SOCIAL DEMOGRAPHIC DETERMINANTS OF MATERNAL MORTALITY IN ZAMBIA: A COMPARATIVE ANALYSIS OF 2002 AND 2007 DEMOGRAPHIC HEALTH SURVEYS

By

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ABSTRACT

This study is aimed at investigating the influence of the socio-demographic determinants on maternal mortality in Zambia drawing from an analysis of 2002 and 2007 demographic health survey data.

A logistic regression was applied on both the 2002 and 2007 Zambia Demographic Health Survey data. The binary logistic regression was used to estimate the woman dying while pregnant, during delivery or within two months after child birth. In this study the independent variable was explained by the odds ratios of the explanatory variables. The dependent variable wasdenoted by the number(1) one if a woman died of the pregnancy related death and (0) zero if otherwise.

Findings from the study indicate higher risks of dying from maternal mortality amongst adolescent mother in rural areas and outside marital unions. This is particularly evident from 2002 ZDHS for adolescent mothers in Eastern and Northern provinces. Adolescent mothers from Eastern and Northern provinces were 1.6 and 1.4 respectively at higher risk of dying from pregnancy related causes compared to women aged 44-49 years from Lusaka, the reference province. The observed early maternal mortality among adolescents outside marital unions was not significantly different in 2007 ZDHS,although there were more provinces experiencing this pattern, with education and religion of the mother having some influence on overall deaths. Mothers with no education were at 1.5 higher risk of dying compared to mothers with higher levels of education, the reference group. It is therefore, evident from both 2002 and 2007 ZDHS that pre-marital fertility especially in rural areas of Zambia and amongst women with no education is having significant influence on maternal mortality.

In order to overcome this challenge, there is need to target young adolescent mothers for comprehensive health care interventions supported by measures to keep adolescents longer in schools. Even though previous surveys have had challenges in investigating factors associated with maternal mortality due to inadequate numbers resulting from maternal deaths, this study shows that the ZDHS data has great potential in explaining the factors associated with maternal mortality when the logistic regression is applied on such survey data.

However, the ideal framework for investigating determinants of maternal mortality as proxy for maternal mortality should be supported by including data on biomedical variables that are otherwise unavailable from the Zambia Demographic Health Survey data.

DEDICATION

I dedicate this work to my dearest sons (Joseph Nonde and Fred Nonde) who in a long time were left alone without a mother around them, yet remained good boys. They always reminded me that they prayed for me and encouraged me to complete my programme.

To my sisters, Ntenda, Mukuka, Katongo and all women in Zambia who are in the reproductive age.We can fight and conquer the maternal mortality provided we abide byall healthy reforms concerning reproductive health. The key ones in this case,are ante- natal and post -natal educationor advice.

DECLARATION

I declare that the work I have presented in this thesis entitled "Social Demographic Determinants of Maternal Mortality in Zambia: A Comparative Analysis of 2002 and 2007 Demographic Health Surveys" is to the best of my knowledge my own work. The work contains no material submitted previously, in whole or in part, for the award of an academic degree at this University or any other University. I have however acknowledged all other works.

Mwasile Cynthia Nauluta

Dated this 12th December 2017

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CERTIFICATE OF APPROVAL

We, the undersigned as examiners and supervisor, recommend that this dissertation has fulfilled the requirements of the Degree of Master of Arts in Population studies of the University of Zambia.

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LIST OF ABBREVIATION

AIDS	Acquired Immune Deficiency Syndromes
CINAHL	Cumulative Index to Nursing and Allied Health
DRC	Democratic Republic of Congo
ERIC	Education Resources Information Centre
HIV	Human Immunodeficiency Virus
ISI	Institution for Scientific Information
MDGs	Millennium Development Goals
MMR	Maternal Mortality Ratio
MOFNP	Ministry of Finance and National Development
RC	Reference Category
UNZA	University of Zambia
UNICEF	United Nations Children Education Fund
UNFPA	United Nations Population Fund
SAP	Structural Adjustment Programme
SPSS	Statistical Package for the Social Sciences
STI	Sexually Transmitted Infections
WHO	World Health Organisation
ZDHS	Zambia Demographic Health Survey

CHAPTER ONE: INTRODUCTION

1.1 Background

Demographic and Health Surveys (DHS) are comparable nationally representative household surveys that have been conducted in more than 85 countries worldwide since 1984. The DHS were initially designed to expand on demographic, fertility and family planning data collected in the World Fertility Surveys and Contraceptive Prevalence Surveys, and continue to provide an important resource for the monitoring of vital statistics and population health indicators in low- and middle-income countries. Nowadays, Demographic and Health Surveys collect a wide range of objective and self-reported data with a strong focus on indicators of fertility, reproductive health, maternal and child health, mortality, nutrition and self-reported health behaviours among adults (Corsi et al., 2012).

In the area of maternal mortality, research has shown that a significant reduction in maternal mortality has been recorded globally with rates from 546 000 in 1990 to 287 000 in 2010 (Zureick-Brown et al., 2013). However, maternal mortality in Zambia remains all time high above at 483 per 100 000 live births, and this has eluded meeting the millennium development target of 162 according to the projections by the CSO (2012).

During the last decade, the Government of the Republic of Zambia has been instrumental in ensuring macro-economic stability and opening up the economy to foreign direct investments, which have contributed significantly to the sustained strong performance of the Zambian economy over the past five years as (MDGs),(UNDP, 2011). It is expected that this growth could be translated more rapidly into results in maternal mortality[1] reduction.

Every day, about 1,500 women across the globe die because of complications during pregnancy or childbirth, and 98 percent of these deaths, half a million annually, occur in developing countries (UNICEF, 2008). Another 10 to 20 million women develop

[1] Maternal mortality is a death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes. http://www.who.int/healthinfo/statistics/indmaternalmortality/en/

physical or mental disabilities every year as a result of complicated pregnancies and deliveries (WHO, 2009). In 2000, the estimated number of maternal deaths worldwide was 529,000. Ninety five per cent of these deaths occurred in Africa and Asia. While women in developed countries have only a 1 in-2,800 chance of dying in childbirth — In Africa women have a 1-in-20 chance (n.d[2]). UNICEF (2008) has observed that in a number of African countries the lifetime risk is greater than 1 in 10. For every woman who dies from obstetric complications, approximately 30 more suffer injuries, infection, and disabilities (UNICEF, 2008). In 1999, for example, WHO estimated that over 2 million women living in developing countries remain untreated for obstetric fistula, a devastating injury of childbirth. It should be stated that there is no single cause of death and disability for men between the ages of 15 and 44 that is close to the magnitude of maternal death and disability (Hunt *et al*., 2011).

These statistics and facts reveal chronic and entrenched health inequalities that ought to be measured and mitigated. At the Millennium Summit in 2000, States resolved to reduce maternal mortality by three quarters by the year 2015. This commitment is encapsulated in the Millennium Development Goals, which derive from the Millennium Summit commitments, and which have come to play a defining role in international development efforts. Goal 5 is a commitment to improve maternal health: the reduction of maternal mortality is an outcome chosen to assess progress in this regard (Hunt *et al*., 2011). Of all the Millennium Development Goals, the least progress has been made on goal Number Five (MDG 5). As part of the global process to measure maternal mortality, Zambia has since the Millennium Summit in 2000 conducted two demographic health surveys. There were the 2002 and 2007ZDHS surveys.

1.2 Statement of the problem

There is little research in Zambia that has investigated the social demographic determinants of maternal mortality. Demographic health surveys have been done in Zambia and so far, little is known if surveys used similar variables or constructs of socio-demographic determinants that determine maternal mortality. In the absence of empirical evidence, it is not possible to affirm if at all there have been any differences in the two data sets of the immediate past surveys. In the event that there are differences, there may be need for an ideal framework that could be used in future in profiling determinants of

[2] Downloaded on 10th March 2013 from https://books.google.co.zm/books?isbn=1136549927.

maternal mortality. Therefore, a review of the two becomes imperative and there are differences, there could be need for an ideal framework for Zambia.

1.3 Research Questions

Given the issues raised in the statement of the problem, this study is seeking to answer the following questions from the two data sets of the Zambia demographic health surveys of 2002 and 2007:

1) Whatsocio- demographic determinants have been used in the two data sets of the Zambia demographic health surveys of 2002 and 2007 to determine maternal mortality?
2) What socio- demographic variables were consistently used inthe two data sets of the Zambia demographic health surveys of 2002 and 2007?
3) Looking at the socio- demographic determinants from the two data sets of the Zambia demographic health surveys of 2002 and 2007, are there any differences in terms of influences on maternal mortality?
4) What is the ideal framework that could be used in profiling determinants of maternal mortality?[3]

[3] This is dependent on the claim presented in the statement of the problem

1.4 General Objective

The aim of this study was to compare the impact of socio-demographic determinants of maternal mortality in Zambia drawing from an analysis of 2002 and 2007 demographic health survey data.

1.5 Scope of the Study

Using 2002 and 2007Zambiademographic health surveys, this study uses multivariate analysis to investigate socio-demographic factors that are associated with maternal mortality in Zambia.

1.6 Definitions of terminologies

Maternal death according to WHO is 'the death of a woman, while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from cause related to or aggravated by the pregnancy or its management but not from accidental cause.'

Information collected on maternal mortality

The data collection method determines whether one measures maternal or maternal mortality.

- ✓ Identifying maternal deaths requires each death certification by an attending physician or a verbal autopsy
- ✓ House-hold survey methods frequently used in low/middle income countries (LMICS) simply ask time of death relative to pregnancy and thus measures maternal mortality.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter discusses many related themes on the determinants of maternal mortality such as; determinants of maternal mortality, morbidity and mortality, pregnancy determinants, macro-social determinants, socio-economic factors, poverty, age structure and staffing.

2.2 Determinants of maternal mortality

Maternal mortality is determined by a mixture of biological, socio-economic, cultural and contextual (including health systems) factors and their complex interaction (Adefuye*et al*, 2003; Jain *et al*, 2004). Identification of the determinants of maternal morbidity and mortality is a valid scientific endeavour in its own right, but it is particularly relevant to any undertaking to improve maternal health. By understanding the determinants of ill-health and their inter-relationships, it is possible to develop treatments, seek preventative measures, target high-risk individuals and groups, and assess the health implications of changes in the biological, physical, or social environment. The term 'determinants' is defined broadly in this paper as encompassing all associations between factors of interest and maternal health outcomes. Included within this are causes, which primarily refer to pathogenic determinants of mortality; risk factors, which have a biologically causal link to the outcome of interest; and risk indicators which are simply associated with the outcome. Maternal health determinants are conceptualized as belonging to one of three groups: determinants of pregnancy, determinants of morbidity, and determinants of mortality. It is noted that methodological techniques for ascertaining the determinants of health often reduce the issues under consideration to simplified, often linear, relationships between the determinants and specific, usually negative, health outcomes. This approach is not always appropriate since factors which are determinants from one perspective may be outcomes from another, and the repeat nature of pregnancy and morbidity makes the entire process a dynamic one with many possible complex interactions. Risk indicators are often highly correlated, and epidemiological strategies for analysis which eliminate confounders and look for single effects are not always relevant. Below are determinants that are linked to maternal mortality.

2.2.1 Morbidity and Mortality

Conceptualization of the determinants of maternal morbidity and mortality is in the initial stages of development. Studies have tended to focus on biomedical determinants, variously classified as genetic or constitutional, environmental, and behavioural risk factors. A review of over 60 studies of the determinants of maternal ill-health shows that the most commonly-stated 'causes' are pathogenic causes, such as haemorrhage and sepsis. These, together with investigations of age and parity as biomedical risk factors concentrating health risks among very young and very old women and nulliparous and grand multiparous women, far outnumber studies investigating other tiers of determinants. Research which moves away from a clinical orientation with its underlying paradigm of biologically causal links and biochemical markers, and considers a wider range of determinants, is rare. This may be partly because maternal health is viewed not as a public health issue but rather as a medical problem to be handled at the individual level. The public health relevance of such clinically-oriented epidemiological research in developing Countries is being increasingly called into question (Akin, 1991; Myntti, 1991).

An important element in understanding the determinants of morbidity and mortality involves the relationship of morbidity to mortality. As shown in Figure 1, each stage is conditional on the previous one, and maternal mortality is conditional on maternal morbidity (Campbell and Graham, n.d)[4].

[4]Downloaded on March 7th 2013from www.maternal-mortality-measurement.org.uk/.../Measuring%20the%20...

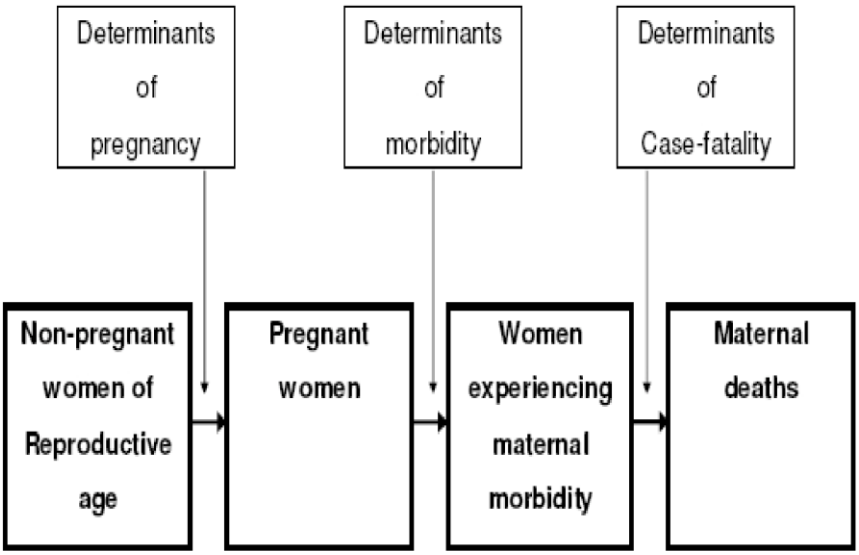


Figure 1: Schema showing the broad categories of outcomes and determinants related to maternal health: Source (Campbell and Graham, n.d).

Thus pregnancy and the characteristics of a specific morbidity, including its severity, duration and pathogenic nature, are frequently labelled "causes" of maternal mortality. These characteristics, their interaction with the woman and with other morbidities or risk factors for the prognosis of morbidity, and the availability, accessibility, quality and effectiveness (including compliance) of services and treatments are grouped as determinants of death. For clarity however, it is preferable to separate those which are primarily determinants of morbidity or pregnancy and pathogenic causes. Pathogenic causes of maternal mortality include all fatal conditions aggravating or aggravated by pregnancy. The complications of pregnancy, childbirth and the puerperium in the ICD- 9 include 40 major three-digit divisions (WHO, 1977). The most common direct causes of death however are haemorrhage, sepsis, obstructed labour, hypertensive diseases of pregnancy and complications of illegally induced abortion, while common indirect causes include malaria and hepatitis. Women with severe anaemia are at higher risk of dying at childbirth (Shulman, 1999). Severe anaemia is frequent particularly in regions

where malaria is endemic (Okoko and Ota, 2003). Young women and women giving birth for the first time are at higher risk of obstructed labour—a major contributor to maternal deaths—and its consequences such as obstetric fistula (Rush, 2000). Ectopic pregnancy is another important cause of maternal deaths and is common in populations where sexually transmitted infections (STI) are widespread. The ICPD Programme of Action addresses these under the specific goal of reducing maternal deaths.

A substantial deteriorating effect on health, including reproductive health, has been that of HIV/AIDS during the last couple of decades, particularly in sub-Saharan Africa (WHO, 2005). The epidemic has had a significant impact on maternal mortality levels. Nationally representative surveys in Malawi and Zimbabwe indicate that pregnancy-related mortality risks have increased 1.9 and 2.5 times, respectively, during the past decade, concomitant with a nearly 10-fold increase in the prevalence of HIV among pregnant women (Bicego*et al*., 2002). Similarly, the confidential enquiry into maternal deaths in South Africa attributed 13% of all deaths to AIDS. Tuberculosis, as a co-infection with AIDS has also emerged as a new contributor to maternal deaths (Khan *et al*., 2001). In addition, the HIV/AIDS epidemic is having deteriorating effects on socio-economic status of people in affected regions, increasing their vulnerability for maternal deaths. Morbidity levels in a society could further influence maternal mortality levels by diverting limited resources from maternal health services to other emerging health problems. This is likely to be already happening in sub Saharan Africa, where health systems are struggling to overcome devastating effects of HIV/AIDS in all other aspects.

2.2.2 Pregnancy Determinants

The proximate and more distal determinants of fertility contribute to maternal morbidity and mortality because pregnancy is a pre-condition. Models of the proximate determinants suggest for example, that non-contracepting, non-lactating women in stable sexual unions are most exposed to the risk of pregnancy, and that on an aggregate level, these characteristics, together with induced abortion, primarily determine the total fertility rate (Bongaarts and Potter, 1983). Within this are reproductive factors, including the woman's physiological makeup, her age, parity, and general health status are the most commonly considered factors as they can be measured relatively easily in facility-based studies. Reproductive factors are thought to play a biologically causal role although some, such as age, entry into sexual union, and parity may influence women's confidence

and use of services. Often however, studies merely demonstrate an association with age and parity and recommend targeting of high risk women for special care without exploring the mechanisms for the association (Cochrane, 1979; Bongaarts and Potter, 1983).

2.2.3 Macro-social Determinants

Distal determinants of fertility are often considered at both the societal and individual level (Cochrane 1979; Lesthaeghe*et al*., 1981). Social institutions, cultural norms, economic and environmental conditions as well as women's education, status, employment, ethnicity, and family size desires have been identified as important distal determinants. Generally, higher levels of education, income, and women's status are associated with lower levels of fertility, and it is assumed that they have a similar association with maternal morbidity and mortality, although this is by no means certain. Louden (1987) argues, for instance, that maternal health, as opposed to neonatal and infant health, is resistant to socio-economic indicators and is much more a function of medical care.

According to Campbell and Graham (n.d) within macro social determinants, another major category of determinants are health service factors. Here, it is helpful to distinguish between curative and preventative interventions, although once again the conditionality of the three stages (determinants of morbidity, mortality and determinants of case fatality) means that an intervention which cures morbidity prevents death. It is common to distinguish between interventions by modern and traditional health practitioners as well as those carried out by women themselves. As regards risk factors, this is perhaps less useful than distinguishing between harmful practices and helpful or beneficial ones. These can be generally grouped under the quality of care to borrow from Bulatao and Lee (1983). The accessibility and availability of preventative and curative health services also belong in the health service category. Thaddeus and Maine (1990) have reviewed the literature on maternal health care utilization and proposed a useful framework examining three phases of delay: (1) delay in deciding to seek care on the part of the individual, the family or both; (2) delay in reaching an adequate health facility; and (3) delay in receiving adequate care at the facility.

2.2.4 Socio-Economic Factors

This final category, socio-economic factors, is extremely broad and often includes urban/rural residence, education, income, status, and cultural factors as risk indicators. Because such influences are not necessarily causal, it is important to elaborate on the expected direction of an association and possible reasons behind it while recognizing the potential for confounding. For example, the evidence on the importance of maternal education has led to several exchanges (Harrison, 1989a, 1989b; Maine *et al*., 1989). Hospital studies often find that illiterate women have higher maternal mortality ratios than more educated women, leading some to argue that female education will reduce maternal mortality. Others counter that such an assumption assumes a causal relationship which is not adequately demonstrated by such studies. Indeed much of the effect of education may be due to selection bias, as in many countries illiterate women normally deliver at home and only use hospitals for complicated deliveries, arriving late and often moribund. If access to health services is controlled for by only considering women booked into the health system, further insight into the effects of education can be gained.

In Zaria, Nigeria between 1976-9, women with lower educational levels had better survival than more highly educated women (110 versus 250 maternal deaths per 100,000 live births respectively) (Harrison, 1985). By contrast, a hospital study in Port Harcourt in 1987-9 showed women with less than secondary school education experienced almost five times the maternal mortality of booked women with secondary or higher education (640 versus 130 maternal deaths per 100,000 live births respectively)(Briggs and Oruambo, 1991). Some differences may be due to underlying health status but it is also likely that ability to pay for health services and staff attitudes play an important role (Campbell *et al*., 1991; Harrison *et al*., 1991). Further exploration of the reasons for such differentials may lead to remedies well within the means of hospital staff and available resources.

2.2.5 Poverty

The association of the level of socio-economic development with many health indicators is well known. The differences in maternal mortality ratios between more developed and developing countries are immense (UNICEF/UNFPA/WHO, 2004). The differences between income groups within countries are also notable. Data from both developing and developed country settings show that poor women are more likely to die in childbirth

than rich women (Graham *et al*., 2004; Mayor, 2001). The findings raise concerns about setting of international goals as societal averages since the differences between advantaged and disadvantaged segments of the populations could be overlooked (Gwatkin, 2002).

2.2.6 Age structure

Age is another important determinant which influences both fecundability and the likelihood of exposure to intercourse. The implications of these proximate determinants of pregnancy for maternal health have been illustrated by Graham and Airey (1987), who among others, show that in many settings the majority of maternal deaths come from the mid-reproductive ages where the most women are giving birth, despite the youngest and oldest women having the highest age-specific risks per pregnancy. Although not yet demonstrated empirically, the same relationships are likely to hold for age and maternal morbidity.

Age structure of a population shows specific fertility and morbidity features, which influence maternal mortality. For example, in countries characterized by a younger age structure and early childbearing, early pregnancies could pose high risk since adolescents have higher rates of birth complications, maternal mortality and morbidity than their older counterparts (Granja *et al*., 2001).

In addition, adolescent mothers are more likely to experience unemployment and poverty as an adult, tend to have closer spacing of births, more non-marital births and a higher proportion of unintended births than women who delay childbearing (Ehlers, 2004; Hayes, 1987).

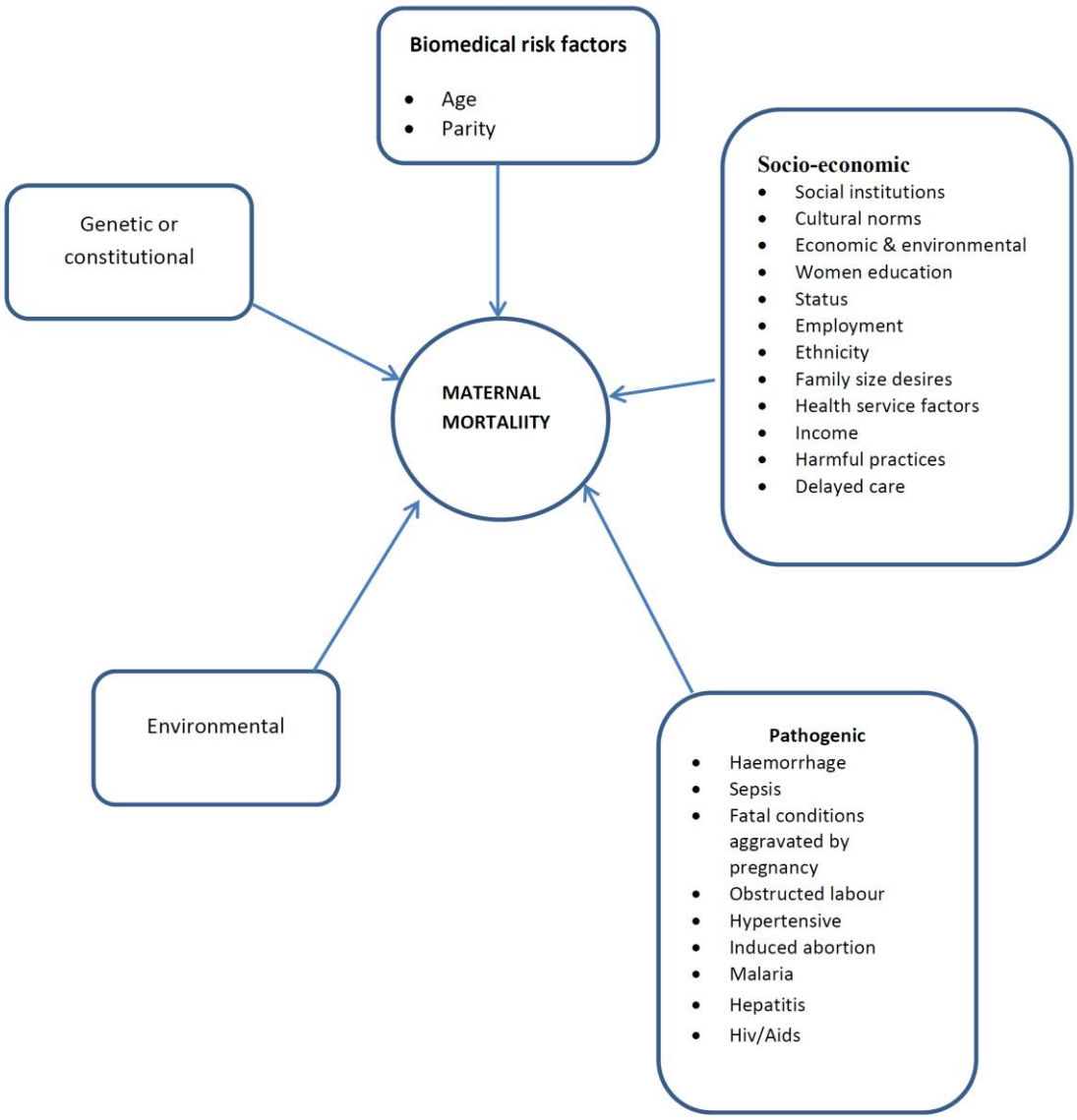
2.2.7 Staffing in Health Units

The maternal mortality ratio in Sub-Saharan Africa for 2005 is estimated at 835 deaths per 100 000 live births (IC 95% 300-1400). This is striking because of its high value as well as its considerable deviation (15-2100). This shows that there are significant differences among the different countries even though this rate is generally much higher than on any other continent. Antenatal care coverage and medical professionals attending births are two measures that are always recognised to be crucial in reducing the maternal mortality (WHO, 2006) ; we often find figures in Sub-Saharan Africa that are between 50% and 80% for these indicators. The lack of basic infrastructure (water and sanitation)

and the lack of basic formal education are factors associated with the infant mortality rate (Victoria et al., 1998), which is shown through bivariate analysis to correlate to the maternal mortality ratio. The economic indicators also show marked differences compared with developed countries in absolute terms.

2.2.8 Conceptual model of Determinants of Maternal Mortality

From the literature above, the conceptual model of maternal mortality and its determinants can be presented diagrammatically as follows:



CHAPTER THREE: METHODOLOGY

3.1 The study area

Zambia is a land-locked sub-Saharan African country sharing boundaries with the Democratic Republic of Congo (DRC) and Tanzania in the north; Malawi and Mozambique in the east; Zimbabwe and Botswana in the south; Namibia in the southwest and Angola in the west. Zambia covers a land area of 752,612 square kilometres, which is about 2.5 per cent of Africa. Administratively, the country is divided into nine provinces and 72 districts at the time of the two Zambia demographic health surveys under study. Of the nine provinces, the two are predominantly urban, namely Lusaka and Copper Belt provinces. The remaining provinces Central, Eastern,Northern, Luapula, north-western, Western and Southern are predominantly rural provinces. However, the number of provinces has added to ten and more districts have and are still been formed as the population keeps increasing and the country developing.

Zambia lies between 8 and 18 degrees south latitude and between 20 and 35 degrees east longitude. It has a tropical climate and vegetation with three distinct seasons: the cool winter from May to August, a hot dry season during September and October, and warm wet season from November to April.

3.2 Study Design

This study was based on two data sets - The 2001-2002 and 2006-2007 Zambia Demographic and Health Survey (ZDHS). The data was from two studies carried out by the Central Statistical Office and the Central Board of Health. The 2001 data is about a nationally representative sample of 7,658 women age 15-49 and 2,145 men age 15-59.

The 2007 Zambia Demographic and Health Survey (ZDHS) was also a national sample survey. The sample included 7,146 women aged 15-49 and 6,500 men aged 15-59 from urban and rural areas. The 2007 ZDHS was a follow-up to the 1992, 1996, and 2001-2002 ZDHS surveys and provides updated estimates of basic demographic and health indicators covered in the earlier surveys. The 2007 ZDHS was the second DHS that included the collection of information on violence against women, and syphilis and HIV testing. In addition, data on malaria prevention and treatment were collected.

The target groups in the two surveys were men age 15-59 and women age 15-49 in randomly selected households across Zambia. The survey collected blood samples for syphilis and HIV testing in order to determine national prevalence rates.

The data drawn for this study was from a stratified multistage clustered sample. The data was primarily derived from questionnaires which were designed to provide up-to-date information on demographic and socioeconomic characteristics of the respondents and a range of important health criteria, such as fertility, awareness, and use of family planning methods.

3.3 Data Processing and Analysis

Data processing involved separating the actual data on socio-demographic variables from the actual data sets to another sheet with the use of (SPSS) version 21. Data on maternal mortality was also separated from the data sets to a new data set. Univariate and bivariate analysis within SPSS was used. Logistic regression was also used in calculating the risk of maternal mortality as a function of socio-demographic variables. Graphs and tables were produced with the use of Microsoft Excel and later transferred to Microsoft word for report writing).

Data was analysed using SPSS. At univariate level, frequency distributions were done on the number of children ever born (parity), age and marital status of the woman as bio-demographic variables, and on region, residence, religion, education as socio-demographic variables on the two data sets.Wealthwas of interest to my research too seeing that it was included on 2007. At bivariate level, chi-square was used to test if there was a significant difference between maternal mortality and the socio - demographic characteristics. At multivariate level logistic regression was used to determine the impact of the independent variables on the dependent variable.

For maternal mortality, [5]the dependent variable wasin binary form, for which the response outcome was ‘maternal related death or not a related maternal death’. Binary logistic regression was used to estimate the odds of a woman dying while pregnant, during delivery or within 2 months after child birth. In this study, the dependent variable was explained by the odds ratios of the explanatory variables. The dependent variable noted 1 if the woman died of a maternal death and 0 if otherwise.

[5] That is maternal mortality represents deaths to women that occur during the reproductive process, meaning during pregnancy, childbirth, or within 2 months of after the birth of termination of a pregnancy.

In this study, the dependent variable was maternal mortality measured numerically and expressed as a percentage.The independent variables were: parity, region, residence, marital status, religion, wealth and education and these were measured on a nominal scale.

CHAPTER FOUR: FINDINGS

4.1 Introduction

This study was designed to answer four research questions which are:

1) What are the possiblesocio- demographic determinants that have been used in the two surveys to determine maternal mortality?
2) What socio- demographic variables were consistently used in the two surveys?
3) Looking at the socio- demographic determinants from the two surveys, where there any differences in terms of impacts on maternal mortality?
4) What is the ideal framework that could be used in profiling determinants of maternal mortality?

This chapter is organised under three themes which are:

a) Respondents Characteristics
b) Variables used as maternal mortality
c) Correlates of maternal mortality in form of social demographic factors

4.2 Respondents Characteristics

The respondents characteristics were generated by province, type of place of residence and education level.These represent national data.

4.2.1 Respondents characteristics by province

Table 1: Distribution of respondents by province

	2002 Data		2007 Data	
Province	Frequency	Percent	Frequency	Percent
Central	562	7.3	658	9.2*
Copper belt	1544	20.2	1263	17~
Eastern	926	12.1	971	18.6*
Luapula	622	8.1	530	7.4~
Lusaka	1132	14.8	1171	16.4*
Northern	1040	13.6	966	13.5~
North-Western	354	4.6	365	5.1*
Southern	814	10.6	726	10.2~
Western	663	8.7	491	6.9~
Total	7658	100	7146	100

~ Denotes a reduction in respondents
* Denotes an increase in respondents

4.2.2 Respondents characteristics by type of place of residence

There were differences in the profile of respondents' bytype of place of residence in the two surveys. In 2007 a notable increase in terms of 2 percentage points was observed for urban areas whereas a reduction by 2 percentage points was observed for rural areas (Table 2).

Table 2: Distribution by type of place of residence

	2002 Data		2007 Data	
	Frequency	Percent	Frequency	Percent
Urban	3073	40.1	3009	42.1
Rural	4585	59.9	4137	57.9
Total	7658	100.0	7146	100.0

In the two surveys, the level of education in terms of not having been to school and having had primary education was higher in the 2002 survey than the 2007 survey. There was on average a 3 percentage point's increase. There was an increase by 3 percentage points in the higher education and secondary school domains (Table 3). It was evident that the respondents in this study demonstrated low school attendance. In the 2002 survey, the mean education (number of years in school) was 7 (± 2.1). And the mode was 6 years. As for 2007 survey, the mean education (number of years in school) was 6 (± 2.4) and the mode was 7. It appears that there was no difference in the level of school attendance between the two surveys.

Table 3: Distribution by education level

	2002		2007	
	Frequency	Percent	Frequency	Percent
No education	925	12.1	744	10.4
Primary	4439	58.0	3891	54.4
Secondary	2061	26.9	2140	29.9
Higher	234	3.1	371	5.2
Total	7658	100.0	7146	100.0

4.3 Maternal mortality variables used in the two surveys[6]

A critical examination of the two data sets that were used in the ZDHS shows a consistency in the use of variables (taken as determinants in this study). The variables are: Parity, Age, Region, Residence, Marital Status, religion, and Education. However, the 2007 survey introduced one variable related to wealth.

4.4 Associations and Maternal mortality[7]

In order to show how each determinant faired with maternal mortality, parity, age, marital status, region, type of residence, religion, education and wealth determinants were identified as correlates and used in the analysis. To start with, the researcher used bivariate analysis of each independent variable to establish the relationship with the dependent variable- maternal mortality.

To begin with, overall picture of maternal mortality is given in table 4 for the two different years under consideration (2001/2 and 2007). The percentages 85 and 86 of 2002 and 2007 respectively were for the deaths not related to pregnancies. Then the 15% in 2002 and 14% in 2007 attributed to maternal mortality. However meagre the percentage may seem, it affects the health of the nation to a larger extent that if over looked may cost the nation's development and prosperity. Some reduction in the deaths have happened as observed in the table; in 2001/2, women who died while pregnant were 104 whereas a reduction was seen in 2007 to 76 deaths by 5%. During delivery in 2001/2, 46 died from maternal mortality while in 2007, 45 deaths were recorded and shown by 2.9%. Besides, the women who died within 2months after child birth in 2001/2 were 95 whereas in 2007 they noted 92 deaths giving the percentage of 6. Though there may seem to be some reduction in the frequencies, the percentages give a different picture altogether in that during delivery and within 2months after child birth, there was almost a steady situation observed in 2007 as well as in 2001/2. The women who died while pregnant in 2001/2 accounted for 6.3% and in 2007 a 5% was noted (Table 4). Despite all this there still remains a lot to be done on the issue of reducing maternal mortality in Zambia today.

[6] Related to research question: What variables as maternal mortality determinants, were used in the two surveys?

[7] Related to the research question: What are the social demographic determinants which are associated with maternal mortality in the two surveys?

Table 4: Maternal Deaths: 2001-2 – 2007

		2001-2		2007	
	Specific deaths	Frequency	Percentage	Frequency	Percentage
Non maternal deaths	Death not related	1413	85.2	1321	86.1
Maternal Deaths	Died during pregnancy	104	6.3	76	5.0
	Died during delivery	46	2.8	45	2.9
	Died 2 months after birth	95	5.7	92	6.0
	Total	1658	100	1534	100

Below are the relationships of the key determinants and maternal mortality

4.4.1 Age and maternal mortality

Here the examination of the association between age and maternal mortalitywas carried out and results were given according to table 5. The age groups are shown by the frequencies and percentages of women who died of maternal mortality in 2001/2 and 2007. The least percentages were observed with the age group 15-19 in 2002 with 7.3% and in 2007was 5.3%. A reduction could have been observed, yet the pattern of maternal mortality still remained the same for 2001/2 and 2007. The highest percentage of 17.8 of maternal mortality was observed between the ages 30 to 34years in 2001/2. On the other hand, in 2007 it was observed between the ages 25 to29 years with 22.3%. Table 5 displays the detail of each age group as can be seen.

However, in this experiment the main essence was to establish the relationship between age and maternal mortality. Therefore, the p-valuescalculated for each year was given by the x^2 as shown in the table. Having looked at age in 2002, it had the p-value of 0.057 which was interpreted as having an association with maternal mortality that was a strong one. The p-value was statistically significant. On the other hand, in 2007 the p-value was 0.187 which indicated less predictive ability for maternal mortality because the strength of association between the two variables was weak.

Table 5: Relationship between Age and maternal mortality

	2001-2		2007	
Age	**Frequency**	**Percentage**	**Frequency**	**Percentage**
15-19	18	7.3	9	5.3
20-24	37	15.0	26	11.7
25-29	**43**	**17.4**	**49**	**22.3**
30-34	**44**	**17.8**	**39**	**18.9**
35-39	**42**	**17.0**	**38**	**19.4**
40-44	40	16.2	29	12.1
45-49	**22**	**8.9**	**23**	**10.2**
Total	246	100	213	100
	X^2*0.057*	*P 0.05*	X^2*0.187*	*P 0.05*

x^2 was used to mean the significant value after running the experiment.

4.4.2 Parity and maternal mortality

The examination here was between the number of children ever born (parity) and maternal mortality.The maternal mortality as recorded in Table 6 had the least percentage for women with 0 parity in 2007 as compared to 2002 which had 10.6.The highest percentage was also observed amongst the women with 1-4 parity in 2007 which stood at 49.5%. From the chi-square done, the p- value shows that it was greater than 0.05.For 2001/2 it was 0.8 and for 2007 the observed was 0.594.(See Table 6). The indication was therefore that there was no statistical significance between the total number of children ever born and maternal mortality. When considering the test of strength of association between the two variables, it could be observed that the relationship was very weak. However, the information from the table above shows that women who are at high risk of death are those with 1-4 parity as the percentages can show. In 2001/2, 48.0% was recorded whereas in 2007, 49.5% was recorded.

Table 6: Relationship between Parity and maternal mortality

	2001-2		2007	
Parity	**Frequency**	**Percentage**	**Frequency**	**Percentage**
0	26	10.6	12	7.8
1-4	117	48.0	108	49.5
5+	101	41.4	82	37.4
Total	244	100	213	100
	X^2 *0.800*	*P > 0.05*	X^2 *0.594*	*P > 0.05*

4.4.3 Marital status and maternal mortality

Marital status was another variable on which an examination was done to establish the relationship that might exist withmaternal mortality and the following were the outcomes.

From table 7, least percentage on marital status andmaternal mortality was observed among the living together in 2001/2 with only 1.2% and in 2007 with 0.5% and the not living together had slightly higher than those of the living together. The married women seem to have been exposed to higher risk of death than any other in both 2001/2 and 2007 because of the higher percentages recorded which were 67 and 68.8 respectively. The deaths are not so much for the formerly married in the two years 2001/2 and 2007 recorded. Generally, the pattern of maternal mortality in 2001/2 and 2007 was the same.

The chi-square run on the marital status and maternal mortality showed that the p-value was 0.372 in 2001/2 and in 2007 it was 0.833. This showed that there was no association between marital status and maternal mortality in both 2001/2 and 2007. Consequently the strength of association, for the two variables was equally weak.

Table 7: Relationship between Marital status and maternal mortality

	2001-2		**2007**	
Marital Status	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Never married	22	9.0	17	10.2
Married	164	67.0	156	68.8
Living together	3	1.2	1	0.5
Formerly married	45	18.3	35	18.8
Not living together	11	4.5	3	1.6
Total	245	100	213	99.9
	$X^2$0.372	*P > 0.05*	*$X^2$0.833*	*P > 0.05*

4.4.4 Residence and maternal mortality

In this section, the examination carried out on the association between residence and the maternal mortality and the following results were observed.

From table 8, the total number of maternal mortality recorded was 245 in 2001/2 and 213 in 2007. In 2001/2, (33.1%) of the maternal mortality happened in urban areas and 66.9% happened in the rural areas. As for 2007, (41.7%) was recorded in the urban areas

and 58.3% was recorded in the rural areas. Though the reduction in the rural areas was observed, on the contrary, an increase appeared in the urban areas. This in a way suggests a challenge somewhere that needs to be mitigated if the balance has to be struck in meeting the MDG 5 by the end of the estimated time concerning the type of place of residence.

In table 8, the significant value of .001 was observed in 2001/2 and it indicated that residence was statistically significant because its value was less than 0.05. The other understanding was that the association between residence and maternal mortality were strong. Thus, the high predictive ability on the dependent variable was observed. However, the opposite was observed in 2007 that the statistical value was 0.102 higher than 0.05 to mean that the predictive ability was not much because the association was weak.

Table 8: Relationship between Residence and maternal mortality

Residence	**2001-2**		**2007**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Urban	81	33.1	89	41.7
Rural	164	66.9	129	58.3
Total	245	100	213	100
	X^2 = 0.001	*P< 0.05*	*X^2 .102*	*P > 0.05*

4.4.5 Religion and maternal mortality

The examination of religion and maternal mortality was done and below the observed were noted.

Catholic women who died from pregnancy related death in 2001/2 accounted for 28.5% while in 2007 18.9% was recorded. Protestants women who died of maternal mortality in 2001/2 recorded 68.6%while in 2007 there was 79.6%. When we consider the percentages on Protestants there has been an increase from 68.6% in 2001/2 to 79.6% in 2007. The other religions recorded meagre maternal mortality which were only 11 in 2001/2 and 3 in 2007.

Table 9: Relationship between Religion and maternal mortality

	2001-2		2007	
Religion	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Catholic	66	28.5	40	18.9
Protestants	176	68.6	168	79.6
Others	0	2.9	5	1.5
Total	242	100	213	100
	$X^2 = 0.583$	*$P < 0.05$*	*$X^2 = 0.405$*	*$P > 0.05$*

The p-value in 2002 showed 0.583 which possessed little statistical significance because p-values was greater than 0.05. the year 2007 also had the p-value greater than 0.05 as shown in table 9, 0.405 This then means that religion does not have much influence on maternal mortality. In other words the predictive ability that religion has on maternal mortality is very little or does not exist at all.

4.4.6 Education and maternal mortality

In this section the researcher examined the association between education and maternal mortality and the outcome was interpreted as below;

In table 10 the different educational levels of mothers were used to establish the relationship that could have existed between education and maternal mortality. The women with primary education category was discovered to be at higher risk of dying from pregnancy related death as their percentages were high both in 2002 and 2007 , being 63.7% and 55.3% respectively. It is also worth noting that those women with secondary education levels detailed 20% in 2001-2 whereas 26.7% was for 2007. The women with higher education levels were found to be at less risk of dying from maternal mortality as they recorded low percentages of deaths in 2001-2 2.8% and 6.3% in 2007.

The p-values for both 2002 and 2007 did not show any statistical significance because they were greater than the 0.05. 0.285And 0.621 were observed for 2002 and 2007 respectively. Therefore, we would say then that the relationship between education and pregnancy related a death was weak.

Table 10: Relationship between Education and maternal mortality

	2001-2		2007	
Education	**Frequency**	**Percentage**	**Frequency**	**Percentage**
No Education	33	13.4	24	11.6
Primary	156	63.7	120	55.3
Secondary	49	20.0	54	26.7
Higher	7	2.8	15	6.3
Total	245	100	213	99.9
	X^2 = .285	*P > 0.05*	*X^2 = .621*	*P > 0.05*

4.4.7 Region and maternal mortality

This section examined the association between region and maternal mortality in the whole country and below was the obtained results.From table 11 the maternal mortality that were observed in the whole country in the year 2001-2 were 245 in total and in 2007 they were 210deaths. Each province had the percentages to record; Copper belt Province recorded the highest numbers both in 2002 and 2007 which were 20.8 % and 20.5 % respectively, followed by Eastern province in 2007 with 19% and Lusaka in the same year with 15.2% and in 2002 13.9%. Central province in 2007 also recorded 13.3%. The remaining provinces recorded but less than 10% in both 2002 and 2007.

Table 11: Relationship between Region and Maternal mortality

	2001-2		2007	
Region	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Central	20	8.2	28	13.3
C/Belt	51	20.8	43	20.5
Eastern	33	13.5	40	19.0
Luapula	21	8.6	16	7.6
Lusaka	34	13.9	32	15.2
Northern	36	14.7	18	8.6
N.Western	9	3.6	6	2.8
Southern	25	10.2	11	5.2
Western	16	6.5	16	7.6
Total	245	100	210	100
	X^2 = .111	*P > 0.05*	*X^2= .001*	*P < 0.05*

The p- value for 2001-2 indicated that there was no statistical significance because the p-value was0.111 which was greater than 0.05. On the contrary, the p= value was less than

0.05, for 2007 which was 0.001 and it showed that there was a statistical significance between region and maternal mortality. Similarly, from the test of the strength of association, it could as well be said that the strength of association between the two variables was very strong for 2007 and weak for 2002. So, for the weak association there is little influence and for very strong association, there is influence on maternal mortality.

4.4.8 Influences of Independent variables and maternal mortality across the two surveys

This section below gives the comparison of the study's independent variables (That is age, parity, education, marital status, region, religion, and type of residence) and their influence onmaternal mortality across the two surveys. Each independent variable was presented to see its effect and odds ration were used to elicit if at all any differences existed.

Table 12: Comparison of Independent Variables and maternal mortalityacross the two surveys

	2001-2 Year		2007 Year	
VARIABLE ∨	**B**	**B(exp)**	**B**	**B(exp)**
Parity				
0	1.207	3.344***	1.274	3.574***
1-4	.484	1.623***	.519	1.680***
5+ RC		1.000		1.000
Age				
15-19	1.727	5.624***	1.724	5.608***
20-24	1.130	3.096***	1.437	4.208***
25-29	.555	1.742***	0 .831	2.295***
30-34	.411	1.508***	0 .460	1.584***
35-39	.229	1.257**	0.130	1.139
40-44	.160	1.173	0.-176	.838
45-49 RC		1.000		1.000
Region				
Central	-.342	.993	.035	1.035
Copper Belt	-.396	.940***	-.292	0 .747***
Eastern	.302	1.892***	.438	1.550***
Luapula	-.292	1.044	.048	1.050
Northern	-.335	1.629***	.324	1.382***
N/Western	.153	1.331*	.376	1.457**
Southern	-.049	1.237*	.033	1.087
Western	-.122	1.398***	.007	1.007
Lusaka RC		1.000		1.000
Residence				
Urban RC		1.000		1.000
Rural	.372	1.450***	0.369	1.446***
Marital Status				
Never Married	1.008	2.739***	0.987	2.683***
Living Together	-.462	.630	0.260	1.297
Widowed	-.474	.622***	0.-528	0.589***
Divorced	-.180	.835*	0.-161	0.851
Not living Together	-.258	1.295	0.-052	0.950
Married RC		1.000		1.000
Religion				
Catholic	-.050	.952	0.-131	0.877*
Others	-.745	.475	0.-133	0.876
Protestants RC		1.000s		1.000
Education				
No Education	.443	1.557**	0.676	1.966***
Primary	.303	1.354*	0.454	1.574***
Secondary	.344	1.410**	0 .610	1.841***
Higher RC		1.000		1.000

RC = Reference Category p < 0.01 = *** p < 0.05 = ** p < 0.1 = *

4.4.8.1 Parity and maternal mortality

Parity has the p-value of less than 0.05 (0.000) in 2002 which is an indication that it is statistically significant and it has the predictive ability to the model. This further entails that it is a major factor contributing to maternal mortality. The odds ratio also gives the description of parity in relation to maternal mortality. The women with 0 parity are 3.3times at higher risk of experiencing maternal mortality than those with 5+ parity. The

women with 1-4 parity have 1.6 chances higher of dying from maternal mortality as compared to those that have 5+ parity.

Similarly, the 2007 dataset shows that parity has the predictive ability to the model with the statistical significant value of less than the .05 (0.000). This also means that it has some influence on maternal mortality. In the same vain the odds ratio according to its grouping suggests that the women with 0 parity are 3.6 times at higher risk of dying from maternal mortality than those with 5+ parity. The women with 1-4 parity have 1.7 times higher probability of experiencing pregnancy or maternal related deaths as compared to the women with 5+ parity.

4.4.8.2 Age and maternal mortality

The variable age from the 2001/2 data has the p-value less than 0.05 (0.000) which indicates that it is statistically significant and that it has a bearing on maternal mortality. Considering the age groups, 15-19years of age is 5.6 times at higher risk of dying from maternal mortality than those in the age group 45-49years. The age group 20-24 years is 3.1 times higher chances of experiencing maternal mortality as compared to the age group 45-49 years. The age group 25-29 years has 1.7 chances more of dying from maternal mortality than those in the age group 45-49years. Those in the age group 30-34 years have 1.5more chances of experiencing pregnancy or maternal related deaths in association to those of group 45-49years. The age group 35-39years also shows 1.3 times more probable of experiencing maternal mortality when matched with those in the age group 45-49 years. Lastly but not the least, the age group 40-44years with the odds ratio 1.2 have higher chances of dying compared to the women in the age group 45-49years.

Correspondingly, the 2007 data has 5.6 times higher probability of women in the age group 15-19years to die of maternal mortality than the women in the age group 45-49years. The 20-24years age group has 4.2 times higher chances of dying from maternal mortality than the 45-49years age group. The age group 25-29years has 2.3times higher odds of dying from maternal mortality than the women in the age group 45-49years. Besides, women aged 30-34years group has 1.6times higher likelihoods of women dying of maternal mortality as compared to those in the 45-49years age group. The 35-39years

age group has 1.1times, almost no difference in the chances of women dying of maternal mortality as compared to women in the age of 45-49years. The 40-44years women have .838timesless likely to experience maternal mortality than those in the age group of 45-49years which is the reference category.

4.4.8.3 Region and maternal mortality

This is another variable from 2002 dataset that gives the statistical significant value of less than 0.05 (0.000). This entails that it is a contributing factor to maternal mortality. Looking at different regions of the country, Central province shows 0.993 less chances of experiencing maternal mortality than Lusaka province. Copper Belt province also expresses the probability of maternal mortality not occurring with the odds ratio 0.940 as compared to Lusaka province. On the contrary, Eastern province gives an impression that the possibility of experiencing maternal mortality is higher as shown by the odds ratio 1.9times when likened to Lusaka province. Luapula province indicates 1.0 odds ratio and that shows no difference at all with the reference category. Northern Province shows 1.6 odds ratio that indicates higher chances of experiencing maternal mortality than Lusaka province. North-Western with the odds ratio 1.3entails those women are at higher risk of experiencing maternal mortality as compared to those in Lusaka province. Southern province equally has 1.2 odds ratio which entails that the women are more likely to experience maternal or pregnancy related mortality than Lusaka province. Western province has 1.4times higher chances of women being subjected to maternal mortality as compared to Lusaka province.

From the 2007 dataset, this same variable still gives a statistical significance value of less than 0.05 (0.000) to show that it has a causative influence on maternal mortality. The odds ratio also account for some detail relationship of independent variables and the dependent variable. Central province in particular has 1.0times chances of its women to die of maternal mortality which is the same with the women in the reference category. Copper Belt province on the contrary, and the only one shows 0.747 odds ratio which necessitates that the likelihood of women dying from maternal mortality in this province are lower as compared to those of women in Lusaka province. Eastern province has 1.6times higher probability of its women dying of maternal mortality than those of Lusaka province. Luapula province displays 1.0times similar odds of women dying of maternal mortality as those in the reference category. Northern Province has 1.4times

higher chances of the women dying of maternal mortality than those on the Lusaka province. North-Western province with 1.5odds ratio entails that there are more chances of women dying from maternal mortality as compared with Lusaka province. Southern province has 1.1times slightly higher chances of the women dying of maternal mortality as compared to the women on the Lusaka province. Western province 1.0times chances of women being subjected to maternal mortality same as the women in the reference category.

4.4.8.4 Residence and maternal mortality

The variable residence of 2001/2 has the p-value less than 0.05 this therefore entails that it is statistically significant and that it is yet another factor that contributes to maternal mortality. Taking odds ratio into consideration, the rural areas with 1.5, gives a confirmation that women are most likely to die while pregnant, during delivery or after childbirth in association with the women in the urban areas.

On the other hand, the 2007 dataset has the similar scenario on the variable of the type of place of residence that it is statistically significant with the p-value less than 0.05.This means that it has influential ability on maternal mortality. This also displays 0.747 odds ratio which gives an impression that the women in rural areas are more likely to experience maternal mortality than the women in the urban areas.

4.4.8.5 Marital status and maternal mortality

This variable has the p-value of 0.000 which is less than 0.05. This shows that the variable is statistically significant such that it has a bearing on maternal mortality. The detail interpretation suggests that the never married women have 2.7times higher chances of experiencing maternal mortality than those who are married. To those that are living together, they have 0.630times less chances of women dying of maternal mortality as compared to those that are married. The widowed have 0.622times reduced chances of being faced with maternal mortality as compared to those that are married. The divorced on the other hand, have 0.835 equally reduced chances of experiencing maternal mortality than those that are married.

In the 2007, the never married women still have more possibilities of dying from maternal mortality and the odds ratio 2.7 attest to this as compared to the married. The living together has 1.3times higher chances of dying from pregnancy related than those

that are married. The divorced have 0.589times reduced chances of experiencing maternal mortality as compared to those that are married. The same goes with the widowed 0.851 odds ratio entails that they are less likely to experience maternal mortality than those who are married.

4.4.8.6 Religion and maternal mortality

The variable religion shows no predictive ability of maternal mortality as the statistical significance is greater than 0.05. In both 2002 and 2007 dataset the Catholics as well as the Protestants are less likely to experience maternal mortality than the category of others.

4.4.8.7 Education and maternal mortality

This variable equally has the p-value less than 0.05 which shows that it is statistically significant and in this case education is another major contributing factor to maternal mortality. Giving the interpretation from the odds ratio perspective women with no education have 1.6times higher chances of experiencing maternal mortality as compared to those with higher education. Those with primary education show 1.4times higher chances of maternal mortality occurring than those with higher education. Finally, the women with secondary education have 1.4times higher chances of experiencing pregnancy related mortality as compared to the ones with higher education.

The 2007 education variable equally has the p-value less than 0.05 which shows that it is statistically significant and confirms that it is another major contributing factor ofmaternal mortality. Giving the interpretation from the odds ratio perspective, women with no education have 2times higher chances of experiencing maternal mortality as compared to those with higher education. Those with primary education show 1.6times higher chances of maternal mortality occurring than those with higher education. Finally, the women with secondary education have 1.8 odds ratio which gives them higher opportunities of experiencing maternal mortality as compared to the ones with higher education.

This segment of multivariate logistic regression examines the influence of all the independent variables on maternal mortality by the use of stepwise (forward) method until the final model is created. Additionally, the analysis uses the odds ratios, in

identifying all possible fundamental factors that in a sense explains the contribution of the other independent variables to maternal mortality (See Table 12).

In statistics, logistic regression is a type of probabilistic statistical classification model which is also used to predict a binary response from a binary predictor, used for predicting the outcome of a categorical dependent variable based on one or more predictor variables (features). In this study, it is used in estimating the parameters of a qualitative response model.

In the 2001/2 analysis, model 7 is the final model and goodness of fit test for the same model shows that the value is less than 0.05 (0.000). This means that the model is better than SPSS's original guess as shown in block 0, which assumed that women may not die of maternal mortality. From Hosmer and Lemeshow test which is the test of the model fit, bears the significant value less than 0.05 (0.035) and the indication is that the model is questionable, yet it was considered for analysis. Further, the usefulness of the model, suggests that the variability of maternal mortality as a dependent variable is explained between 5.9% and 9.6%.

Parity on its own shows some influence on maternal mortality but immediately it is controlled for it shows otherwise. This then means that it has no direct influence on maternal mortality but rather can be better explained through other variables especially age.

On the other hand, age and residence prove to be the variables that have direct influence on maternal mortality as these indicate statistical significance at 99%. Mothers from the age group 15-19years old had an intense association with higher risk of maternal mortality to an extent that they were 4.5 times more likely to die of maternal mortality than the women in the age group 45-49years. Those from the age group of 20-24years also have 3 higher chances of dying from maternal mortality than the last age group 45-49. The 25-29years age group indicates 1.8 times more probable of experiencing maternal mortality than the women in the age group 45-49years. The age group 30-34years has 1.5 and 1.3 for the 35-39 age groups more times likely to die of maternal mortality as compared to age group 45-49. The age group 40- 44years does not show the association with the high risk of maternal mortality still confirms that it has 1.2 higher chances of risk of maternal mortality than those in the age group 45-49years. The order

of the risks as observed in the model on age suggests that the younger the women the more likely they are to die of maternal mortality. This could results from many reasons that they are the most sexually active and exposure to pregnancy is high. They are as well inexperienced young mothers that can easily develop complications during labour. Literature equally supports this, that young women and women giving birth for the first time are at higher risk of obstructed labour- a major contributor to maternal deaths and its consequences such as obstetric fistula (Rush,2000).

Region as a variable shows the statistical significance and a strong association being present with maternal mortality. However, it is not true for some provinces. Eastern and Northern Province confirms an association with maternal mortality with a statistical significance at 99% each and their odds ratio 1.6 and 1.4times higher chances of experiencing maternal mortality as compared to Lusaka. The rest of the provinces do not show the significance at all. Nevertheless, the odds ratio for Central, Copper Belt and Luapula provinces 0.866, 0.944 and 0.922 respectively display reduced chances for the women to die of maternal mortality as compared to those on the Lusaka province. North-Western, Southern and Western provinces shows slightly higher risk chances of women dying of maternal mortality than Lusaka province.

Residence has a major influence on maternal mortality and indicates a steady predictive ability. The rural areas have .1.3times higher chances of the women dying of maternal mortality as compared to the women in urban areas.

Education equally has a bearing on maternal mortality such that the women with no education have more chance of dying from maternal mortality than those with higher education. This is supported by the odds ratio 1.5 at 95% statistical significance then followed by the women with primary education with 1.2time higher chances and finally the women with secondary education with 1.1times odds of experiencing maternal mortality which shows no difference at all as compared to the women with higher education. The other two variables however, marital status and religion do not show any statistical significance and we would be right to say, they have no or little influence on maternal mortality. Even though it is true for marital status that those that are in stable sexual unions are exposed to higher risk of pregnancy and such can die of maternal mortality. These variables might be indirectly influencing maternal mortality, yet not as they stand on their own and thus little can be said about them in this model.

Table 13: Multivariate Analysis: Exponetiated (B), 2001-2

VARIABLE ∨	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Parity							
0	3.344***	1.060	1.164	1.216	1.003	0.976	0.984
1-4	1.623***	0.943	0.986	1.010	1.018	0.999	1.004
5+ RC	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Age							
15-19		5.425***	5.211***	5.089***	4.303***	4.476***	4.522***
20-24		3.174***	3.078***	3.031***	2.799***	2.916***	2.956***
25-29		1.797***	1.791***	1.770***	1.714***	1.768***	1.798***
30-34		1.532***	1.521***	1.513***	1.472***	1.482***	1.511***
35-39		1.264*	1.248*	1.230	1.219	1.268*	1.284*
40-44		1.175	1.161	1.156	1.145	1.176	1.188
45-49 RC		1.000	1.000	1.000	1.000	1.000	1.000
Region							
Central			1.025***	0.861	0.862	0.855	0.866
Copper Belt			0.943	0.931	0.934	0.935	0.944
Eastern			2.023***	1.608***	1.617***	1.617***	1.605***
Luapula			1.110	0.902	0.910	0.917	0.922
Northern			1.742***	1.418***	1.412***	1.421***	1.427***
N/Western			1.445**	1.176	1.178	1.136	1.134
Southern			1.297**	1.075	1.082	1.092	1.099
Western			1.513***	1.197	1.206	1.190	1.189
Lusaka RC			1.000	1.000	1.000	1.000	1.000
Residence							
Urban RC				1.000	1.000	1.000	1.000
Rural				1.358***	1.374***	1.367***	1.334***
Marital Status							
Never Married					1.494***	1.482***	1.498***
Living Together					0.554**	0.551**	0.551**
Widowed					0.912	0.908	0.909
Divorced					0.897	0.917	0.914
Not Living Together					1.294	1.313	1.309
Married RC					1.000	1.000	1.000
Religion							
Catholic						0.907	0.909
Others						0.452	0.453
Protestant RC						1.000	1.000
Education							
No Education							1.221
Primary							1.028
Secondary							1.010
Higher RC							1.000

RC = Reference Category p < 0.01 = *** p < 0.05 = ** p < 0.1 = *

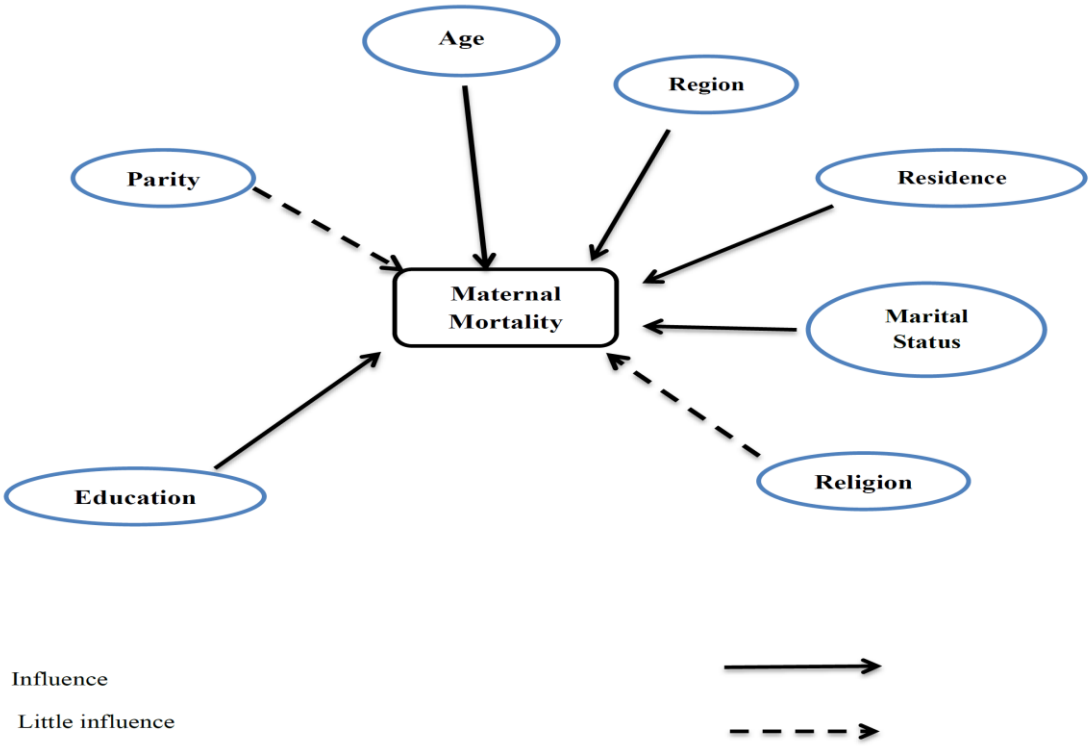


Figure 2: Presentation of Model 7 Multivariate Analysis 2002

In the 2007 analysis, the goodness of fit test shows the value less than 0.05 (0.000). This then means that the model is better than SPSS's original guess shown in block 0, which assumed that women may not die of maternal related deaths. From Hosmer and Lemeshow test, the significant value is greater than 0.05 (0.660) and the indication is that it supports the model. Coming to the usefulness of the model, the suggestion is that the variability of the maternal mortality variable is explained between 7.6% and 12.4%. The reference category denoted by (RC) considered for every variable is the last value with the odds ratio of 1.000 except for one variable the type of place of residence which has taken up the first value. And every variable has been explained in comparison to it (See Table 14).

From model 8 of the logistic regression multivariate analysis, the independent variables are explained in relation to each other as to the dependent variable- maternal mortality. There are three variables that do not portray the statistical significance; and these are parity, marital status and wealth. Then the rest of the variables are statistically significant, that is to say they can be relied upon for predicting maternal mortality.

Parity as an individual variable can be seen to have the predictive ability towards maternal mortality, yet upon pushing in another control variable the results are not the same. It can therefore, be well explained in relation to age of the mother.

Age is the variable that stands out with consistency in that it is not changed by any other variable and hence proves a major contributor of maternal mortality and influences other variables at large. From age 15-34years in that order chances of women dying from maternal mortality are higher than those of the reference category. The age group 15-19years for instance, has 4.7times higher chances of experiencing maternal mortality than those in the age group 45-49years. It is true for this group because they are young women with little or no experience and are prone to developing complications during their first pregnancy at childbirth. The age group 20-24years which has 4.2times higher chances of facing maternal mortality than the women in the age group 45-49years. This also is another group that has higher chances of dying from maternal mortality simply because there is high coital frequency for them for most of them are in unions. The 25-29 age groups are also giving almost the same picture of having 2.4times higher of women dying from maternal mortality as compared to the women aged 45-49years. The women aged 30-34years have 1.6times higher probability of dying from maternal mortality unlike those in age group 45-49years and 35-39years age group has 1.1times higher of facing maternal mortality as compared to the 45-49years age group. On the contrary, the age group 40-44years have 0 .820times less likely to die of maternal mortality as compared to the women in the age group 45-49years. This might be explaining the fact that most of the women in the age group 40-44years at this time have their fertility levels and sexual desires gone down more so, experiencing the early menopause. Besides all these, at this age the risks of developing complications during childbirth are also very high and most women in sexual unions are encouraged to go on full-time contraception. The models of proximate determinants suggest that for instance, that non-lactating, non-contraception in stable sexual unions are the most exposed to the risk of pregnancy, and that on an aggregate level, these characteristics, together with induced abortion primarily determine the total fertility rate(Bongaarts and Potter, 1983). Unfortunately, the variables are not collected in the Zambia demographic survey for women dying from maternal mortality.

The other independent variable that has a bearing on maternal mortality from the findings isthe type of place of residence which has also been consistent. The results

review that the women in the rural areas are more likely to experience maternal mortality as compared to the women in the urban areas as the odds ratio show 1.4times higher chances.

The region variable has also some influence on maternal mortality as the odds ratios indicate. To begin with, CopperBelt is statistically significant at 99% with the odds ratio 0.738 which indicates that the women in this province have less chances of experiencing maternal mortality as compared to Lusaka province. North-Western and Western provinces show that there are statistically significant at 95% with the odds ratio 1.1 suggesting that women have higher chances of experiencing maternal mortality but only at 10% than Lusaka province and 0.721 less likely to experience maternal mortality respectively. Eastern province is another province which statistically significant at 90% with the odds ratio 1.3 confirming higher chances of experiencing maternal mortality as compared to Lusaka province. The remaining provinces are not statistically significant and from the odds ratios point of view, Central, Luapula, and Southern provinces show less chance of the women experiencing pregnancy related death as compared to Lusaka province. Northern is also another province with no statistical significance, yet shows that the women have 1.1times higher chances of experiencing maternal mortality than Lusaka province.

Education as an independent variable that influences maternal mortality proves otherwise, yet it is true for the women with no education that they have 1.5times higher chances of facing maternal mortality than those with higher education. A hospital study in Port Harcourt in 1987-9 showed women with less than secondary school education experienced almost five times the maternal mortality of booked women with secondary or higher education (640 versus 130 maternal deaths per 100,000 live births respectively)(Briggs and Oruambo, 1991). Some differences may be due to underlying health status but it is also likely that the ability to pay for health services and staff attitudes play an important role (Campbell *et al*., 1991; Harrison *et al*., 1991). Similar situation comes with marital status where the never married have 1.5times higher odds of experiencing maternal mortality than the women with the status not living together.

The wealth variable was only used in the 2007 dataset and not in the 2001/2.Thoughit does not show any statistical significance, it gives the picture thatthe poorest have 1.4times higher chances of dying from maternal mortality than the richest. The poorer

have 1.3times higher probability of them dying from maternal mortality than the richest. The medium also have 1.4times higher chances of women dying of maternal related deaths as compared to the richest. The richer at 10% higher chances of experiencing pregnancy related than the richest.

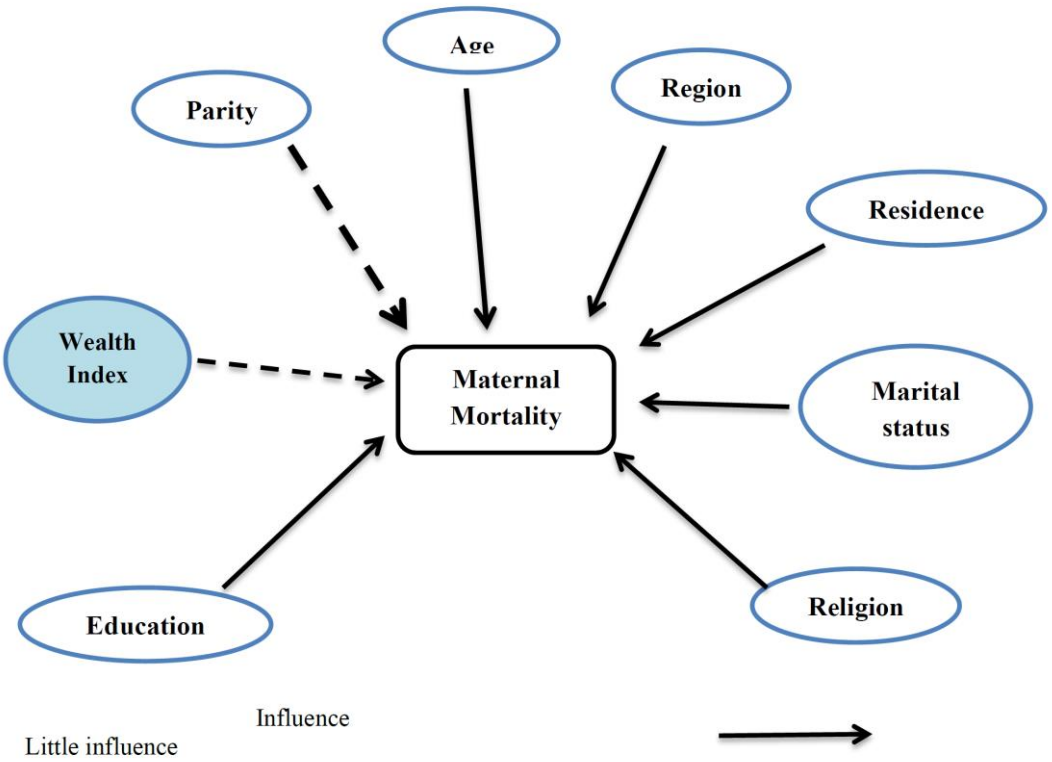


Figure 3: Presentation of Model 7 Multivariate Analysis 2007

Table 14: Multivariate Analysis: Exponetiated (B), 2007

VARIABLE ∨	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Parity								
0	3.574***	0.944	1.066	1.155	0.984	0.977	1.001	1.003
1-4	1.680***	0.792***	0.845**	0.881	0.880	0.893	0.911	0.914
5+	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Age								
15-19		5.904***	5.624***	5.430***	4.732***	4.740***	4.695***	4.667***
20-24		4.885***	4.692***	4.573***	4.352***	4.267***	4.271***	4.245***
25-29		2.648***	2.592***	2.537***	2.476***	2.414***	2.438***	2.428***
30-34		1.710***	1.698***	1.670***	1.657***	1.611***	1.620***	1.616***
35-39		1.166	1.142	1.128	1.122	1.087	1.105	1.103
40-44		0.847	0.844	0.837	0.839	0.821	0.823	0.820
45-49 RC		1.000	1.000	1.000	1.000	1.000	1.000	1.000
Region								
Central			1.083	0.881	0.881	0.880	0.881	0.866
Copper Belt			0.756***	0.751***	0.750***	0.737***	0.741***	0.738***
Eastern			1.788***	1.362**	1.362**	1.376**	1.336**	1.311*
Luapula			1.119	0.872	0.871	0.869	0.864	0.837
Northern			1.483***	1.173	1.177	1.182	1.165	1.135
N/Western			1.541**	1.213	1.211	1.162	1.140	1.107**
Southern			1.124	0.903	0.896	0.869	0.871	0.860
Western			1.100	0.838	0.815	0.765*	0.741*	0.721**
Lusaka RC			1.000	1.000	1.000	1.000	1.000	1.000
Residence								
Urban RC				1.000	1.000	1.000	1.000	1.000
Rural				1.452***	1.480***	1.490***	1.441***	1.350**
Marital Status								
Never Married					1.382**	1.403**	1.427**	1.434***
Living Together					1.363	1.652	1.644	1.644
Widowed					0.990	1.016	1.018	1.019
Divorced					0.984	0.997	0.990	0.990
Not living together					0.947	0.948	0.939	0.938
Married RC					1.000	1.000	1.000	1.000
Religion								
Catholic						0.844**	0.846**	0.846**
Other						0.938	0.956	0.945
Protestant RC						1.000	1.000	1.000
Education								
No Education							1.488**	1.463**
Primary							1.122	1.107
Secondary							1.117	1.115
Higher RC							1.000	1.000
Wealth Index								
Poor								1.100
Medium								1.123
Rich								1.012

RC = Reference Category $p < 0.01$ = *** $p < 0.05$ = ** $p < 0.1$ =*

CHAPTER FIVE: DISCUSSIONS AND CONCLUSIONS

5.1 Introduction

This study was premised on answering four research questions which are

i. What possiblesocio- demographic determinants that have been used in the 2002 and 2007 surveys to determine maternal mortality?
ii. What socio- demographic variables were consistently used in the 2002 and 2007 surveys?
iii. Looking at the socio- demographic determinants from the 2002 and 2007 surveys, where there any differences in terms of impacts on maternal mortality?
iv. What is the ideal framework that could be used in profiling determinants of maternal mortality?

Below are the answers to the four research questions:

5.2 Profile of maternal mortality

Maternal mortality in Zambia has been on the higher side and all the efforts done to reduce the rate of maternal deaths have only resulted into making insufficient progress. Comparing the two surveys 2001-2 and 2007, it is clear that there has not been significant reduction in maternal mortality. It is however clear thatmaternal mortalityhad reduced in 2007 by a marginal number of 0.9% to be precise. The contributing factors being that the sample sizes were different and so were the populations.

5.3 Determinants of maternal mortality

In the model,age, region and residence are the notable determinants of maternal mortality.Maternal mortality among women of all age groups apart from 40-44years from the 2007 dataset experienced a significant reduction. On the other hand, the highest proportion of maternal mortality was consistently recorded amongst young women during the two different studies conducted in 2001-2 and 2007. The contributing factors

to explain the higher proportions of the deaths amidst the women aged 15-19years could be multiple.

However, one of them that hold to this fact is that this group of young women are physiologically immature to handle pressure during labour and as such can easily develop complications that could in the process claim a life. As Rush (2000) observes, young women and women giving birth for the first time are at higher risk of obstructed labour –a major contributor to maternal death and its consequences such as obstertricfistula. The trend in the age groups for the two datasets is actually the same. Unsafe abortions are also common among young women because they are not only unprepared but also afraid of handling the whole process and just feel it is a burden to be a mother because they are not ready.

The age groups 20-24 and 25-29years, still indicate higher chances of experiencing maternal mortality, the reason could be that, these women are in stable sexual unions and are highly exposed to coital frequency which also gives them higher chances of becoming pregnant.Bonggarts and Potter, (1983) in support also say that, the models of proximate determinants suggest that for instance, non-lactating, non- contraception in stable sexual unions are the most exposed to the risk of pregnancy, and that on the aggregate level, these characteristics, together with induced abortion primarily determine the total fertility rate. The decline noted among the women aged 40-44years especially in 2007 could have been enhanced by the education that it is safer for women to have children before 35years than after 35years of age. And most women in stable sexual unions opt to go on extensive contraception use after the age of 35years.

The other picture we get out of marital status is that the never married women in 2002 are at 50% and 2007 at 43% higher risk of experience maternal mortality than the married women. This still point to the majority same group with reference to age that are young adolescents and are involved in pre-marital fertility and having their first births.

It is interesting however that Eastern and Northern were the only provinces with the worst profile in terms of maternal mortality in the 2002 survey whereas in 2007 the number of provinces increased to four; Eastern, Copper belt, North-Western and Western provinces. Of the four provinces of 2007, eastern still shows the highest chances of women dying of maternal mortality than Lusaka province which is the reference category. The other three though they are statistically significant they are less likely to

experience maternal mortalitythan Lusaka province. This does not show improvement in terms of reducing maternal mortality. In the previous survey, Lusaka had less chance of women dying from maternal mortality as compared to the 2007 survey which shows that for the same province the opposite is true. Demographic characteristics even migration and fertility could have played some major role in changing the face of maternal mortality in Lusaka during the 2007 survey. The population did not for sure remain the same in 2007 as in 2002 but increased and that in it can account for increased maternal mortality in Lusaka.

Coming to the type of place of residence it shows that in 2002 the risk of women dying from maternal mortality was at 33% and in 2007 it went up to 35% in rural areas than in the urban areas. We can therefore hypothesise the lag in improvement that whatever intervention or strategies put in place after the 2002 survey did not yield good fruits at all. This also confirms why Eastern province still remains the province with higher risks of women dying of maternal mortality because it is a rural province. It could be that little attention was paid to rural areas if at all intervention were considered.

In terms of education, though in 2002 it had little bearing on maternal mortality in terms of statistical significance yet; in 2007 the picture changed. The women with no education had 46% higher chances of dying from maternal mortality than the highly educated. Then the women with primary and secondary education follow respectively. While this picture may be true for Zambia that women with higher education have reduced chances of dying from maternal mortality than those with lower education Some good lesson can be learnt from Zaria, Nigeria between 1976-9, women with lower educational levels had better survival chances than more highly educated women (110 versus 250 maternal deaths per 100,000 live births respectively) (Harrison, 1985).

The results of the study provide numerous lessons worth highlighting. Zambia has been tirelessly working towards improving maternal health and reducing maternal mortality by ensuring that good health services are provided to every citizen and most of all mothers. There has been provision of mobile hospitals to ensure that even the one in the remotest area receive the health care they deserved. Nevertheless, according to WHO (2012) ‘Zambia has made insufficient progress towards improving maternal health’. The 0.9% difference affirms a no change scenario. This therefore, means the country still has a long way to go in meeting the MDG 5 and should continue working even harder to

improving maternal health and reduce mortality in Zambia. The evidence shows further that maternal deaths are not uniformly distributed throughout the country and the risk is highest by far in Eastern province.

The evidence further demonstrates that the benefits at the turn of this century, where Zambia had endorsed the Millennium Declaration and especially [MDG] 5 which is to "improve maternal health" (Sachs and McArthur, 2005) are far from being met. Since maternal death was, however, chosen as the outcome with which to judge progress towards this goal, thus bringing renewed attention to what is a 21st century problem essentially only for the poor, and one virtually eliminated for people with the means and status to access healthcare, the three demographic determinants age , region and residence remain critical. Such a marker of inequity in Zambia and its persistency are shocking and an indication of wider development issues that are not being targeted.

The Millennium Declaration is, however, the first time that maternal mortalityhave featured so prominently in the high ranks of a global pronouncement, providing an opportunity to galvanisation which seems to be a slow pace and which action is not helping to ensure that the risk of maternal death is minimised for all women in Zambia. Though such action is informed in the demographic health survey by an understanding of who is dying, when, where, and not why, it appears that the surveys are merely taken to be academic exercises.

Following analyses of the data sets from the two surveys, there has been no attempt to present other key determinantsof maternal mortality, the interactions with biological, socio-economic, cultural and contextual (including health systems) factors as observed by Adefuye and others (2003) and Jain*et al*., (2004). A review of over 60 studies of the determinants of maternal ill-health shows that the most commonly-stated 'causes' are pathogenic causes, such as anaemia, tuberculosis, HIV co infection, haemorrhage and sepsis. These, together with investigations of age and parity as biomedical risk factors concentrating health risks among very young and very old women and nulliparous and grand multiparous women, far outnumber studies investigating other tiers of determinants.

This study like others, has established that age is another important determinant which influences both fecundability, the likelihood of exposure to intercourse unwanted

pregnancy and mortality. The implications of these proximate determinants of pregnancy for maternal health have been illustrated by Graham and Airey (1987), who among others, show that in many settings the majority of maternal deaths come from the mid-reproductive ages where the most women are giving birth, despite the youngest and oldest women having the highest age-specific risks per pregnancy. Although not yet demonstrated empirically, the same relationships are likely to hold for age and maternal morbidity (Ehlers, 2004; Haye, 1987).

The meagre reduction of maternal mortality reported in 2007 was only the starting point of putting up more interventions that would eventually bring about improvement of maternal health in Zambia and reduce maternal mortality. Some determinants of maternal mortality used in the two data sets did not show any significance and hence, were not worthwhile to report on. However, the determinants used in both datasets have a uniform pattern to be precise age, education, marital status and parity. For such, for example WHO 2012 still gives the precise statistic that in every 37 deaths that occurs, 1 woman dies of a pregnancy related death in Zambia even today.

These results call for an ideal framework that could be used in profiling determinants of maternal mortality. First and foremost, an important element which this study did not examine is the understanding of other determinants of morbidity and mortality. Unlike this study, previous research has shown that pregnancy and the characteristics of a specific morbidity, including its severity, duration and pathogenic nature like malaria, anaemia; HIV and Tuberculosis, as a co-infection with AIDS for instance, are frequently labelled "causes" or determinants of maternal mortality. These characteristics, their interaction with the woman and with other morbidities or risk factors for the prognosis of morbidity, and the availability, accessibility, quality and effectiveness (including compliance) of services and treatments are grouped as determinants of death (WHO, 1977; Shulman, 1999; Bicego*et al*., 2002; Okoko and Ota, 2003; WHO, 2005). This is not what the ZDHS considers.

5.4 Limitations and Strengths of the Study

Like many other areas of international public health, substantial constraints exist on the availability and quality of information to confidently describe the problem, and interpretation of the evidence must be informed by awareness of these constraints. For

maternal mortality, some of these limitations seem overwhelming and to dwell on them can rapidly give the false impression that nothing is known.

This ws a retrospective study and as such, such studies tend to have under-coverage errors (omission of deaths) and misreporting of deaths and may not cover all eligible respondents. It is highly possible to omit eligible respondents (15-49) because some eligible women are missing at home or just refuse to be interviewed. The fact that the demographic health surveys are only proxy studies, where respondents are relative to those who died, recall and inaccuracies abound. Age is another factor that can be misreported of eligible women due to age heaping as a result of digit preferences especially digits 0, 2 and 5. In other cases, the respondents may not know their exact ages themselves and what more those who died?

The demographic health survey has demonstrated some shortfalls and as such, a mixed methods approach should be encouraged, seizing all opportunities to gather fit-for-purpose data, such as decennial censuses (Stanton et al., 2001; Hill et al., 2006).

5.5 Conclusions of the Study

To conclude, the research has provided credible information on social demographic determinants that have been used in the two surveys to determine maternal mortality include parity, age, region, residence, marital status, religion, education and wealth. All variables except wealth were used consistently used in the two surveys. In terms of impacts, there are differences in terms of impacts on maternal mortality. There were fewer deaths in 2002 for instance in rural areas then increased in 2007 which in normal circumstances a reduction should have occurred. Education gives the picture that in 2002 it had little influence while in 2007 about 46% maternal mortality were experienced. The region indicates that two provinces in 2002 had influence on maternal mortality whereas in 2007 it was four provinces. The ideal framework that could be used in profiling determinants of maternal mortality should include biomedical risk factors, macro-social determinants, maternal related deaths and pregnancy determinants.

It has emerged that social demographic determinants that have been used in the two surveys are unlikely to predict maternal mortalityamongwomen in Zambia. The researchers involved in the ZDHSshould ensure thatbiomedical risk factors, macro-social

determinants, maternal related deaths and pregnancy determinants are all included in providing a holistic picture of interactants of maternal mortality among women in Zambia.

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