THE ETIOLOGY OF MATERNAL MORTALITY IN THE EIGHT REGIONS OF NAMIBIA: WHAT DO VERBAL AUTOPSIES TELL US?

Submitted in partial fulfillment of Bachelor of Science (Honors) in population Studies, Geography minor

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ABSTRACT

Objective: To reassess the practical value of verbal autopsy data, which in the absence of more definitive information, have been used to describe the causes of maternal and to identify priorities in programs intended to save women's lives in developing countries.

Methods: I re analyzed verbal autopsy information from a study of all 97 identified maternal deaths that occurred in the eight regions located East, West and Central part of Namibia (Oshana, Omusati, Ohangwena, Oshikoto, Kavango, Caprivi, Kunene and Otjozondjupa) from 2008-2010, taking into account other causes of death and the who classification system. The results will be used to fit a binary logistic regression model.

Findings: the reclassification is expected to show wide variations in the attribution of maternal deaths to single specific non medical causes.

Conclusion: the verbal autopsy methodology will inherit limitations as a means of obtaining histories of medical events. At best it may reconfirm the knowledge that mortality among poor women with little access to medical care is higher than that among wealthier women who have better access to such care.

Keywords: Maternal mortality; cause of death; death certificates; autopsy/methods; interviews; Regions (Kunene, Caprivi, Kavango, Oshikoto, Ohangwena, Omusati, Oshana).

ACKNOWLEDGEMENTS

LIST OF ACRONYMS

C/B/EMOC	Comprehensive/Basic/Emergency Obstetric Care
ICD-10	International Classification of Disease 10th Edition
MOHSS	Ministry of Health and Social Services
MDGs	Millennium Development Goals
MMR	Maternal Mortality Rate
NDHS	Namibia Demographic and Health Survey
RAPID	Rapid Ascertainment Process for Institutional Death
TBA	Traditional Birth Attendant
TWG	Technical Working Group
UNAM	University of Namibia
UNFPA	United Nations Population Fund
UNICEF	United Nations' Children Fund
VA	Verbal Autopsy
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background to the Problem

Every minute of everyday a woman dies as a result of pregnancy or childbirth somewhere in the world (Nawal et.al, 2008). Phillip et.al (2006) state that she may be a teenage bride, physically not yet sufficiently developed for child birth, struggling to give birth to a first baby, and far from professional help. She may h also be a however be a woman who has delivered in hospital who dies for what blood or drugs that are in short supply. Or she may be an older woman struggling to deliver during labor.

Maternal mortality, of all health indicators is strongly believed by Ziraba et.al (2006) to exhibit the greatest disparity between the developed and developing world with 95% of the burden being in Africa and Asia alone. With a functioning health care system, all the major causes are treatable if complications are identified early. Current estimates for Maternal Mortality Rate (MMR) are as moderate as 180/100 000 live births in Namibia. Where about 70% of births are delivered by skilled birth attendants in developing cities, and only about half of the births in the urban informal settlements are assisted by skilled health professionals. Under these circumstances, it is likely that maternal mortality situation in informal settlements and remote areas will be worse than the national estimates.

Maternal mortality according to Canavan (2009) is defined as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes."

Canavan further highlights the difficulty in obtaining accurate measures of maternal mortality and morbidity; in part attributable to the nature and outcome of the measure in question. With weak health information systems, it's also difficult to obtain reliable measures even in countries with more advanced health information systems (e.g. India & China). Most significantly the highest maternal mortality rates are in sub-Saharan Africa and South Asia according to a recent study by the Maternal Mortality Network.

A major challenge in understanding maternal mortality burden in Namibia is the lack of reliable data. This paper is proposing to reassess the practical value of verbal autopsy data, which in the absence of more definitive information, have been used to describe the causes of maternal mortality as well as in identifying priorities in programmes intended to save women's lives in developing countries from the eight regions of Namibia: Omusati, Oshana, Ohangwena, Oshikoto, Kavango, Caprivi, Kunene and Otjozondjupa. This formative study will help to guide future research in prioritizing the effectiveness of skilled birth attendance by filling up the identified gaps on maternal mortality causes.

REGION	TOTAL NUMBER OF REPORTED MATERNAL DEATHS
OTJOZONDJUPA	7
KAVANGO	18
OSHIKOTO	15
OSHANA	27
OMUSATI	10
OHANGWENA	9
KUNENE	1
CAPRIVI	10
GRAND TOTAL	97

Table 1: *Reported deaths covering the period 1ˢᵗ January 2008 to 31 May 2010*

Table 1 indicates that maternal deaths are still occurring in the health facilities throughout the country. However it appears that the full extent and information on maternal deaths in the country may not be well known as the figures presented relate to health facility-based maternal deaths mostly reported in maternal wards.

Vital registrations in Namibia are often incomplete. Hence, the probability of certain maternal deaths not being recorded is very high. There is an urgent need of an ascertainment system in Namibia that will be held responsible for both the cause and deaths record keeping.

1.2 Study sites

The study area consisted of 8 regions (the northern and central regions) namely Oshikoto, Kavango, Oshana, Otjozondjupa, Ohangwena, Omusati, Caprivi and Kunene in Namibia. These regions consist of 22 districts, whereby all 22 districts within the eight regions where maternal deaths occurred were selected for VA. Figure 2 below displays the areas under study.
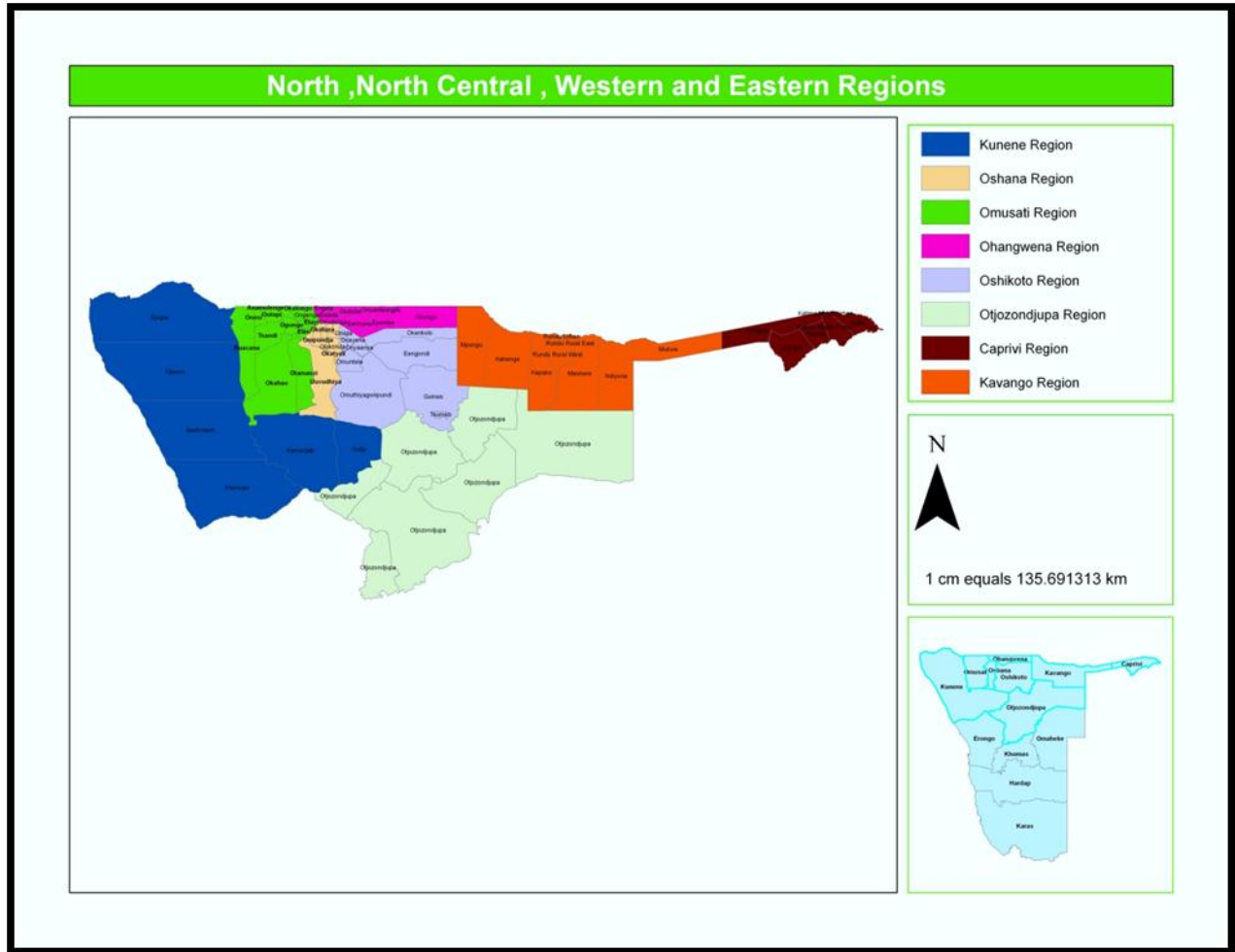
Figure 1: Geographical boundaries of the eight regions

Source: MOHSS-Survey contributing to maternal deaths 2010

1.3 SOCIO ECONOMIC ACTIVITIES

Subsistence farming and animal husbandry are the main source of Income in almost all the targeted regions. The unemployment rate in the country is 37% and most of these people are in the rural area. Educational status of the regions is presented in table three.

1.3.1 EDUCATIONAL STATUS:

Region	Male – No education (%)	Female – No education (%)
Omusati	13.8	13.8
Oshana	9.9	10.8
Ohangwena	18	21.5
Oshikoto	14.3	17.4
Kavango	21.7	18.4
Caprivi	16	8.3
Kunene	38.3	41.7
Otjozondjupa	22.3	27.3

Table 2: educational status indicators

Source: [NDHS 2006/7]

REGIONS	BEMOC	CEMOC %
OMUSATI	0	50
OSHANA	0	100
OHANGWENA	0	0
OTJOZONDJUPA	0	50
KUNENE	0	75
CAPRIVI	0	0
OSHIKOTO	0	50
KAVANGO	0	75

Table 3: availability of B/CEMOC in the regions under study

Source: MOHSS-Survey contributing to maternal deaths 2010-Draft report

1.4 Statement Of The Problem

Recent meta-analyses of verbal autopsy data to estimate indirect causes of maternal mortality in developing nations (Abouzahr et al. 1991; Sloan et al. 2001) reflect that today's rates of maternal mortality show a greater disparity between countries than even the infant mortality rate, which is most often taken as the measure of comparative disadvantage (Philip et al. 2006). Every time a woman in the world's poorest communities becomes pregnant she runs a risk of dying as a result of pregnancy and childbirth that is up to 200 times higher than the risk run by a woman in, say, Western Europe. And not only does she run a greater risk, she also undergoes that risk more often (Nour, 2008).

Approximately 529, 000 women die from pregnancy-related causes annually and almost 99% of these maternal deaths occur in developing nations such as Namibia. The highest maternal mortality rates are in Africa, with a lifetime risk of 1 in 16, and the lowest rates are in Western nations (1:2800) with a global ration of 400 maternal deaths per 100 000 live births (adapted from Women's health in the developing world, 2008).

WHO (1990) identifies the main causes of death as postpartum hemorrhage (24%), while indirect causes such as anemia, malaria, and heart disease all constitute (20%); infection (15%); unsafe abortion (13%); Eclampsia (12%); obstructed labor (8%); ectopic pregnancy, embolism, and anesthesia complications (8%). Abouzahr & Royston (1990) further classified maternal mortality in resource-poor nations as attributed to the "three main delays": delay in deciding to seek care, delay in reaching care in time, and delay in receiving adequate treatment.

Figure 1 below illustrates the three delays which will be discussed in depth later in chapter four of this report.
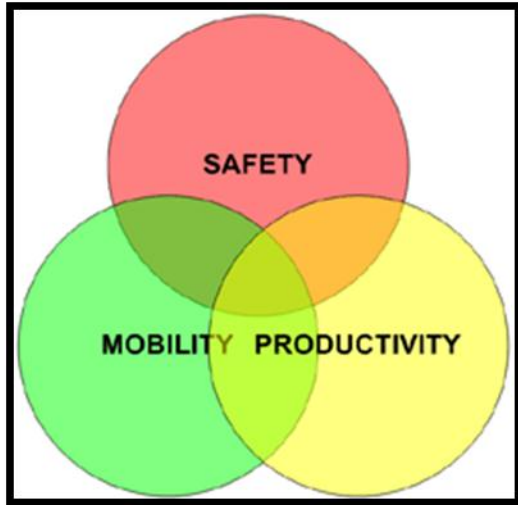
Figure2: the three delay framework in maternal mortality

Moreover, as with any other processes maternal mortality is believed by various researchers to have its origins other than just the presented direct medical causes which mostly presented on the death certificates. However, these origins can only be accessed via the verbal autopsies procedures, thus the aim of this study, and thereafter be able to suggest possible recommendations to combat these immediate causes effectively.

In Namibia to be specific, improving the health-care system overall is undoubtedly a critical component to reducing its maternal mortality as well as the general health of the nation. Considering that accurately measures of the progress the country is currently making and evaluating its health programs as an expected challenge, there is still no capacity to collect data, and data collected varies in both quantity and quality.

The area of investigation has been commented by Canavan (2009), Nour (2008) and Sloan et al. (2001) who are in agreement that maternal mortality is not a chance event, but the end point beginning at birth and developing over the entire reproductive life period.

However, various studies have been done, focusing only more on medical causes, leaving out the non medical causes which are more useful in forecasting future maternal events, and as with any other processes it has its origins other than medical causes and these origins can only be accessed via verbal autopsies, hence the **significance** of this study.

Moreover, civil registrations in the countries are still incomplete and often starting to advocate and engage our political leaders. The issue of baby-dumping is becoming severe mostly in the riverbeds and disposed wastes of the rural regions. Deaths due to unsafe abortions among adolescents are on the lookouts as safe abortion is still nonexistent in the country. Moreover, the process of identifying health complications and seeking assistance as well as poor socio-economic indicators of women of the reproductive age in the informal settlements of urban regions are still unsolved. There is more to maternal deaths other than just the direct and indirect causes. There is a need to identify these non-probable medical causes such as the biomedical and social circumstances which are quiet increasing in northern Namibia, and are believed to be some of the etiological causes in maternal mortality. Hence through the verbal autopsy procedure, these probable non medical causes can be investigated and assessed.

1.5 Study Objectives

Primary objective:

To reassess the practical value of verbal autopsy data, which in the absence of more definitive information, have been used to describe the non medical causes of maternal mortality and to identify priorities in programs intended to save women's lives in Oshikoto, Kavango, Oshana, Otjozondjupa, Ohangwena, Omusati, Caprivi and Kunene region .

Secondary objectives:

➢ To reconstruct events preceding death so as to establish the probable non medical causes

➢ To reconstruct factors associated with care-seeking behavior and access to and delivery of services; and

➢ To collect information on background characteristics of the deceased including age, party, education and other social variables to be used in fitting a binary logistic regression model.

1.6 Organization of Chapters

Chapter one gives the background information about the study. This includes aspects such as the background information, statement of the problem, goals and objectives of the study, and the organization of the chapters presented in this report.

Chapter two entails the review of relevant literature to the study. This chapter is separated into relevant categories; what other researchers and authors have stated and done that is relevant to the etiology of maternal deaths in developing countries, and Namibia to be specific.

Chapter three outline and discuss the materials and methods used in the study. It presents the study design and further explains the procedures that were followed to obtain the results. Even though this study relied heavily on secondary data, research instruments (i.e. the questionnaire, hardware and software) used in the data management of the original study will be discussed briefly by the chapter. Sampling methods and statistical tests applied will be discussed in detail throughout.

Chapter four presents the findings and analysis. Results will be presented in raw data (extracted from the secondary VA data set), summarized and further clarified in tables and figures. A clear description and interpretation of what was found as well as hypotheses testing will be reported in the chapter. Moreover, implications of the results on the etiological causes of maternal mortality in the eight regions of Namibia and in the reproductive health field at large will be discussed.

Chapter 5 concludes and recommends further approaches to be undertaken either by future researchers or health care planners and providers. This chapter presents a summary of the findings, gives suggestions on further research, and remark on the study's contribution. These conclusions will be based on the specific objectives of the study with relevant recommendations.

CHAPTER TWO

LITERATURE REVIEW

WHO (1990) defines **verbal autopsy** as a process designed to facilitate the identification of maternal deaths where medical certification is inadequate-to separate maternal deaths from those that are non-maternal through a reconstruction of the events surrounding deaths in the community.

According to the *global fact book on maternal mortality* (1990), the etiologies of maternal deaths can be grouped into three causes:

a) direct causes
b) indirect causes and
c) non-medical causes

The **direct** causes refer to the diseases or complications which occur only during pregnancy and they include *abortion, ectopic pregnancy* (pregnancy which develops outside the uterus), *hypertensive* diseases of pregnancy, *ante partum* & *postpartum hemorrhage, obstructed labor*, and *puerperal sepsis*.

The **indirect** causes are the diseases which may be present even before pregnancy but are aggravated by pregnancy; examples include *heart disease*, *anemia*, essential *hypertension* (high blood pressure of unknown origin), *diabetes mellitus* and *haemoglobinopathesi*s (disease of the red blood cells). Philip et al. (2006) also added that coincidental causes are fortuitous in nature, and deaths from road traffic accidents are a typical example of these indirect causes.

As for the **Non-medical** causes, Sloan et al. (2001) strongly believe that in fact the reasons why women die in pregnancy & child birth are many layered. Behind the medical causes there are logistic causes-failures in the health-care system, lack of transport, and behind all these are all the social, cultural & political factors which together determine the status of women, their health, fertility and health seeking-behavior.

2 .1 The evolution of maternal and newborn health programs

The evolution of maternal and newborn health programming has led to a series of guidelines and protocols3 that have been developed to guide practitioners on best practice and ultimately lead to providing a comprehensive package of maternal and newborn healthcare. Linked directly with access to skilled health providers, UNFPA4 have defined priority actions that are imperative for safe motherhood including the following key practices;

- all women receive or have access to information on reproductive health, counseling and services for prevention of unwanted pregnancies
- all pregnant women have access to skilled medical care during and after pregnancy, and care for the newborn
- geographic, socio-cultural, economic, legal and regulatory barriers that impede access to skilled health care are addressed
- The capacity of the health system at all levels is strengthened for efficient and effective delivery of reproductive services

Traditional birth attendees have been also been corner stone's in support to mothers giving birth in rural villages throughout developing countries for centuries. In the past decades, WHO and other health agencies (UNFPA, UNICEF) promoted training of TBAs in order to improve access to safe delivery and scale up coverage of maternal and reproductive health services. This initiative became a public health strategy as advocated by UNICEF in the 1950s by pursuing provision of delivery kits to TBAs. Following the Alma Ata in 1978, efforts were focused to strengthen the links between traditional birth attendees in the community and the public health systems. However, evidence of increasing maternal mortality rates and limited impact of untrained TBA interventions led to a rethink on more effective strategies (adapted from Canavan, 2009).

2.2 Interventions to Reduce Maternal Mortality

Nawal & Nour (2008) state that there are several interventions procedures in place to try and reduce maternal mortality mostly in developing countries. Evidence-based interventions for reducing maternal mortality strategically target the main causes of death mentioned earlier. They further indicated that, the consensus among international organizations is that quality care requires services throughout a woman's reproductive period. These organizations design

programs that focus on improving the outcomes during the Intrapartum/postpartum period, offering family planning services, providing safe abortions, and increasing ante partum care.

2.2.1   Intrapartum and postpartum Period

Several interventions focusing on the Intrapartum period have been implemented. For example, efforts to address or treat postpartum hemorrhage and infection at health-care facilities have been made by providing oxytocics and antibiotics, manual removal of the placenta, blood transfusion, and if needed hysterectomy. But are these measures all effective? Has an objective been reach yet to reduce postpartum hemorrhage in Namibia for example? Programs designed for home-based deliveries recommend that, skilled birth attendants carry emergency first aid kits and easy access to health facilities if labor becomes dysfunctional. However, this is not the case in some parts of Namibia, mainly in the northern part, as well as in the informal settlements of the Windhoek city.

2.2.2   Family Planning

Donors, UN organizations, and the Namibian government have made great strides in promoting and monitoring family planning and contraceptive use. Due to this effort, thousands of maternal deaths have been prevented. However, contraceptive use in many resource-poor communities in the country is still not at optimal levels. Nawal et.al mentioned that the overall lack of contraceptive access rate is 50%, with a low of 4% in Europe and high of 57% in African countries. Moreover, this lack of access to contraception leads to unwanted pregnancies, increase demand for abortions, and death related to unsafe abortions. Nevertheless, if unwanted pregnancies are prevented, data suggest that about 25% to 40% of maternal deaths could be eliminated.

2.2.3   Safe Abortions

Given the high rate of maternal death due to unwanted pregnancies, some African countries such as South Africa and Tunisia, are recognizing the importance of developing wider access to safe abortions. Countries such as Mali, Sudan, Benin and Burkina Faso, where legally, politically, and culturally access to abortion creates internal dispute, governments have allowed women access to safe abortions under specific circumstances, such as in cases of

rape or foetal malformation. A similar procedure is used in Namibia, whereby some of the reported rape victims are intervened with specific injections immediately after the incident to prevent unwanted pregnancies and other sexually transmitted diseases. However, reports on such cases in Namibia are very rare and seldom, baby dumping is still a major daily problem in both rural and urban areas of the country, and women's access to safe abortions is nonexistence when advocating policy change. Moreover, Women who seek help may be ostracized.

2.2.4   Ante partum care

Following the Safe Motherhood Conference as well as Namibia's Millennium Development Goals (MDGs), a key action point was improving ante partum care in order to identify high-risk pregnancies and infant deaths. Although this seems logical that it should be a core component to maternal health, program evaluations demonstrate that ante partum care shows little impact on reducing maternal mortality. Screening tests during the antenatal period are sometimes found to be inefficient and overwhelming the Namibian referral health centers. Hoases et.al (1990) also feel that women offered free antenatal care do not always necessarily use it because they may feel well and do not see the need to see a health care provider. This is not to disapprove the need for ante partum care or its importance, but rather to indicate that resources should be allocated elsewhere especially in rural remote areas in the country to make a greater impact on maternal mortality.

CHAPTER THREE

METHODOLOGY

This study relied extensively on secondary data collected from the VA open-ended questionnaires that were distributed to the eight North East, West and Central part regions in Namibia. A replication of the original study is replicated below.

3.1 Study Design

This was a retrospective cross-sectional descriptive study which gathered information through the Rapid Ascertainment Process for Institutional Deaths (RAPID) to ascertain the prevalence of the unreported maternal deaths at health facilities and verbal autopsy (VA) determined the factors leading to maternal deaths and gathered information from the institution and from the community perspective.

Based on the original study, the choice of the two methods was informed by the need to have a more holistic picture of the magnitude of maternal deaths in the regions. However, for the purpose of this study, the focus is mainly only on the verbal autopsy methodology. Results from the (RAPID) procedure will not be used for this study.

VERBAL AUTOPSY: A WHO standard tool was used to audit records of the deceased and who met the criteria of the study followed by interviewing of family members, close friends and neighbors, on the events preceding the death, and collect background information on the deceased such as age, parity, education, occupation and other important variables. It is also important to remark that the VA tool was employed to meet the requirements with regards to the obtaining situations in as far as maternal deaths are concerned in the selected regions.

An opened questionnaire tackled the qualitative aspect of the tool and a form was added to help the field workers classify the contributing factors using the three delay conceptual frame work and the cause of death and the ICD-10 was used to classify the cause of death.

3.2 Study sites

The study area consisted of eight northern and central regions i.e. Oshikoto, Kavango, Oshana, Otjozondjupa, Ohangwena, Omusati, Caprivi and Kunene in Namibia. From these regions all 22 districts within the eight regions where maternal deaths occurred were selected for VA.

3.3 Sampling and Study population

The sample for the Verbal Autopsy consisted of the respondents who were identified using the records of all reported maternal death cases in the institutions within the regions under study during the period from the 1st January 2008 to 31 May 2010.

Region	Reported Deaths		Exported cases	Total cases remained per region	Imported cases	Total cases studied by the region
	All	Non-qualifying				
Kunene	3	0	0	1	2	3
Caprivi	10	0	0	10	1	11
Oshikoto	16	1	4	11	1	11
Omusati	12	6	1	5	10	15
Oshana	37	4	25	8	5	13
Kavango	21	2	1	18	0	17
Ohangwena	11	1	2	9	11	20
Otjozondjupa	8	0	1	7	0	7
TOTAL	116	14	27	81	27	97

Table 3: Sampled population of the reported maternal deaths for VA

Source: MOHSS-Survey contributing to maternal deaths 2010-Draft report

<u>NB</u>: 17 cases in total were lost [14 cases Angolans, 2 could not be traced, 1 beyond the reporting period, 2 double counted]

3.4 Data Sources

3.4.1 Secondary Data

The secondary data used for an in depth determination of the etiology of maternal mortality in the eight regions of Namibia were obtained from "*The survey on the contributing factors leading to maternal death and establish the prevalence of missed deaths in the eight regions of Namibia*", (2010) MOHSS-Oshikoto directorate.

Table two below explains the inclusion as well as the exclusion criteria that were used to obtain the sample size.

Verbal Autopsy	
Inclusion Criteria	**Exclusion criteria**
Death of a woman of child bearing age (15-49yrs) that occurred during pregnancy, delivery and up to 42 days after delivery or termination of pregnancy irrespective of gestational age and site of pregnancy between 1st January 2008 and 31st May 2010	Death of a woman unrelated to pregnancy or delivery
	Death of a woman that occurred more than 42 days after delivery or termination of pregnancy
	Death that occurred as a result of an accident or incident
	Maternal death of a woman from outside the country where relatives or respondents cannot be traced
	Deaths occurring outside the Regions under study

Table 4: Inclusion and Exclusion Criteria

Source: MOHSS-Survey contributing to maternal deaths 2010

3.5 Data Collection

Data collection was done from the 30th August to the 30th September 2010 by 46 field workers who were selected from the participating regions on the merit of being a nurse/midwife with counseling skills and trained on the administration of VA questionnaires and the RAPID tools. The International verbal autopsy (VA) questionnaire related to the death of a person aged 15 years and above including deaths related to pregnancy and childbirth was adapted and modified to capture the idea of three delays and causes of death and administered to the identified respondents at community level. Available records of the deceased were reviewed and information related to the cause of death and contributing factors were extracted.

Death registers, outpatient and inpatient registers, death notification books and other hospital records such as, nurses and doctors' report, post mortem records and operating theatre records pertaining to deaths of all women of child-bearing age were reviewed to determine the cause of deaths. The information from the registers was extracted to R1 form and where the case was not correctly classified, the information was extracted further to R2 form. This was done to classify cases as maternal or non-maternal death or maternal death unclear.

In both cases, supervisors who were inducted were appointed to ensure quality of data collection, provide technical support, and to coordinate the survey activities. After data collection and verification at the site level, completed questionnaires/tools were sent to a central processing center where a team of the Principal Investigator and Co-Investigator who are medical doctors with vast experience cross checked before computing the data. The computed data were forwarded electronically to the Statistician for analysis.

3.4 Pre-test of the Data Collection Tools

The tool has been validated and used in other settings however to ensure the clarity, validity, completeness and relevance of the Verbal Autopsy, a pre-test was done at community and health facility respectively before undertaking the actual field work. After the pre-test, the survey tools were revised to enhance its validity and reliability. Tools were not translated into the local

languages due to the diversity of languages in the area under study. Translation was done during the interview (for VA tool) by the well trained field officers.

3.5 Data management

3.5.1   Data handling

The acquired secondary data set was imported into SPSS from version 16 to SPSS version 18 for data cleaning. Missing cases were identified and coded as missing before any analysis was performed.

3.5.2   Data analysis

Statistical analysis was done in SPSS version 18. Frequencies of maternal deaths identified by non-medical causes of deaths were tabulated. A 95% confidence interval around the estimates such as age was calculated. Social, cultural, economic & behavior factors such as age, education, parity, marital status, place residence, region, occupation, pregnancy and delivery status were analyzed to best explain risk factors associated in the three delay framework, as well as the pregnancy and delivery status. Variables that were found significant were included in the two binary logistic regression models that aimed at forecasting future maternal events given these covariates.

3.5 Ethical Issues

Ethical approval to undertake the study was sought and obtained from the Research and Ethics Committee of the Ministry of Health and Social Services. Access to communities was granted by local political and traditional leaders for VA. Permission was obtained from the Regional Management Teams of each of the eight participating Regions and each District Coordinating Committee. Access to the health records and data was obtained from the Regional Directors of each region and the Medical Superintendents/Principal Medical Officers of each hospital. Verbal informed consent was obtained from the community members who were identified as respondents and approached for interviews. The study respondents were approached in a respectful and empathetic manner due to the nature of this research. They were informed of their right to choose not to participate in the research and refusal will have no consequences on them.

All data collected was handled with strict confidentiality and access to the data was limited to the TWG. It is most important to state that research approval to replicate the original was obtained from the Research and Ethics Committee of the Ministry of Health and Social Services.

CHAPTER FOUR

RESULTS AND ANALYSIS

To accurately compare findings across the three-year period (1st Jan 2008-31st may 2010), the number of maternal deaths identified from the verbal autopsy questionnaires, are presented in their raw format by tables and figures in their respective years. To enable the forecasting of the next future maternal events given a set of particular explanatory variables mostly the socio-economic indicators of women of child bearing in Omusati, Oshana, Ohangwena, Oshikoto, Kavango, Caprivi, Kunene and Otjozondjupa region, various binary logistic regression models are fitted below and their significance are evaluated by their corresponding p-values respectively.

4.1 Findings

The mean age of the women who died was 29.4± 5.2 years; 25.0% of the sample were in their first pregnancy; 38.1% were married or in a stable relationship and living with a partner; 3.1% were widowed; 57.7 % were never married and only 1.0% were separated when death intervened. Please refer to table 5 below.

Age at death	frequency	%
15-19	9	9.3
20-24	15	15.5
25-29	23	23.7
30-34	28	28.9
35-39	16	16.5
40-44	4	4.1
45-49	2	2.1
Totals	*97*	*100*

Educational Level		
None	6	6.2
Primary	44	45.4
Secondary	36	37.1
Higher	3	3.1
Not Known	8	8.2
Totals	*97*	*100*
Marital Status		
Never Married	56	57.7
Married	37	38.1
Widowed	3	3.1
Divorced	0	0
Separated	1	1
Totals	*97*	*100*
Region		
Caprivi	10	10.3
Kavango	18	18.6
Kunene	1	1.0
Ohangwena	9	9.3
Omusati	10	10.3

Oshana	27	27.8
Oshikoto	15	15.5
Otjozondjupa	7	7.2
Totals	*97*	*100*

Table 5: case demographic summary report of deceased

A high proportion of those who died had primary education (45.4%) in comparison to those that have received higher education (3.1%). The figure 3 illustrates their education composition below.
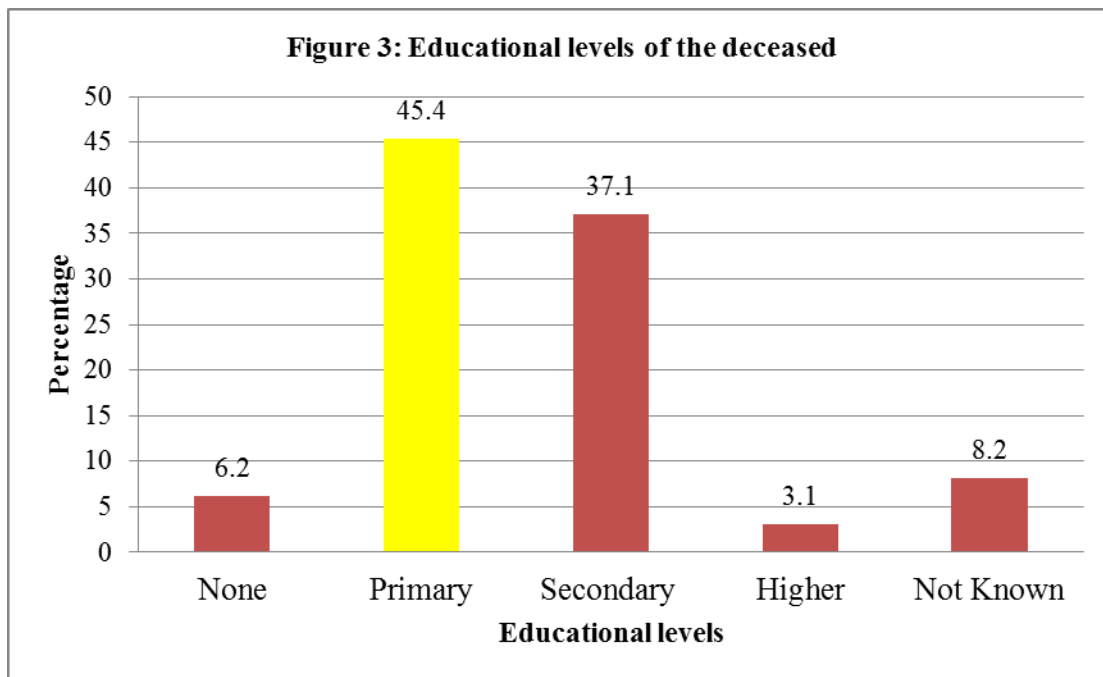
A high proportion of those who died had primary education (45.4%) in comparison to those that

Of the 69 women for whom the respondents knew the type of delivery, 66.7% had normal vaginal deliveries. About 28% of deaths occurred before delivery (i.e. died while pregnant), and about 72% died within 42 days after recently given birth. Of the 27 women whom respondents knew the deceased's delivery status, 30% died during labor, but did not deliver. The respondents

did not know who attended 10 of the 69 deliveries that took place within 42 days of giving birth. Of the women who had a known birth attendant, 11.3% had non-institutional community-based deliveries and another 49.4% delivered in community health posts.

Based on the verbal autopsies, 93.8% of the 97 women in question died in the hospital, 3.1% died at home and 3.1% died on their way to the hospital. Of the 69 women for whom the respondents knew the type of delivery, 66.7% had normal vaginal deliveries.

28% died pregnant; and 72% died within 42 days after recently given birth. Figure 4 shows that 83% of the sample were in rural regions and only a small portion of women who died (17%) were in urban areas.

Figure 4: Place of residence of deceased
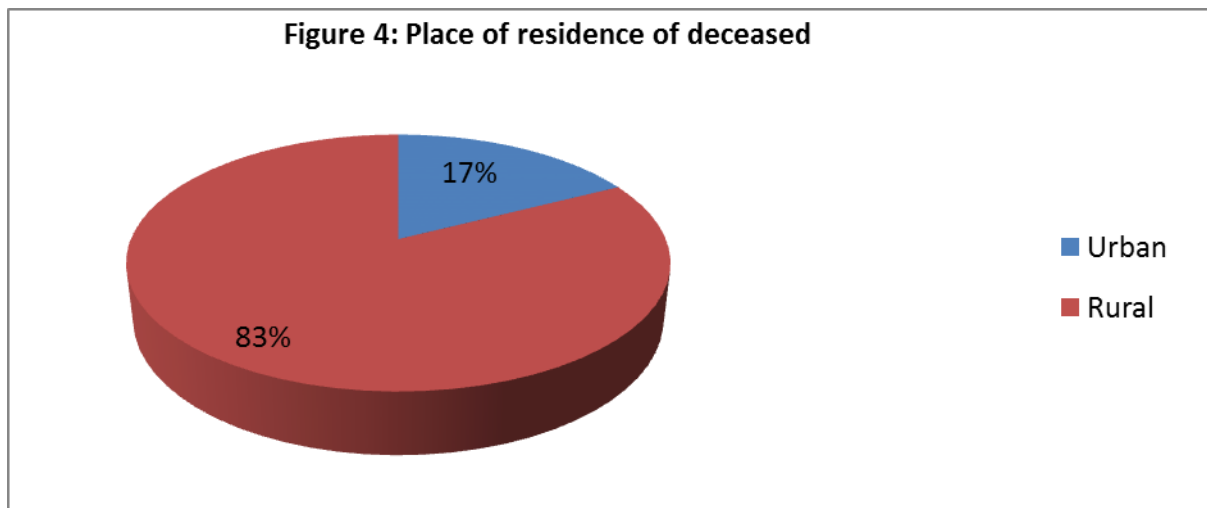
93.8 % in rural areas died due to the delay in reaching care in time; 78.9% died due to the delay in receiving adequate treatment. On the other hand as tabulated in table 6 below, in urban areas, only a few (6.3%) reported on the delay in reaching care in time; so many died due to delay in receiving adequate treatment (21.1%).

residence	1st delay	2nd delay	3rd delay
	(%)		
Urban	12.3	6.3	21.1
Rural	87.7	93.8	78.9

Table 6: health seeking-behavior delays

Moreover, out of the 57 women who experienced delay in seeking health care and whom respondents knew their occupation, 63.2% where unemployed. With respect to delay in receiving adequate treatment, 59.6% were unemployed and only about 33.3% were employed at the time of death. 66.7% of the 27 women who were unemployed died while pregnant; and only 25.9% were employed when death intervened.

4.2 Model fitting

The main aim of perfoming a binary logistic regression model is to quantify relationship between the $\prod$ explanatory variables $X_1, X_2,.....X_k$ based on some sample data. X in this case is a multiple continuos explanatory variable.

Suppose we are interested in predicting whose more likely to die while pregnant; and die as delays in receiving adequate treatment(delay 3) given their marital status composition(married or not married).

Model 1: Let x be pregnancy status

Then our equation will be: *Logit [$\prod$(x)]=-2.110+1.635* Marital_Rec(1)*

Interpreting table 7(a) below, results shows a negative gradient between pregnancy status and marital status, however, the odds of dying while pregnant for never married women is 5.1 times higher than the odds for married women.

Variable				95% C.I.for EXP(B)	
	B	Sig.	Exp(B)	Lower	Upper
MARITAL_REC(1)	1.635	.006	5.128	1.606	16.373
Constant	-2.110	.000	.121		

Figure 7 (a): Logistic regression table

Model 2: Let x be delay (3)

A fitted regression line from table 7(b) yields: *Logit [$\prod$(x)]=-0.993+0.959* Marital_Rec(1)*

<u>Interpretation</u>: the odds of dying due to experiencing delays in receiving adequate treatment among never married women is 2.6 times higher than the odds of married women.

variable				95% C.I.for EXP(B)	
	B	Sig.	Exp(B)	Lower	Upper
MARITAL_REC(1)	.959	.034	2.610	1.075	6.337
Constant	-.993	.007	.370		

Figure 7 (b): Logistic regression table

4.3 Discussion

Integrating the three delay framework, it's evident that maternal mortality is unique among different age groups, marital status, education and geographical characteristics.

- ✓ Rural areas are still victims of maternal cases as (83%) of the women reported to have died in the rural regions. These results correlate with the findings from Mexico by Sloan et al. (Sloan, 2001) where nearly 82% of the women who died, died in the remote areas of Mexico. Primary health care programs for single mothers are still *limping* since (*61.8%*) died after delivery, as compared to that of deceased married women.
- ✓ Health education among women with primary (45.4%) and secondary (37.1%) education need to be prioritize as education level appears to be confounding health-care seeking behavior among deceased women.
- ✓ Based on the verbal autopsies, there is a need for health care providers and health managers to urgently prioritize Safe motherhood for women who have recently given birth, as the results pinpoint that out of the sample, 72% died within 42 days of delivery.
- ✓ Distances, infrastructure and transport to health facilities remain a challenge in rural areas, this is because (93.8%) of the deaths occurred as a delay in reaching care in time. This is explained by the health ministry referral system where a patient would

initially start from the clinics where an ambulance will be requested from the district hospitals which are often at a distance varying from 10 Km to more than 400 km (*case of Tsumkwe in Otjozondjupa region*). In regions or areas were three clinics are catered for one ambulance for example, maternal events of this type are even higher (MOHSS, 2010).

✓ Awareness in health care seeking behavior is needed among women of child-bearing ages. More than 2/3 (i.e. 87.7%), of the sample lack recognition of an emergence, or simply put: costs, poor educational background, lack of access to information and gender inequality is confounding women's health-care accessing behavior.

✓ The original study is also in agreement that delays in receiving adequate treatment (3rd delay) even after reaching the referral hospitals is a possibility as evidenced by regions such as Kavango and Oshana. It also crucial to remark that, in the regions under study, only one tertiary centre (i.e. Oshikoto state hospital in Oshana region) has specialist gynaecologist and obstetricians, thus many cases may have been handled by other medical practioners with limited skills in labor wards.

✓ Although rural areas are often more prone to maternal events which is also the case in this study, results reveal that there is also lack of adequate treatment in urban areas.

✓ Quality of emergency care services and rendering of basic maternal services such as Antenatal care are still not sufficient in the northern regions as there are still maternal cases occurring as a result of unskilled staff in handling pregnancy related complications (28% died while pregnant).

✓ Initially, all variables stated in the methodology and as guided by literature were included in the model using Backward method. However, marital status was the only significant variable, hence it is the only explanatory variable presented in the regression equation in explaining the two response variables. Not to say this is counter intuitive, but the study expected a much more variation among explanatory variables such as occupation and educational level and the delays experienced as explained by previous researchers and Canavan (2009).

✓ Moreover, although the initial idea was to fit delay one and three, delay in health-care seeking behavior (delay 1) could not be fitted, as all fitted models on this response variable were not of good fit, hence could not be used to identify

background characteristics that are confounding this type of death. Challenges like missing of cases and mis reporting of certain demographic variable are the main cause of models insignificancy.

✓ The two fitted regression models are of-good-fit as observed by their corresponding p-values.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

To sum up, the verbal autopsy methodology inherited limitations as a means of obtaining histories of non medical events of the deceased. At best it may reconfirm the knowledge that mortality among poor women with little access to medical care is higher than that among wealthier women who have better access to such care. Additionally, the verbal autopsy tool can provide the much needed data on maternal mortality and its causes in the developing world. However, this methodology was evidently not dependable as a means of obtaining the non medical causes of maternal mortality in the eight northern regions of Namibia and reconstructing factors associated with health care-seeking behavior and access to and delivery of services given the social, cultural and economic variables.

The author feels that the inconsistency of the data could be attributed to many factors. Ultimately, however, there might be inherent limitations in obtaining reproductive event (e.g. parity) histories from informants who may not be literate and lack a medical background. Moreover, errors are most common in reporting demographic data such as age, and most importantly, recalling errors are also often common. Respondents may have encountered difficulties in recalling certain background information especially those pertaining to maternal deaths that occurred exactly in 2008, hence a large proportion of missing data in the data set. It is therefore due to these challenges and limitations that, of all models that were fitted except for the recorded variable "marital status" to forecast future maternal events on which set of women are more likely to die while pregnant and experiencing delays in receiving adequate treatment care, none of them were significant. It is also important to remark that these were maternal cases only, it would have made the study even more intense if cases that did not qualify as maternal cases were included in the dataset to allow a comparison in the contributing factors contributing to maternal mortality in its response variable using the three delay framework and prioritize programmes in the most vulnerable regions, such as Oshana to save women's lives. However this should not limit the researcher

to say, quality of emergency obstetric care services and programs should and must be prioritized in rural areas as they are still ranking as top victims of maternal mortality.

There is an urgent need to address the lack of health care seeking behavior among the urban and rural poor and strengthen the integration of health-related activities such as health education for mothers in maternal health-care programs as death after delivery is becoming a major non medical cause of maternal death.

5.1 Recommendations

- In addition to *maternal health care services at community level, quality of emergency obstetric care services, monitoring of maternal deaths and record keeping* as recommended by the original study, this study further suggests that:

✓ Future researchers interested in the same area under investigation should employ the same (VA) methodology, however, data collection should be done every year in these regions, and data set merging must be done after every three years for data analysis, as this different approach will not only avoid recalling errors, mis-reporting and tracing of cases, but will also reconfirm the knowledge about the non-medical causes correlating with maternal mortality, allowing a significant logistic regression model to be fitted to best explain and forecast future maternal events.

✓ Finally, and probably most importantly, cases that did not qualify as maternal after the classification system, should not be removed from the data set, but rather merged to allow a comparison in the relative risks among the two outcomes given the social, cultural and economic characteristics of the deceased women in these regions.

REFERENCES

Books and hard copies

1. A. Canavan, *Review of global literature on maternal health interventions and outcomes related to skilled birth attendance* KIT Working Papers Series H3. Amsterdam: KIT (2009)

2. A. k. Ziraba. N. Madise, S. Mills., C. Kyorbutung., and A. Ezen. *Maternal Mortality in the informal settlements of Nairobi City: what do we know?* University of Southampton, World bank

3. C. Abouzahr, E. Royston. *Maternal mortality a global fact book*. World Health Organization, Geneva. (1991).

4. L. Hoases., H. Nakakuwa., P. Namfua. Utilization *of Reproductive health services and facilities by adolescents & youth (A Draft Proposal for Research*). University of Namibia, Population and development project (1990).

5. MOHSS (2007*). Roadmap for the reduction of maternal and child morbidity and mortality in Namibia.* Windhoek:MOHSS

6.

7. MOHSS (2009). *Annual Reports and Essential Indicators of Regional Directorates*

8. MOHSS (2010a). *Summary Report of Regional Consultations on maternal and child health*. Windhoek: MOHSS

9. MOHSS (2010b). *Annual Reports and Essential Indicators of Regional Directorates for 2009/2010 Financial Year*

10. MOHSS & Macro International (2007). *National Demographic and Health Survey Report 2006/2007*. Windhoek: MOHSS & Macro International

11. MOHSS (2010). *First draft report of the Survey on the contributing factors leading to maternal and establish the prevalence of missed deaths in the seven regions of Namibia.*

12. N. L. Sloan, A. Langer, B. Hernandez, M. Romero, & B. Winkoff. *Bulletin of the World Health Organization*, 79(9). WHO (2001).

13. N. M. Nour. *An introduction to maternal mortality*. Vol.1. NO.2. Med Reviews. LLC. (2008).

14. P. W. Setel., D. R., Whiting., Y. Hemend., D. Chandramohan., L,J. Wolfson, K.G. M. M. Alberti., A. D. Lopez. *Validity of verbal autopsy procedures for determining cause of death in Tanzania*. Blackwell Publishing. LTD(2006)

15. WHO Technical Consultation on Verbal autopsy tools. Review *of the Literature and currently used verbal autopsy tools*. WHO, Geneva (2004).

16. *2006 Namibia Inter-Censal Demographic Survey Analytical Report*. Central Bureau of statistics, National Planning Commission. (2010).

17. D. L. Huong, H. Minh & P. Byass. Applying *verbal autopsy to determine cause of death in rural Vietnam.* Scandinavian Journal of Public Health. Sag

Online resources

18. McKinsey (2010). *Saving Mothers' lives in Namibia (online)*. Accessed 16th May 2012 at https://www.mckinseyquarterly.org

19. WHO (1995).Verbal Autopsy (online). Accessed 16th May 2012 at http://www.whqlibdoc.who.int/hq/1995_FHE_MSM_95.15.pdf.

Appendix
Verbal Autopsy Interview Tool

My name is _____ and I am working with the Ministry of Health and Social Services.

We are collecting information on the causes of death in the community. We would very much appreciate your participation in this effort. We want to ask you about the circumstances leading to the death of the deceased. Whatever information you provide will be kept strictly confidential. No information identifying you or the deceased will ever be released to anyone outside of this information-collection activity.

Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions. You may also stop the interview completely at any time without any consequences at all. However, we hope that you will participate in this survey since the results will help the government improve services for people.

At this time, do you want to ask me anything about the purpose or content of this interview?
May I begin the interview now?

Date: ………………………..

Respondent agrees to be interviewed . . . ……………1 (proceed with interview)
Respondent does not agree to be interviewed ……….2 (end the visit)

BASIC INFORMATION ABOUT RESPONDENT

SECTION 1: DEMOGRAPHIC INFORMATION	
Region	……………………………………………………..
District:	……………………………………………………..
Constituency:	……………………………………………………..
Village/Town:	……..……………………………………………...
Name of reference **(deceased):**	…………………………………………………...
Residential status of the deceased:	Residential status of the deceased:
	Resident in study area [1]
	Body brought home for burial [2]
	Home-coming sick [3]

	RECORD THE TIME AT START OF INTERVIEW	HOUR……………. MINUTES……….. ☐ ☐ **H** ☐ ☐	
	NAME OF THE RESPONDENT	Name:……………………………	
		Please encircle correct answer	**Skip to**
1	What is your relationship to the deceased?	Father …………..1 Mother …………....2 Spouse …………..3	

		Sibling…………….4	
		Child ……………..5	
		Other relative …….66	
		(specify)	
		No relation………..88	
2	Did you live with the deceased in the period leading to her/his death?	Yes………………..1 No ………………..2	
	SECTION 2. INFORMATION ON THE DECEASED AND DATE/PLACE OF DEATH		
3	What was the name of the deceased?	Name ………………………………………..	
4	When was the deceased born? *RECORD '8 8' IF DON'T KNOW DAY OR MONTH RECORD '888 8' IF DON'T KNOW YEAR*	Dd/mm/yyyy ☐☐-☐☐-☐☐☐☐ Day …………... Month ……….. Year …………. Don't know……..88	
5	How old was the deceased when she died? *RECORD '8 8' IF DON'T KNOW*	Age in years……….. ☐☐	
6	What was her occupation (work she mainly did)? *RECORD '8 8' IF DON'T KNOW*	Occupation ……………………………………...	
7	What was her highest educational level?	None ………………1 Primary …………….2 Secondary ………….3	

		Higher ……………...4	
		Don't know………….88	
8	What was her marital status?	Never married ………1 Married/living with a partner …………………………2 Widowed …………...3 Divorced ……………4 Separated …………...5 Don't know …………88	
9	When did she die? (date, month, year) *RECORD '8 8' IF DON'T KNOW DAY OR MONTH* *RECORD '888 8' IF DON'T KNOW YEAR*	☐☐-☐☐-☐☐☐☐ Day………………………….. Month …………………….. Year …………………………	
10	Where did she die?	Hospital………………………1 Home…………………………2 On way to hospital…………...3 Others (specify)………………4	
	SECION 3: ACCOUNTS OF EVENTS PRIOR TO DEATH THAT COULD HAVE LEAD TO THE DEATH OF THIS CASE		
11	**Can you tell me about the illness/events prior to death in this case?**		
12	What do you think is the cause (s) of death of this woman?		
12a	**CAUSE OF DEATH 1 ACCORDING TO RESPONDENT**	……………………………………………………………… …	

12b	**CAUSE OF DEATH 2 ACCORDING TO RESPONDENT**	………………………………………………………… …	
13	I would like to ask you questions concerning previously known medical conditions the deceased had; signs and symptoms the deceased had shown when she was ill; injuries and accidents the deceased suffered; some of the questions might not be directly related to the death. Please bear with me and try to answer all the questions as far as you can. They will help us to get a clear picture of all possible symptoms the deceased had. Please tell me if the deceased suffered from any of the following conditions		
13a	Heart disease?	Yes………………………………1 No………………………………..2 Do not know………………………88	
13b	Diabetes?	Yes………………………………1 No………………………………..2 Do not know…………………...88	
13c	Asthma?	Yes………………………………1	

		No…………………………………..2	
		Do not know……………………..88	
13d	Kidney problems?	Yes………………………………….1	
		No…………………………………..2	
		Do not know……………………..88	
13e	Epilepsy?	Yes………………………………….1	
		No…………………………………..2	
		Do not know……………………..88	
13f	Malnutrition?	Yes………………………………….1	
		No…………………………………..2	
		Do not know……………………..88	
13g	Cancer?	Yes………………………………….1	
		No…………………………………..2	→ 13i
		Do not know……………………..88	→ 13i
13h	Kindly specify the type and site of the cancer	Type/site………………………….	
13i	Tuberculosis?	Yes………………………………………1	
		No……………………………………….2	
		Do not know…………………………..88	
13j	HIV/AIDS?	Yes………………………………………1	
		No……………………………………….2	
		Do not know…………………………..88	
14	Did she suffer from any other medically diagnosed illness?	Yes………………………………………1	
		No……………………………………….2	→ 16
		Do not know…………………………..88	→ 16
15	Can you specify the illness	Illness…………………………..	
	SECTION 4: **HISTORY OF** **INJURIES/ACCIDEN**		

	TS		
16	Did she suffer from any injury/accident that led to her death?	Yes……………………………………1 No…………………………………….2 Do not know……………………………88	⟶ 20 ⟶ 20
17	What kind of injury/accident did the deceased suffer from?	Road traffic accident……………………1 Fall……………………………………2 Drowning………………… …………..3 Poisoning……………………..………4 Burns………………………………...5 Violence/assault………………………6 Others (specify)………………………...66 Don't know …………………………..88	
18	Was the injury/accident intentionally inflicted by someone else?	Yes……………………………………1 No…………………………………….2 Do not know……………………88	
19	Do you think she committed suicide?	Yes……………………………………1 No…………………………………….2 Do not know………………………….88	
20	Did she suffer from any animal/insect bite that led to her death?	Yes……………………………………1 No…………………………………….2 Do not know………………………….88	⟶ 22 ⟶ 22
21	What type of animal/insect was it?	Dog ………………………………...1 Snake…………………………………2 Insect…………………………………...3 Others (specify)……………………...66 Don't know………………………....88	
SECTION 5. SYMPTOMS AND SIGNS ASSOCIATED WITH ILLNESS OF WOMEN			
22	Did she have an ulcer or swelling in the breast?	Yes……………………………………1 No…………………………………….2 Do not know………………………….88	⟶ 24 ⟶ 24
23	For how long did she	Days…………………………………...1	

	have an ulcer or swelling in the breast?	Months……………………………..…..2 Do not know…………………….88	
24	Did she have excessive vaginal bleeding during menstrual periods?	Yes…………………………………1 No…………………………………2 Do not know………………….88	⟶ 26 ⟶ 26
25	For how long did she have the excessive vaginal bleeding during menstrual periods?	Days……………………………1 Months………………………..2 Do not know………………...88	
26	Did she have vaginal bleeding in between menstrual periods?	Yes…………………………….1 No…………………………….2 Do not know………………….88	⟶ 28 ⟶ 28
27	For how long did she have vaginal bleeding in between menstrual periods?	Days……………………………1 Months………………………...2 Do not know………………..88	
28	Did she have abnormal vaginal discharge?	Yes…………………………….1 No…………………………….2 Do not know………………….88	⟶ 30 ⟶ 30
29	For how long did she have abnormal vaginal discharge?	Days……………………………1 Months……………………….2 Do not know………………..88	
	SECTION 5: SYMPTOMS AND		

	SIGNS ASSOCIATED WITH PREGNANCY		
30	Was she pregnant at the time of death?	Yes.………………………………………1 No.……………………………………….2 Do not know.…………………………88	⟶ 35 ⟶ 35
31	How long was she pregnant?	Weeks.…………………………….....1 ☐☐ Months.…………………………….2 ☐☐ Don't know.……………………88	
32	How many pregnancies had she had, including this one?	Number of pregnancies.…………….. ☐☐ Don't know.…………………88	
33	During the last 3 months of pregnancy, did she suffer from any of the following illnesses: 1 Vaginal bleeding? 2 Smelly vaginal discharge? 3 Puffy face? 4 Headaches? 5. Blurred vision? 6. Convulsions? 7 Febrile illness? 8 Severe abdominal	Y N DK Vaginal bleeding.…… 1 2 88 Smelly vaginal discharge 1 2 88 Puffy face.………………….. 1 2 88 Headache.…………………. 1 2 88 Blurred vision.……………. 1 2 88 Convulsions.………………. 1 2 88 Febrile illness.………… … 1 2 88 Severe abdominal pain that was not labor pain.……………….. 1 2 88 Pallor and shortness of breaths (both present?).……… …. 1 2 88 Other illness(specify).…….66	

	pain that was not labor pain? 9 Pallor and shortness of breath (both present)? 10 Did she suffer from any other illness?		
34	Did she die during labor but undelivered?	Yes…………………………………………1 No…………………………………………2 Do not know………………………88	
35	Did she give birth recently?	Yes…………………………………………1 No…………………………………………2 Do not know………………………88	⟶ 47 ⟶ 47
36	How many days after birth did she die?	Days………………… ☐☐ Don't know………………88	
37	Was there excessive bleeding on the day labor started?	Yes…………………………………………1 No…………………………………………2 Do not know………………………88	
38	Was there excessive bleeding during labor but before delivering the baby?	Yes…………………………………………1 No…………………………………………2 Do not know…………………………88	
39	Was there excessive bleeding after delivering the baby?	Yes…………………………………………1 No…………………………………………2 Do not know………………………88	
40	Did she have difficulty in delivering the placenta?	Yes…………………………………………1 No…………………………………………2 Do not know………………………88	
41	Was she in labor for unusually long? (more than 24 hours)	Yes…………………………………………1 No…………………………………………2 Do not know………………………88	

42	Was it a normal vaginal delivery?	Yes……………………………………………1	
		No…………………………………………2	→ 44
		Do not know…………………………88	→ 44
43	What type of delivery was it?	Forceps/vacuum…………………1	
		Cesarean section…………………2	
		Others (specify)…………………66	
		Don't know …………………………88	
44	Did she have bad smelling vaginal discharge?	Yes……………………………………………1	
		No…………………………………………2	
		Do not know…………………………88	
45	Where did she give birth?	Hospital…………………………………1	
		Other health facility………………2	
		Home………………………………………3	
		Others (specify) ……………………66	
		Don't know…………………………88	
46	Who conducted the delivery?	Doctor…………… ………………...1	
		Nurse/midwife………………………2	
		TBA………………………………...3	
		Relative………………………………4	
		Mother herself…………………...5	
		Others (specify)…………………66	
		Don't know…………………………88	
47	Did she experience any abortion recently?	Yes…………………………………1	
		No…………………………………2	→ 54
		Do not know……………………88	→ 54
48	Did she die during abortion?	Yes…………………………………1	→ 50
		No…………………………………2	
		Do not know……………………88	→ 50
49	How many days before her death did she have abortion?	Days ………………………..1 ☐☐ Don/t know……………88	
50	How many months was she pregnant when she	Months ……………………1 ☐☐	

	had an abortion?	Don't know…………….88	
51	Did she have heavy bleeding after abortion?	Yes………………………………..1 No……………………………………2 Do not know…………………88	
52	Did the abortion occur by itself, spontaneously?	Yes………………………………1 No……………………………….2 Do not know………………..88	⟶ 54 ⟶ 54
53	Did she take medicine or treatment to induce abortion?	Yes………………………………..1 No……………………………………2 Do not know…………………88	

SECTION 6: SIGNS AND SYMPTOMS NOTED DURING THE FINAL ILLNESS

54	For how long was she ill before she died?	Days …………………………………1 [ ][ ] Months…………………………..2 [ ][ ] Don't know ………………………..88	
55	Did she have fever?	Yes……………………………………1 No………………………………………2 Do not know…………………………88	⟶ 60 ⟶ 60
56	For how long was the fever?	Days ……………………………………1 [ ][ ] Months……………………………….2 [ ][ ] Don't know ………………..88	
57	Was the fever continuous or on and off?	Yes……………………………………1 No………………………………………2 Do not know…………………………88	
58	Did she have fever only at night?	Yes……………………………………1 No………………………………………2 Do not know…………………………88	
59	Did she have chills/rigors?	Yes……………………………………1 No………………………………………2	

		Do not know…………………………88	
60	Did she have cough?	Yes…………………………………………1	
		No…………………………………………2	⟶ 66
		Do not know…………………………88	⟶ 66
61	For how long did she have cough?	Days …………………………..1 ☐☐ Months…………………….2 ☐☐ Don't know ………………….88	
62	Was the cough severe?	Yes…………………………………………1 No…………………………………………2 Do not know…………………………88	
63	Was the cough productive with sputum?	Yes…………………………………………1 No…………………………………………2 Do not know…………………………88	
64	Did she cough out blood?	Yes…………………………………………1 No…………………………………………2 Do not know…………………………88	
65	Did she have night sweats?	Yes…………………………………………1 No…………………………………………2 Do not know…………………………88	
66	Did she have breathlessness?	Yes…………………………………………1	
		No…………………………………………2	⟶ 71
		Do not know…………………………88	⟶ 71
67	For how long did she have breathlessness?	Yes…………………………………………1 No…………………………………………2 Do not know…………………………88	
68	Was she unable to carry out daily routines/activities due to breathlessness	Yes…………………………………………1 No…………………………………………2 Do not know…………………………88	
69	Was she breathless while laying flat?	Yes…………………………………………1 No…………………………………………2 Do not know…………………………88	

70	Did she have wheezing?	Yes…………………………………………1	
		No…………………………………………2	
		Do not know…………………………88	
71	Did she have chest pain?	Yes…………………………………………1	
		No…………………………………………2	→ 81
		Do not know…………………………88	→ 81
72	For how long did she have chest pain?	Days …………………………..1	
		Months……………………2	
		Don't know …………………88	
73	Did chest pain start suddenly or gradually?	Yes…………………………………………1	
		No…………………………………………2	
		Do not know…………………………88	
74	When she had severe chest pain, how long did it last?	Less than half an hour……..……..1	
		Half an hour to 24 hours………….2	
		Longer than 24 hours……………..3	
		Don't know ………………………88	
75	Was the chest pain located below the breastbone? (sternum)	Yes…………………………………………1	
		No…………………………………………2	
		Do not know…………………………88	
76	Was the chest pain located over the heart and did it spread to the left arm?	Yes…………………………………………1	
		No…………………………………………2	
		Do not know…………………………88	
77	Was the chest pain located on the rib sides?	Yes…………………………………………1	
		No…………………………………………2	
		Do not know…………………………88	
78	Was the chest pain continuous or on and off?	Continuous …………………………..1	
		On and off……………………………2	
		Do not know…………………………88	
79	Did the chest pain get worse with coughing?	Yes…………………………………………1	
		No…………………………………………2	
		Do not know…………………………88	

80	Did she have palpitations?	Yes…………………………………………1	
		No…………………………………………2	
		Do not know…………………………88	
81	Did she have diarrhea?	Yes…………………………………………1	
		No…………………………………………2	→86
		Do not know…………………………88	→86
82	For how long was the diarrhea?	Days…………………………………..1 Months…………………………………2 Don't know…………………………88	
83	Was the diarrhea continuous or on and off?	Continuous …………………………..1	
		On and off……………………………2	
		Do not know…………………………88	
84	At any stage of the final illness, was there blood in the stools?	Yes……………………………………1	
		No……………………………………2	
		Do not know…………………………88	
85	When the diarrhea was at most worse, how many times did she pass stools in a day?	Number…………………………1 Don't know………………….88	
86	Did she vomit?	Yes……………………………………1	
		No……………………………………2	→90
		Do not know…………………………88	→90
87	For how long did she vomit?	Days …………………………….....1 Months……………………….……2 Don't know …………………88	
88	Did the vomit look like coffee-colored fluid or bright red/blood red or some others?	Coffee-colored like……………1	
		Bright red/blood red……………...2	
		Others (specify)……………………6	
		Don't know…………………………..88	
89	When the vomit was at most	Number ……………………………1	

	worse, how many times did she vomit in a day?	□□ Don't know …………………………88	
	CHECK QUESTIONS 30, 34, 48 TO SEE IF SHE DIED DURING PREGNANCY, LABOR, ABORTION OR POSTPARTUM	**YES………………………………1** **NO……………………………..2**	⟶ **99**
90	Did she have abdominal pain?	Yes…………………………………1 No…………………………………2 Do not know……………………..88	 ⟶ 92 ⟶ 92
91	For how long did she have abdominal pain?	Days □□ Months □□ Don't know…………………………. 88	
92	Did she have abdominal distension?	Yes…………………………………1 No…………………………………2 Do not know……………………..88	 ⟶ 96 ⟶ 96
93	For how long did she have abdominal distension?	Day ………………………………….1 □□ Month……………………………….2 □□ Don't know…………………………88	
94	Did the abdominal distension develop rapidly within days or gradually over months?	Rapidly within day………………1 Gradually over months…………..2 Don't know………………………88	
95	Was there a period of a day or longer which she did not pass stools?	Yes…………………………………1 No…………………………………2 Do not know……………………..88	
96	Did she have a mass in the abdomen?	Yes…………………………………1 No…………………………………2 Do not know……………………..88	 ⟶ 99 ⟶ 99

97	For how long did she have a mass in the abdomen?	Days ……………………………………1 □□ Months …………………………………2 □□ Don't know……………………………88	
98	Where in the abdomen was the mass located?	Right upper abdomen ……………………1 Left upper abdomen………………………2 Lower abdomen…………………………3 All over abdomen………………………4 Don't know……………………………88	
99	Did she have difficulty or pain while swallowing solid?	Yes…………………………………………1 No…………………………………………2 Do not know…………………………..88	⟶ 101 ⟶ 101
100	For how long did she have difficulty or pain while swallowing solid?	Days ……………………………………....1 □□ Months …………………………………2 □□ Don't know……………………………88	
101	Did she have difficulty or pain in swallowing liquid?	Yes…………………………………………1 No…………………………………………2 Do not know……………………………88	⟶ 103 ⟶ 103
102	For how long did she have difficulty or pain while swallowing liquid?	Days ……………………………………1 □□ Months …………………………………2 □□ Don't know……………………………88	
103	Did she have any headache?	Yes………………………………………..1 No………………………………………..2 Do not know……………………………88	⟶ 106 ⟶ 106
104	For how long did she have headache?	Days ……………………………………1 □□ Months …………………………………2 □□	

		Don't know…………………...........88	
105	Was the headache severe?	Yes……………………………………..1 No………………………………………..2 Do not know……………………………88	
106	Did she have stiff or painful neck?	Yes……………………………………..1 No………………………………………..2 Do not know…………………………..88	→ 108 → 108
107	For how long did she have stiff or painful neck?	Days …………………………………..1 Months …………………………………2 Don't know…………………………88	
108	Did she have mental confusion?	Yes………………………………………1 No………………………………………2 Do not know…………………………88	→ 111 → 111
109	For how long did she have mental confusion?	Days ………………………………...1 Months……………………………2 Don't know…………………………88	
110	Did the mental confusion develop suddenly, quickly within single day or slowly over many days?	Suddenly …………………………1 Quick within a day…………………2 Over days……………………………3 Don't know…………………………88	
111	Did she become unconscious?	Yes ……………………………………1 No………………………………………...2 Don't know…………...…………88	→ 114 → 114
112	For how long was she unconscious?	Days _____..............................1 Months_____...............................2 Don't know _____....................88	
113	Did the unconsciousness start	Suddenly_____.....................1	

	suddenly, quickly within single day or slowly over many days?	Quickly within a day_____.......................2 Slowly over days _____.....................3 Don't know_____....................88	
114	Did she have convulsions?	Yes………………………………………..1 No…………………………………………..2 Do not know……………………………….88	→116 →116
115	For how long did she have convulsions?	Days ……………………………………….1 ☐☐ Months ………………………………………2 ☐☐ Don't know…………………………………88	
116	Was she unable to open her mouth?	Yes………………………………………..1 No…………………………………………..2 Do not know……………………………….88	→118 →118
117	For how long was she unable to open her mouth?	Days …………………………………..1 ☐☐ Months ……………………………….2 ☐☐ Don't know…………………………...88	
118	Did she have stiffness of the whole body?	Yes…………………………………………1 No…………………………………………..2 Do not know…………………………….88	→120 →120
119	For how long did she have stiffness of the whole body?	Days ………………………………….1 ☐☐ Months ……………………………….2 ☐☐ Don't know…………………………….88	
120	Did she have paralysis of one side of the body?	Yes …………………………………..1 No………………………………………..2 Don't know…………………………....88	→123 →123
121	For how long did she have	Days …………………………………..1	

	paralysis of one side of the body?	Months …………………………2 Don't know…………………………88	
122	Did the paralysis of one side of the body start suddenly, quickly within a single day or slowly over many days?	Suddenly …………………….. 1 Quickly within a day…………………2 Slowly over days……………………3 Don't know……………………………88	
123	Did she have paralysis of the lower limbs?	Yes……………………………………..1 No…………………………………………..2 Do not know………………………………88	→ 126 → 126
124	For how long did she have paralysis of the lower limbs?	Days …………………………………1 Months…………………………………2 Don't know………………………………88	
125	Did she have paralysis of one the lower limbs start suddenly, quickly within a single day or slowly over many days?	Suddenly…………………………………...1 Quickly within a day…………………......2 Slowly over days………………………..3 Don't know……………………………..88	
126	Was there any change in color of urine?	Yes……………………………………….1 No…………………………………………..2 Do not know…………………………………88	→ 128 → 128
127	For how long did she have change in color of urine?	Days………………………………………...1 Months …………………………………..2 Don't know…………………………………88	
128	During the final illness did she ever pass blood in urine?	Yes……………………………………….1 No………………………………………..2 Do not know………………………………88	→ 130 → 130
129	For how long did she pass	Days ……………………………………1	

	blood in urine?	Months ……………………………………2	
		Don't know ………………………………88	
130	Was there any change in amount of urine passed daily?	Yes………………………………………..1	
		No………………………………………….2	→ 133
		Do not know…………………………..88	→ 133
131	For how long did she have change in the amount of urine passed daily?	Days…………………………………………… 1 ☐☐ Months………………………………………2 ☐☐ Don't know……………………………..88	
132	Did she pass too much, too little or no urine at all?	Too much………………………………..1 Too little………………………………….2 No urine at all…………………………..3 Don't know ………………………………88	
133	During the illness that led to death, did she have any skin rash?	Yes………………………………………..1	
		No………………………………………….2	→ 137
		Do not know………………………………88	→ 137
134	For how long did she have skin rash?	Days……………………………………….1 ☐☐ Months……………………………… .2 ☐☐ Don't know…………………………...88	
135	Was the rash on the 1. Face? 2. Trunk? 3. Arms and legs? 4. Any other place?	Y N DK 1. Face 1 2 88 2. Trunk 1 2 88 3. Arms and legs 1 2 88 4. Other place (specify) 1 2 88	
136	What did the rash look like?	Measles like rash…………………………..1 Rash with clear fluids……………………2 Rash with pus……………………………………3 Don't know ………………………………..88	

137	Did she have red eyes?	Yes…………………………………………..1 No…………………………………………..2 Do not know……………………………....88	
138	Did she have bleeding from the nose, mouth or anus?	Yes…………………………………………..1 No…………………………………………..2 Do not know………………………………88	
139	Did she have ever shingles/herpes zoster?	Yes…………………………………………..1 No…………………………………………..2 Do not know……………………………....88	
140	Did she have weight loss?	Yes…………………………………………..1 No…………………………………………..2 Do not know………………………………88	→ 143 → 143
141	For how long did she have weight loss?	Days………………………………………..1 ☐☐ Months……………………………………2 ☐☐ Don't know………………………………88	
142	Did she look very thin and wasted?	Yes…………………………………………..1 No…………………………………………..2 Do not know………………………………88	
143	Did she have sores in the mouth or white patches in the mouth or on the tongue?	Yes…………………………………………..1 No…………………………………………..2 Do not know………………………………88	→ 145 → 145
144	For how long did she have sores in the mouth or white patches in the mouth or on the tongue?	Days………………………………………..1 ☐☐ Months……………………………………2 ☐☐ Don't know………………………………88	
145	Did she have any swelling?	Yes…………………………………………..1 No…………………………………………..2 Do not know………………………………88	→ 147 → 147
146	Was the swelling on the	Y N	

	1. Face 2. Joints 3. Ankles 4. Whole body 5. Any other places	DK 1. Face 1 2 88 2. Joints 1 2 88 3. Ankles 1 2 88 4. Whole body 1 2 88 5. Any other place 1 2 88	
147	Did she have any lump?	Yes…………………………………………..1 No……………………………………………..2 Do not know…………………………....88	→ 150 → 150
148	For how long did have lumps?	Days…………………………………………..1 ☐☐ Months………………………………..…2 ☐☐ Don't know…………………………………88	
149	Were the lumps on 1. The Neck 2. The armpit 3. The groin 4. Any other place	Y N DK 1. The Neck………………….. 1 2 88 2. The armpit………………... 1 2 88 3. The groin………………….. 1 2 88 4. Any other place…………… 1 2 88	
150	Did she have yellow discoloration of the eyes?	Yes…………………………………………..1 No……………………………………………..2 Do not know………………………………88	→ 152 → 152
151	For how long did she have yellow discoloration of the eyes?	Days…………………………………………..1 ☐☐ Months………………………………………2 ☐☐ Don't know………………………………88	
152	Did she look pale (thinning/lack of blood), or have pale palms, eyes or nail beds?	Yes…………………………………………..1 No……………………………………………..2 Do not know…………………………....88	→ 154 → 154
153	For how long did she look pale or have pale palms, eyes	Days ……………………………………………1	

	or nail beds	Months……………………………………..2 ⬜⬜ Don't know …………………………….88 ⬜⬜	
154	Did she have ulcer, abscess, or sores anywhere on the body?	Yes……………………………………………..1 No…………………………………………..2 Do not know……………………………...88	➝ 157 ➝ 157
155	For how long did she have ulcer, abscess or sores?	Days ……………………………..1 ⬜⬜ Months…………………………………2 ⬜⬜ Don't know…………………………...88	
156	What was the location of the ulcer, abscess or sore?	…………………………………………………… ……… Specify	
	SECTION 7: TREATMENET AND HEALTH SERVICE USE FOR THE FINAL ILLNESS		
157	Did she receive any treatment for illness that led to death?	Yes…………………………………………..1 No……………………………………………..2 Do not know………………………..…...88	➝ 164 ➝ 164
158	Can you please list the drugs she was given for the illness that led to her death? COPY FROM THE CARD IF AVAILABLE	………………………………………………… ………………………………………………… …………………………………………………	
159	What type of treatment did she receive 1. ORS or Drip treatment	Y N DK 1. ORS /IV 1 2 88 2. Blood transfusion 1 2 88 3. Gastric tube 1 2 88	

	2. Blood transfusion 3. Gastric tube 4. Any other treatment (specify)	4. Others … 1 2 88	

160	Please tell me at what place did she receive treatment during the last illness that led to her death
	   1. Home
	   2. Traditional healer
	   3. State clinic/health centre
	   4. State hospital
	   5. Private clinic
	   6. Private hospital
	   7. Pharmacy
	   8. Any other place (specify)
		Y N DK
		1. Home 1 2 88
		2. Traditional healer 1 2 88
		3. State clinic/HC 1 2 88
		4. State hospital 1 2 88
		5. Private clinic 1 2 88
		6. Private hospital 1 2 88
		7. Pharmacy 1 2 88
		Any other place (specify) 66……………………
		………………………………………………………	

161	In the last month before her death, how many contacts with the formal health services did she have?	Number of contacts………………………1 ⬚⬚ Don't know……………………………..…88	
162	Did the health worker tell you the cause of death?	Yes…………………………………………..1 No………………………………………..2 Do not know………………………………88	⟶ 164 ⟶ 164
163	What did the health worker say?		
164	Did she have any operation (s) for her illness?	Yes…………………………………………..1 No…………………………………………..2 Do not know………………………………88	⟶ 167 ⟶ 167
165	How long before death did she have the operation?	Days…………………………………1	

		Don't know ……………………………..88	
166	On what part of the body was the operation?	Abdomen………………………...1 Chest……………………………..2 Head……………………………...3 Others…………………………..66 Don't know……………………..88	
	SECTION 8: RISK FACTORS		
167	Did she drink alcohol?	Yes…………………………………...1 No…………………………………...2 Do not know……………………,…..88	→ 172 → 172
168	How long had she been drinking?	Years………………………………..1 Don't know……………………………88	
169	How often did she drink alcohol?	Daily ……………………………………1 Frequently (weekly)………………………2 Once in a while……………………………3 Don't know……………………………88	
170	Did she stop drinking before death?	Yes…………………………………….1 No…………………………………….2 Do not know……………………………88	
171	How long before death did she stop drinking? RECORD '00' IF LESS THAN A MONTH	Months…………………………………1 Don't know ……………………………88	
172	Did she smoke tobacco (cigarette, pipe, and cigar)?	Yes…………………………………..1 No…………………………………...2 Do not know……………………………..88	→ 178 → 178
173	How long had she been smoking?	Years………………………………….1 Don't know ……………………………88	

174	How often did she smoke?	Daily …………………………………..1	
		Frequently (weekly)………………………2	
		Once in a while…………………………3	
		Don't know………………………………88	
175	How many cigarettes did she smoke daily?	Number of cigarettes…………………..1	
		[ ][ ]	
		Don't know	
176	Did she stop smoking before death?	Yes……………………………………1	
		No…………………………………..2	
		Do not know……………………………88	
177	How long before death did she stop smoking? RECORD '00' IF LESS THAN A MONTH	Months …………………………………1	
		[ ][ ]	
		Don't know………………………..88	
	DATA EXTRACED FROM THE DEATH CERTIFICATE		
178	Do you have the death certificate of the deceased?	Yes……………………………………..1	
		No………………………………………..2	⟶ 193
179	Can I see it please **COPY** DAY, MONTH AND YEAR OF DEATH FROM DEATH CERTIFICATE	Dd/mm/yyyy [ ][ ] - [ ][ ] - [ ][ ][ ][ ]	
180	**COPY** DAY, MONTH AND YEAR OF ISSUE OF DEATH CERTICIFATE	Dd/mm/yyyy [ ][ ] - [ ][ ] - [ ][ ][ ][ ]	
181	**RECORD** CAUSE OF DEATH 1 FROM THE DEATH CERTIFICATE	…………………………………………… ……	
182	**RECORD** CAUSE OF DEATH 2 FROM THE DEATH CERTIFCATE (IF ANY)	…………………………………………… …………	

SECTION 9. DATA ABSTRACTED FROM OTHER HEALTH RECORDS

183	OTHER HEALTH RECORDS AVAILABLE?	Yes……………………………1 No…………………………..2 Don't know………………...88	
184	FOR EACH TYPE OF HEALTH RECORD SUMMARIZE DETAILS FOR LAST 2 VISITS (IF MORE THAN 2)		
185	BURIAL PERMIT (CAUSE OF DEATH)		
186	POSTMORTEM RESULTS (CAUSE OF DEATH)		
187	MCH/ANC CARD (RELEVANT INFORMATION		
188	HOSPITAL PRESCRIPTION (RELEVANT INFORMATION)		
189	TREATMENT CARDS (RELEVANT INFORMATION)		
190	HOSPITAL DISCHARGE		

	(RELEVANT INFORMATION)		
191	LABORATORY RESULTS (RELEVANT INFORMATION)		
192	OTHER HOSPITAL DOCUMENTS SPECIFY:		
193	RECORD THE TIME AT THE END OF INTERVIEW	HH/MM [ ][ ] H [ ][ ]	

FIELD WORKER'S OBSERVATIONS (TO BE FILLED IN AFTER COMPLETING INTERVIEW)

194. COMMENTS ON SPECIFIC QUESTIONS:

195. ANY OTHER COMMENTS:

196. CLASSIFICATION OF DEATH [circle]

196i Direct Cause………………1

196ii Indirect Cause……………..2

197. CONTRIBUTING FACTOR/S

197i First delay (specify)_____1

197ii Second delay (specify)_____2

197iii Third delay (specify)_____3

198. CAUSE OF DEATH [circle]

198A. Direct Causes:

198i PPH…………………………………………………..1

198ii APH……………………………………………….2

198iii Septic abortion………………………………….3

198iv Puerperal Sepsis…………………………………4

198v Pre-Eclampsia…………………………………….5

198vi Eclampsia………………………………………….6

198vii Obstructed Labor…………………………..7

198viii others (specify)------------------------------ …66

198B. Indirect causes:

198C. Other indirect causes (specify) ----------------------------66

Signature of interviewer:………………………….……….

SUPERVISOR'S OBSERVATION [circle]

Complete: Y = 1   N = 2

If no, comments:

Agree with summary: Y = 1 N = 2

If no, comments:

NAME OF THE SUPERVISOR: ………………………….DATE:………………...