon to offer stay in MWHs to all rural women.

Members of the Apostolic Faith Christian sect were at higher risk of maternal death, due to their strong belief that health problems should be treated only through prayer. This is now a big problem because 29% of pregnant women belong to this sect. Even after the problems of the health system have been addressed, 29% of women may still not have access because of their religion. The major challenge will be to develop a sensitive approach to the sect, which respects their right to religious freedom but also asserts women's right to health.

## **8.6 Perinatal mortality**

The PNMR of 29 per 1000 births was higher than the estimate reported in the Zimbabwe DHS of 2005-6, when it was 25 per 1000 births. Other previous estimates from Zimbabwe were from institutions or districts, so they cannot be used for comparison.

The latest Demographic and Health and Surveys of three countries bordering Zimbabwe showed PNMR estimates ranging between 34 and 43 per 1000 births. In Zambia it was 38/1000 births, in Mozambique 43/1000 births and in Malawi 34/1000 births. In South Africa, the PNMR in 2000-2002 for the metropolitan, city and town and rural groupings were 36, 39, and 27/1000 births respectively<sup>15</sup>.

Of concern is that this PNMR has risen by 16% in 2 years, compared to the Zimbabwe DHS estimate of 2005-06. The three major causes of perinatal death (preterm birth, intrapartum asphyxia and trauma, and unexplained intrauterine death) contributed 78% towards the mortality.

The risk of neonatal death was highest in the first 24 hrs when 49% of the deaths occurred, and the first 72 hours constituted a very high risk time. It had been feared that the policy of early discharge after delivery led to neonatal deaths, as babies not suspected to be at risk went home with their mothers as early as 12 hrs after delivery. However, only 17 babies died at home having been discharged from facilities, compared to 113 who died at home, having been delivered at home. This suggests that babies delivered at home should be brought into a facility for observation, especially in the first three days.

## **8.7 Interview study**

Knowledge of the problems which contributed to maternal and perinatal mortality was good among the women and in the community in general. Knowledge of danger signs was good about obstetric problems but not about neonatal illnesses. The women knew about the value of antenatal care, which is why most of them attended at least four times, despite the distances involved in rural areas.

Previous studies in Zimbabwe had reported that most rural women would like to deliver at facilities, even if some of them end up doing so at home. This study confirmed this and found that the barriers were the same as those reported by the latest ZDHS<sup>5</sup>. These were: getting money for treatment, distance to the health facility, having to take transportation, concern over lack of drugs, concern over lack of providers, and not wanting to go alone. Inability of the woman to decide for herself or concern over the lack of a female provider at the facility were not significant barriers.

At the onset of labour, the woman has a high motivation to reach a facility, but is eventually overwhelmed by the obstacles of getting there. To make matters worse, the rural health centres, which are the closest to women, are known by the community to be short of skills and drugs. They are very likely to refer the woman to a district hospital, which is going to demand fees from the woman. Even if the woman has the fees, the RHC may not have access to communication or transport. In the end it is a very easy decision to labour at home!

User fees were a commonly mentioned reason for lack of access. A very damaging aspect of the fee structure is that women are charged more for the care of complications. This prevents access to women who are at risk from dying, the very *opposite* of what the health system is trying to achieve. Part of the problem is that the collection of fees is the responsibility of the finance departments of the hospitals, whose objectives are to recover costs and ensure financial viability. They are not aware of the health implications of their policies, or regard them as secondary to their main objectives. An overhaul of the policy is long overdue with clear ethical guidelines for finance administrators and health workers. The issues have been well described in a review<sup>16</sup>.

One factor which facilitated access to facilities was the availability of maternity waiting homes. All rural district hospitals had MWHs of varying degrees of quality, but apart from primigravidae and high risk women, admission was optional. Many RHCs also had MWHs (about one third in every district), but most were in disrepair and unoccupied. MWHs which offered good accommodation and kitchen facilities were always well patronised, but even the bad ones always had clients. Such was the motivation of the women to have a good outcome that they were prepared to 'rough it up' for a few weeks. The benefits of MWHs have already been demonstrated in Zimbabwe<sup>17</sup>.

The third obstetric delay was caused almost entirely by health system deficiencies. Previously it was mostly to do with lack of drugs and equipment but now the shortage of health workers and their lack of skills is very evident. Maintaining the skills of the providers and keeping the RHCs well stocked is very difficult because the facilities are numerous and some of them have very low workloads.

Neonatal care was less subject to the second and third delays, and the first delay was caused by the mother under-estimating the seriousness of the illness. There was a strong suggestion from TBAs that parents also delayed whilst consulting traditional healers, especially for conditions which they thought were caused by witchcraft. Health education for improved neonatal outcomes should be planned after studying local traditions and practices. The first delay could be reduced for neonates if women stayed at a MWH before delivery, since so many deaths occur on the first day. Reports from Zimbabwe have also indicated improved perinatal and neonatal outcomes associated with stay in a MWH.

## 9.1 (Vital) Registration of births and deaths

Recommendation 1: Facilities should record all area ward deliveries, including those occurring at home, in the same register.

Recommendation 2: It is recommended that the feasibility of vital registration be investigated in a small number of pilot districts over the next 5 years.

Recommendation 3: All pregnant women should use the same hand held maternity record in all public facilities throughout the country.

## 9.2 Notification of maternal deaths and audit

Recommendation 1: Maternal death notification should be streamlined, changed to electronic format and become linked to district-based audit.

Recommendation 2: Each district should employ a worker dedicated for district-based maternal and perinatal audit.

## 9.3 Skilled attendance for emergency obstetric and neonatal care

Recommendation 1: All rural women in Zimbabwe should be offered stay at maternity waiting homes for 3 weeks before and three days after delivery.

Recommendation 2: The MoHCW should greatly expand the training of midwives, clinical officers and nurse anaesthetists to improve the availability of CEOC skills at district hospitals.

Recommendation 3: The MoHCW should develop a sensitive strategy to engage the Apostolic Faith sect with the aim of improving the pregnancy outcomes among its female members.

## 9.4 User fees

Recommendation 1: An urgent review of the ‘user fee’ policy is required in order to remove this barrier to access for pregnant women.

## 9.5 Monitoring and evaluation

Recommendation 1: A national 5 year M&E plan for maternal and newborn health should be developed with plans for acting on the results expeditiously.

Recommendation 2: A confidential enquiry into maternal deaths should be considered in about 5 years’ time, after it has been determined that the health system can respond to its findings.

Recommendation 3: A repeat national maternal and perinatal mortality study should be conducted in 10-15 years’ time.

## 9.6 Next maternal and perinatal mortality study

Recommendation 1: The MoHCW should plan to fund the next study out of Zimbabwe’s resources.

Recommendation 2: The next maternal and perinatal mortality study should be simplified and made less expensive by reducing the number of process indicators to be evaluated to a minimum .

The ZMPMS team would like to acknowledge the assistance it received from several organisations and institutions:

The Department for International Development (UK) contributed most of the funds which enabled the study to take place. The team also received enormous encouragement from DFID Zimbabwe, led by Dr Allison Beattie.

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- The World Health Organization (WHO)
- The United Nations Fund for Population Activities (UNFPA)
- United Nations Children's Fund (UNICEF)
- The Department of Epidemiology and Public Health, University of Umea, Sweden
- University of Zimbabwe

We thank Loma Linda University, California, for allowing Dr Ronald Mataya to come to Zimbabwe to assist the study.

The enumerators, drivers and other field workers persevered through fuel shortages, delayed salaries and night camping to deliver the data which went into this report. The full list of participants involved can be seen in Annex 2. To them we say thank you and well done!

Many people facilitated the study through their work, and sometimes went outside the call of duty to assist us. They are too numerous to mention by name, but we owe them gratitude.

Lastly but not least, we thank the women and their relatives who gave up their time to answer our questions, sometimes at difficult times after a death. We hope the information will help other women and their babies to avoid deaths which can be prevented.

## Key references

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1. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. *Lancet*. 2006 Sep 30;368(9542):1189-200.
2. Mbizvo MT, Fawcus S, Lindmark G, Nystrom L. Maternal mortality in rural and urban Zimbabwe: social and reproductive factors in an incident case-referent study. *Soc Sci Med*. 1993 May; 36(9):1197-205.
3. WHO/UNICEF/UNFPA and The World Bank. Maternal mortality in 2005. Estimates developed by WHO, UNICEF, UNFPA and the World Bank. Geneva: World Health Organisation; 2007.
4. Central Statistical Office (Zimbabwe) and Macro International Inc. Zimbabwe Demographic and Health Survey 1999. Calverton, Maryland: Central Statistical Office and Macro International Inc; 2000.
5. Central Statistical Office (Zimbabwe) and Macro International Inc. Zimbabwe Demographic and Health Survey 2005-6. Calverton, Maryland: CSO and Macro International; 2007.
6. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: when? Where? Why? *Lancet*. 2005 Mar 5-11;365(9462):891-900.
7. Iliff PJ, Kenyon N. Perinatal mortality statistics in Harare 1980-1989. *Cent Afr J Med*. 1991 May;37(5):133-6.
8. Majoko F, Chipato T, Iliff V. Trends in maternal mortality for the Greater Harare Maternity Unit: 1976 to 1997. *Cent Afr J Med*. 2001 Aug;47(8):199-203.
9. Hill K, El Arifeen S, Koenig M, Al-Sabir A, Jamil K, Raggars H. How should we measure maternal mortality in the developing world? A comparison of household deaths and sibling history approaches. *Bull World Health Organ*. 2006 Mar;84(3):173-80.
10. Graham WJ, Ahmed S, Stanton C, Abou-Zahr C, Campbell OM. Measuring maternal mortality: an overview of opportunities and options for developing countries. *BMC Med*. 2008;6:12.
11. Immpact (Initiative for Maternal Mortality Programme Assessment). Immpact Toolkit. 2009 29/4/2009 [cited; Available from: [www.immpact-international.org/](http://www.immpact-international.org/)]
12. Gulmezoglu AM, Say L, Betran AP, Villar J, Piaggio G. WHO systematic review of maternal mortality and morbidity: methodological issues and challenges. *BMC Med Res Methodol*. 2004 Jul 5;4:16.
13. World Health Organization. International Statistical Classification of Diseases and Related Health Problems. 10th Revision. Geneva: WHO; 1992.
14. Fawcus S, Mbizvo MT, Lindmark G, Nystrom L. A community based investigation of causes of maternal mortality in rural and urban Zimbabwe. Maternal Mortality Study Group. *Cent Afr J Med*. 1995 Apr;41(4):105-13.
15. Pattinson RC. Why babies die—a perinatal care survey of South Africa, 2000-2002. *S Afr Med J*. 2003 Jun;93(6):445-50.
16. Gilson L. The lessons of user fee experience in Africa. *Health Policy Plan*. 1997 Dec;12(4):273-85.
17. Millard P, Bailey J, Hanson J. Antenatal village stay and pregnancy outcome in rural Zimbabwe. *Cent Afr J Med*. 1991 Jan;37(1):1-4.

# Annexes

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## Annex 1 – Main definitions

**Abortion:** any birth where the gestation is less than 22 completed weeks or the fetus less than 500 grams in weight.

**Birth weight:** The first weight of the fetus or newborn obtained after birth.

**Death of a woman in the reproductive age:** death of a woman between the ages of 12 and 49 years, irrespective of the cause.

**Direct maternal death:** death from obstetric complications of the pregnant state (pregnancy, labour, puerperium) from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.

**Early neonatal death:** death of a neonate born at least 500 grams in weight or at least 22 weeks in gestation, in the first 7 days after birth.

**Early neonatal death rate (ENNDR):** 
$$\frac{\text{Total number of early neonatal deaths} \times 1000}{\text{Total number of live births}}$$

**Gestational age:** duration of pregnancy measured from the first day of the last normal menstrual period in completed weeks.

**Incidental death:** death from unrelated causes which happen to occur in the pregnancy or puerperium.

**Indirect maternal death:** death resulting from previous existing disease, or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by the physiological effects of pregnancy.

**Late neonatal death:** death of a neonate more than 7 days, but less than 28 days completed after birth.

**Live birth:** any birth of a live neonate at least 500 gram in weight or at least 22 weeks gestation.

**Maternal death:** death of a woman while pregnant or within 42 days of the end of the pregnancy, from any cause related to, or aggravated by, the pregnancy or its management but not from accidental or incidental causes.

**Maternal mortality ratio:** 
$$\frac{\text{Maternal deaths in a period} \times 100,000}{\text{Live births in a period}}$$

**Perinatal mortality rate (PNMR):** 
$$\frac{\text{Total number of perinatal deaths} \times 1000}{\text{Total number of births}}$$

**Perinatal period:** period commencing at 22 completed weeks of gestation, the time when birth weight is normally 500 grams, and ends seven completed days after birth.

**Pre-term:** Less than 37 completed weeks of gestation.

**Post-term:** 42 completed weeks or more of gestation.

**Stillbirth:** an infant born with no signs of life after 22 weeks of gestation or weighing more than 500 grams.

**Stillbirth rate (SBR):** 
$$\frac{\text{Total number of stillbirths} \times 1000}{\text{Total number of births}}$$

## Annex 2 – List of participants of the Zimbabwe Maternal and Perinatal Mortality Study

Name	Title	Institution	Status
S P Munjanja	Senior Lecturer	University of Zimbabwe	Principal Investigator
M Nyandoro	Deputy Director, RH	MoHCW	Head Office Supervisor
T Magwali	Lecturer	University of Zimbabwe	Assistant Principal Investigator
A Mangombe	Programme officer	MoCHW	Research assistant
M Mungazi	Clerical Assistant	MoCHW	Clerical Assistant
G Dube	Administrator	University of Zimbabwe	Administrator
A Chimatira	Data Entry Clerk	University of Zimbabwe	Data Entry Clerk
L Zickie	Data Entry Clerk	University of Zimbabwe	Data Entry Clerk
P Nyuswa	Data Entry Clerk	University of Zimbabwe	Data Entry Clerk
M Makunike	Data Entry Clerk	University of Zimbabwe	Data Entry Clerk
L Maumbe	Driver	University of Zimbabwe	Driver
F K Zingoni	Driver	MoHCW	Driver
E Tahuringana	Midwife	University of Zimbabwe	Research midwife
J Kasule	Professor	University of Zimbabwe	Maternal Death reviewer
J Chirengwa	Obstetrician	Masvingo Hospital	Maternal Death Verifier
T Gunguwo	Obstetrician	United Bulawayo Hospital	Maternal Death Verifier
D Matutu	Registrar	United Bulawayo Hospital	Maternal Death Verifier
T M Magure	Lecturer	University of Zimbabwe	Researcher
V Mushangwe	Lecturer	University of Zimbabwe	Researcher
NA Gona	Paediatrician	University of Zimbabwe	Researcher
G Kandawasvika	Lecturer	University of Zimbabwe	Researcher
R Mataya	Assoc Professor	Loma Linda University	Researcher
L Nystrom	Assoc Professor	University of Umea	Statistician
S Manyame	Registrar	Parirenyatwa Hospital	Researcher
B T Guzha	Registrar	Parirenyatwa Hospital	Researcher
V Dondo	Registrar	Harare Hospital	Researcher
M Chirehwa	Statistician	University of Zimbabwe	Statistician
C Bakasa	Provincial Nursing Officer	Mash West	Provincial Supervisor
S M Banda	Provincial Medical Director	Manicaland	Provincial Supervisor
J Chitando	Provincial Nursing Officer	Masvingo	Provincial Supervisor
J Dube	Provincial Nursing Officer	Mat South	Provincial Supervisor
R Gerede	Provincial Nursing Officer	Mash East	Provincial Supervisor
J Marembo	Provincial Nursing Officer	Midlands	Provincial Supervisor
O Mlingo	Provincial Nursing Officer	Bulawayo	Provincial Supervisor
P Munyaradzi	Provincial Nursing Officer	Harare	Provincial Supervisor
E S Tshuma	Provincial Nursing Officer	Mat. North	Provincial Supervisor
C Zvamashakwe	Provincial Nursing Officer	Mash Central	Provincial Supervisor
C Chiteura	Community Sister	Chivi	District Supervisor
K Chivende	Community Sister	Zvimba	District Supervisor
O Karisa	Community Sister	Bindura	District Supervisor
S Muchirahondo	Community Sister	Mutare	District Supervisor
S Mushoriwa	Community Sister	Kwekwe	District Supervisor
E Mvere	Community Sister	Mutoko	District Supervisor
W Ngwenya	Community Sister	Tsholotsho	District Supervisor
R Sibanda	Community Sister	Matobo	District Supervisor

<b>Name</b>	<b>Title</b>	<b>Institution</b>	<b>Status</b>
I Masvosva	Midwife	Bindura	Enumerator
B E Mungate	Midwife	Bindura	Enumerator
C S Ngwenya	Midwife	Bindura	Enumerator
G Nhivativa	Midwife	Bindura	Enumerator
L M Jiri	Midwife	Bulawayo	Enumerator
F Mambira	Midwife	Bulawayo	Enumerator
S Mazivisa	Midwife	Bulawayo	Enumerator
S Ngwenya	Midwife	Bulawayo	Enumerator
I Pedze	Midwife	Bulawayo	Enumerator
L Sibanda	Midwife	Bulawayo	Enumerator
B Mamombe	Midwife	Chivi	Enumerator
F Nyamadzao	Midwife	Chivi	Enumerator
S Tandai	Midwife	Chivi	Enumerator
C Zishumba	Midwife	Chivi	Enumerator
P Gadzirai	Midwife	Harare	Enumerator
A Magaba	Midwife	Harare	Enumerator
V Makaza	Midwife	Harare	Enumerator
F Mandimika	Midwife	Harare	Enumerator
L A Mbiri	Midwife	Harare	Enumerator
L Muguti	Midwife	Harare	Enumerator
I Ndoro	Midwife	Harare	Enumerator
E Nyamasve	Midwife	Harare	Enumerator
L M Vinga	Midwife	Harare	Enumerator
E Wood	Midwife	Harare	Enumerator
B E Kuvheya	Midwife	Harare	Enumerator
H Mhlanga	Midwife	Harare	Enumerator
F Nyika	Midwife	Harare	Enumerator
D M Chadavaenzi	Midwife	Harare	Enumerator
N Benhura	Midwife	Kwekwe	Enumerator
B Machaka	Midwife	Kwekwe	Enumerator
B Muzota	Midwife	Kwekwe	Enumerator
P Zimbizi	Midwife	Kwekwe	Enumerator
O Madonko	Midwife	Matobo	Enumerator
I Mcingolwane	Midwife	Matobo	Enumerator
E Ndlovu	Midwife	Matobo	Enumerator
B Ndlovu	Midwife	Matobo	Enumerator
B Chikukwa	Midwife	Mutare	Enumerator
J Dube	Midwife	Mutare	Enumerator
S Gonah	Midwife	Mutare	Enumerator
G Murimwa	Midwife	Mutare	Enumerator
P Nyazika	Midwife	Mutare	Enumerator
M Bganya	Midwife	Mutoko	Enumerator
P Mandaza	Midwife	Mutoko	Enumerator
K Mutsena	Midwife	Mutoko	Enumerator
N Ndlovu	Midwife	Mutoko	Enumerator
E B Moyo	Midwife	Tsholotsho	Enumerator
I Moyo	Midwife	Tsholotsho	Enumerator
A J Ndiweni	Midwife	Tsholotsho	Enumerator
E Ngaru	Midwife	Tsholotsho	Enumerator
S Bonga	Midwife	Zvimba	Enumerator
P Kandengwa	Midwife	Zvimba	Enumerator
EM'soko	Midwife	Zvimba	Enumerator
K Ndoro	Midwife	Zvimba	Enumerator