LEVELS, TRENDS AND HOUSEHOLD DETERMINANTS OF STILLBIRTHS AND MISCARRIAGES IN SOUTH AFRICA (2010-2014)

A research report submitted to the Faculties of Health Sciences and Humanities, Schools of Public Health and Social Sciences, University of Witwatersrand, Johannesburg in partial fulfilment of the requirements for the degree of Master of Arts in the field of Demography and Population Studies

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OCTOBER, 2017

DECLARATION

I, Faith Nfii, N. hereby affirm that this research report is my personal own work. All materials used in this study have been carefully according to the recommended referencing style; American Psychological Association (APA). It is being submitted to the Faculty of Humanities and Health sciences, School of Public Health and Social Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the Master of Arts degree in Demography and Population Studies. I hereby declare that this report has not been submitted previously, in part or in full, for any other degree or examination in this or any other university.

F.N. NFII

……. (Signature)

25th …….. Day of October……. 2017……

DEDICATION

This paper is dedicated to the Almighty God, my late Sister and Dad: Late. Mrs Roselyn Barivule Nfii-Lamba and Late Mr Innocent Lucky Nfii.

ACKNOWLEDGEMENTS

I am most grateful to God Almighty for the grace to conduct and conclude this study in spite of all the hurdles. To the Department of Demography and Population studies, Wits University, I owe a debt of gratitude for giving me the platform upon which I have developed as a scholar in the field of population and health research. I am most indebted to my wonderful supervisor, Dr Nicole De Wet for her support, guidance and mentorship throughout this process. I am also grateful to Professor Clifford Odimegwu for all his fatherly support throughout the process of my Master's degree. I also wish to thank my lecturers and mentors at the department, late Dr Jeremy Gumbo, Dr Vesper Chisumpa, Dr Sibusiso Mkwananzi, and Dr Joshua, Akinyemi. I also wish to specially thank my mentors and colleagues at the United Nations Population Fund, Eastern and South Regional Office (UNFPA ESARO), Dr Julitta Onabanjo, Dr Akinyele Eric Dairo, Professor Reginald Chima, Dr Richmond Tiemoko, Dr Fredrick Okwayo, Kizito Nsanzya, Ruth Chirimuta, Dr Renata Tallarico, Sipho Guvi, Mark, Nora, and Campbell. Your support during this process was immensely vital in accomplishing this task.

Finally, I wish to thank my family and friends for all their support, especially Mr Innocent Nfii, Mrs Mercy Nfii, Mr Dominic Nfii, Very Rev Fr Joseph Kabari (PhD), Rev Fr Francis Tete, Kingsley Orievulu, Ekeminiabasi Eyita, Martin Osasuyi, Braimoh Bello, Seyi Somefun and Patricia Muaka. May God continue to bless and sustain you all. Amen.

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ARV - Antiretroviral

ANC - Antenatal care

CARMMA - Campaign on accelerated reduction of maternal and child mortality in Africa

GBV - Gender-based violence

HIV - Human immuno-deficiency virus

MDGs - Millennium development goals

NPAC - National plan of action for children

NGO - Non-governmental organization

QLFS - Quarterly labour force survey

SBR - Stillbirth rate

SAGHS - South African general household survey

SDGs - Sustainable development goals

STATS SA - Statistics South Africa

TBAs - Traditional birth attendants

WHO - World health organization

ABSTRACT

Background: Various international and national commitments and interventions that focus on improving maternal, newborn and child health have been established in South Africa. Irrespective of these efforts, adverse pregnancy outcomes (stillbirths and miscarriages) remain invisible within policies and programmes intended to reduce this public health burden thus leading to its high rate in South Africa. This mismatch of burden to action is due to several factors that keep stillbirths and miscarriages hidden, notably underreporting which leads to a lack of data and a lack of consensus on priority interventions and, social taboos that reduce the visibility of stillbirths and the associated family morning. While studies have identified a number of individual demographic and socioeconomic factors associated with stillbirths and miscarriages, the role of household socioeconomic factors remain unexplored. Poor socioeconomic conditions within a household have broadly been linked with poor health and negative birth outcome among pregnant women. This study therefore sought to identify demographic and household socioeconomic associated with stillbirths and miscarriages in South Africa.

Methods: This study utilized secondary data from the 2010 – 2014 South African General Household Survey (SAGHS). The study sample comprises of women of reproductive age 15-49 years who were resident in the households selected to participate in the SAGHS. A sample of 248,057 women were included in the study; these are women who reported to have been pregnant in the last 12 months preceding the survey from 2010-2014. The population of interest in this study are South African women whose pregnancy has ended in a stillbirth and or a miscarriage. The outcome variable was pregnancy outcomes (stillbirths, miscarriages and others) while predictor variables include household wealth status, maternal age, source of drinking water, type of toilet facility, sex of household head, province of residence, household electricity, population group and HIV status. Data analysis was done in three

stages. First, univariate analysis was done to provide descriptive results of the study population. The second staged involved a bivariate analysis producing odds ratios to examine the association between each predictor variable with each pregnancy outcome. The third stage included an unadjusted (bivariate) and adjusted (multivariate) multinomial logistic regression producing relative risk ratios (RRRs) to examine the demographic and household socioeconomic determinants of stillbirths and miscarriages.

Results: The levels of stillbirths were 0.17% and 0.37% in 2013 compared to 0.11% and 0.12% respectively. The stillbirth rate (SBR) from 2010-2014 was 25.7 per 1000 births while miscarriage rate was 24.5 per 1000 pregnancies. Results from the multinomial logistic regression showed that maternal age, race, sex of household head, province of residence, source of drinking water, type of toilet facility, geographic type, household wealth index, hypertension and HIV positive status are significant determinants of stillbirths and miscarriages among women in South Africa. Advanced maternal age (34-39 and 40-44 years), rural residence, being Black, use of other type of toilet facilities, poor wealth quintile, Northern Cape province, being 000HIV positive and drinking piped water are associated with an increased risk of stillbirths and miscarriages.

Conclusion: This study found that demographic and household socioeconomic factors are associated with pregnancy outcomes (stillbirths and miscarriages) among women aged 15-49 years in South Africa. This study has demonstrated the fact that household socioeconomic factors are important in understanding the determinants of stillbirths and miscarriages. Thus, the outcomes of pregnancy are not separable from the socioeconomic conditions of the pregnant women within a household as maternal poverty can translate to poor foetal health. Interventions on maternal, newborn and child health should also be more targeted at these pregnancy outcomes as stand-alone health indicators to address the dearth of data and to ensure proper monitoring. Furthermore, women in remote areas who do not have access to

electricity, toilet facilities and other important assets in their household should be prioritized by programs on poverty alleviation. Lastly, it is crucial that quality obstetric care services should be made available, accessible and affordable for women in remote areas. This may improve the outcomes of pregnancy through early detection of pregnancy complications.

CHAPTER ONE

1.1. Introduction

This chapter provides background to the issue of stillbirths and miscarriages within South Africa drawing on a global perspective and regional – sub-Saharan Africa experience. This background provides in depth information about the trends of stillbirths and miscarriages and their implications to society and development of countries. This chapter further covers the rationale of the study, problem statement, study questions and objectives.

1.2. Background

Stillbirths and miscarriages are undoubtedly important global public health and development concerns, especially within developing countries. This necessitates improved efforts within various international, sub-regional and national platforms to undertake programmes and policy interventions to stem their rise. Although, there have been increased commitments and investments within global institutions and among countries to reduce the rates of infant mortality, stillbirths and miscarriages have continued to be under the radar and not adequately integrated within these efforts (Lawn et al., 2011). Globally, there are about 6.3 million perinatal deaths with 3.3 million of these deaths being stillbirth and 7,178 deaths per day (WHO, 2015). In addition, 98% of these stillbirths occur in sub-Saharan Africa despite efforts by the authorities and technological advancements in the health sector to reduce their levels. (WHO, 2015).

A pregnancy outcome is defined as the end-point of a pregnancy including live birth, still birth, spontaneous abortion or miscarriage and abortion by choice. Stillbirth as defined by the World Health Organization (WHO) refers to a baby born dead at 28 weeks of gestation or more, with a birthweight of ≥ 1000g, or a body length of ≥ 35cm while miscarriage is a non-induced pregnancy loss or foetal death before the 20^{th} week gestation (Frøen et al., 2011).

Drawing on these definitions, this study therefore presents an analytical focus on the determinants of these two important negative pregnancy outcomes as it pertains to South Africa.

Stillbirths and miscarriages in developing countries far outweigh those of developed countries where most pregnancies are planned, complications are few and outcomes are generally favourable for both mother and infant (Kramer, 2003). A recent review reported that in high income countries, one in every 200 pregnant women reaching 22 weeks and beyond will have a stillborn baby (Flenady et al., 2011). The United Kingdom for instance is said to have one of the highest stillbirth rates among the high-income countries – only France and Australia rank higher (Flenady et al., 2011). In fact 4,100 stillbirths were reported in the UK in 2009, a rate of 3.5 per 1000 births or 11 stillbirths daily (Flenady et al., 2011). Although some developed countries report a stillbirth rate of 3 per 1000 births, a ten-fold increase is noted in some settings in Sub-Saharan Africa and South East Asia with reported stillbirth rate of 30 per 1000 births and over (Blencowe et al., 2016; Elizabeth M. McClure et al., 2011; Elizabeth M. McClure, Saleem, Pasha, & Goldenberg, 2009a). This is evident in India where stillbirth rate was estimated as 20 per 1000 births and miscarriage 46 per 1000 pregnancies respectively (Kochar, Dandona, Kumar, & Dandona, 2014).

Sub-Saharan Africa has been identified as the geographical region with the highest incidence of stillbirths and miscarriages globally and thus contributes more than one-fourth of the global total (Lander & others, 2006). A study that examined the demographic and socio-economic determinants of stillbirths across four countries, namely Nigeria, Zambia, Uganda and Mozambique reports stillbirths rates of 41.7, 21, 26.2 and 28.4 per 1000 live births respectively (Asiki et al., 2015a; Pires, Rosa, Zangarote, & Chicumbe, 2016; Stringer et al., 2011).

With regards to reducing stillbirth and miscarriage rates in the Sub-Saharan African region, South Africa is lowly ranked due to the high miscarriage rate of 23 to 25 per 1000 births in the country (Blencowe et al., 2016). This is broadly because these issues do not seem to be prioritised as pressing public health issues when compared to infant and maternal mortality or HIV and tuberculosis in South Africa. Although the rates of stillbirths and miscarriage vary across different provinces and regions in South Africa, there is however, no consensus on the estimates, reporting systems, and thus a misclassification of these rates in the country. This misclassification of the rates possibly explains the continuous high rate of stillbirth and miscarriage in South Africa compared to other middle-income countries (Lawn, Yakoob, et al., 2009a).

Furthermore, apart from lack of consensus on estimate, incoherent reporting systems and a broad misclassification of the rates of stillbirth and miscarriages, South Africa also has several laws which govern the management of foetal remains – including those that have bearing on foetal remains in induced abortion and stillbirths. In fact, the 1996 Constitution of Republic of South Africa and the common law treat the mother and foetus as one, and this implies that the foetus has no vested rights unless it results in a live birth (du Toit-Prinsloo, Pickles, & Lombaard, 2016). This is evidenced by the fact that foetuses in South Africa are generally regarded as medical wastes, are not issued births or death certificates by law and are disposed of in medical waste bags via incineration (Hosken, n.d.). This attitude towards foetal remains and indeed the foetuses themselves go a long way to explaining the seeming lack of adequate policy and research on stillbirth and miscarriage as important public health concerns in South Africa – moreover Stillbirths and Miscarriages in the South African context are rarely spoken of as grieving parents most times do not get a chance to mourn their stillborn.

1.3. Problem Statement

Stillbirth and miscarriages, in South Africa, have largely been ignored regardless of the tremendous policy focus on maternal, new born and child health (Michalow et al., 2015). In South Africa, over 20,000 stillbirths are recorded annually and about 55 stillbirths occur daily (Blencowe et al., 2016; Michalow et al., 2015). The country is ranked 176th out of 193 countries for stillbirth numbers and 148th for stillbirth rate (Blencowe et al., 2016). An outlook on the current trends show that patterns of stillbirth in South Africa have only reported minimal reduction of 22.7 to 17.6 stillbirths per 1000 live births in the period of 2010-2014 (Stats SA, 2015). Furthermore, stillbirths accounted for 63.8% of all perinatal deaths in South Africa in 2011 and increased to 66.0% in 2013 (Stats SA, 2015). In addition, miscarriage/spontaneous abortion occurs in at least 15-20% of all pregnancies in South Africa annually (Gilani & others, 2012). The high rates of stillbirths and miscarriage thus suggest that South Africa is lagging behind in its strides towards curbing these adverse pregnancy outcomes especially as the country's laws prohibit the issuance of death certificate to the parents of the stillborn. This in itself hinders record keeping and proper reporting of these negative pregnancy outcomes.

In South Africa, there are about 25 stillborn infants per 1000 deliveries and this is truly a high stillbirth rate. It is also an issue which places enormous pressure on the government, family and society at large, economically and psychosocially. While research has quantified the biological determinants of negative outcomes of pregnancy, a neglected area of research is the level and socioeconomic determinants of negative pregnancy outcomes such as stillbirth and miscarriage in South Africa. This is especially in relation to household determinants of stillbirth and miscarriage.

1.4. Justification

The area of adverse pregnancy outcomes and perinatal/child health is well researched, but many previous studies have focused on preterm births and low birth weight (babies) thus neglecting other important adverse outcomes such as stillbirths and spontaneous abortion/miscarriage. Miscarriages and stillbirth have been reported to be the most common negative pregnancy outcomes with aggravating emotional consequences for affected individuals and families. Furthermore, stillbirths and miscarriages have been identified as important indicator of embryo-toxicity and obstetric care respectively (Dellicour et al., 2016). Therefore, as indicators of maternal morbidity (embryo-toxicity) and obstetric care, they are thus relevant end points to track the progress of reproductive health programmes and their impact on maternal health.

Stillbirths and miscarriage in South Africa are hardly accounted for as they are classified under perinatal mortality which are a combination of foetuses that are born and new-borns that die in their first week of birth (Oti & Odimegwu, 2011). In addition, without taking miscarriages and stillbirths into cognisance, maternal and reproductive health related indicators miss a significant number of unreported pregnancies that are often not seen by the health systems and are not recorded (Dellicour et al., 2016).

In South Africa, reports such as "*Saving Babies: A Perinatal Care Survey of South Africa*", "*Saving Mothers: A confidential enquiry into maternal deaths*" and "*Every death count: Saving the lives of mother, babies and children in South Africa*" (Pattinson, 2003; Lawn et al., 2006 & Pattinson, 2012) which routinely report pregnancy outcomes focus only on maternal and prenatal mortalities thus reporting nothing on miscarriage and stillbirths. Also, programmes have been put in place to reduce maternal and child mortality such as the National Strategic Plan for a Campaign on Accelerated Reduction of Maternal and child Mortality in Africa (CARMMA) established in 2009. The goal and target of CARMMA is to

accelerate implementation of evidence based intervention essential to improve maternal health and child survival and to reduce by two-third the under-five mortality rate between 1990-2015 (Republic of South Africa (RSA), 2009). The goal and target of CARMMA did not specifically touch on reducing the rates of stillbirths and miscarriages despite its high rate in the country. Furthermore, the National Plan of Action for Children in South Africa (NPAC) 2012-2017 was developed in 1996 as part of the collaborative efforts of children's right activists, the Non-Governmental Organization (NGO) sector and the UNICEF to reduce child mortality with special attention to stillbirths and neonatal mortality amongst others (RSA, 2012). Although the NPAC paid attention to reducing stillbirths and neonatal mortality in South Africa, it failed to address the issue of miscarriage which is the most common foetal death regardless of its high burden in South Africa.

Furthermore, previous studies have mainly focused on biological factors associated with stillbirths and miscarriages such as maternal obesity, hypertension, diabetes, HIV status amongst other and thus overlooked socioeconomic and demographic factors associated with stillbirths and miscarriages (Aune, Saugstad, Henriksen, & Tonstad, 2014; Duong, Davis, & Falhammar, 2015; Wedi et al., 2016a). Motivated by this knowledge and policy gap, this study will therefore take a different approach by investigating the socioeconomic, demographic as well as biological factors associated with stillbirths and miscarriage in South Africa. This is mainly because biological factors alone cannot influence stillbirths and miscarriages without the interplay of socioeconomic factors such as education, occupation. There is evidence that the level of education and type of occupation of pregnant women influences their health behaviour as well as increase their risk of having a stillbirth and miscarriages (Ahmed and Jaakkola, 2007; Li et al., 2010). The findings of this study will provide relevant information on stillbirths and miscarriages at population level, for targeted

planning of maternal and child health services, to make pregnancy safer and to improve foetal outcomes.

1.5. Research Question

What are the levels, trends and household determinants of stillbirths and miscarriages in South Africa (2010-2014)?

Sub-Questions

1. What are the levels and trends of stillbirths and miscarriages in South Africa (2010-2014)?
2. What are the demographic and household socioeconomic factors associated with stillbirths and miscarriages in South Africa (2010-2014)?

1.6. Research Objective

The main objective of this study is to examine the levels, trends and household determinants of stillbirths and miscarriage in South Africa (2010-2014).

Specific Objectives

1. To examine the levels and trends of stillbirths and miscarriages in South Africa.
2. To explore the demographic and household socioeconomic factors associated with stillbirths and miscarriages in South Africa.

1.7. Definition of terms

1.7.1. Pregnancy Outcomes

This is the end point of a pregnancy which may be live birth, preterm birth or foetal loss (Still births and miscarriage).

1.7.2. Stillbirth

This refers to a birth with no sign of life at or after 28 weeks gestation (WHO, 2016)

1.7.3. Miscarriage/Spontaneous abortion

This is the premature loss of a foetus up to 23 weeks of pregnancy and weighing up to 500g (Mehta, 2013)

CHAPTER 2: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1. Introduction

The following chapter draws on previous relevant literature, providing a methodical review of the levels and trends of stillbirths and miscarriages. This chapter is divided into three sub-sections, namely: level and trends of stillbirths and miscarriages in developing countries; demographic, socioeconomic factors associated with stillbirths and miscarriages; and household characteristics of stillbirth and miscarriage. In addition, the chapter also provides the theoretical and conceptual framework that underpins this study and the hypothesis tested.

2.2. Literature review

2.2.1. Levels and Trends of Stillbirths and Miscarriages in Developing countries

Stillbirths and Miscarriages have been identified to be predominantly a developing world public health problem in the sense that most of the cases reported and documented – about 98% of the general world experience – are founded within developing (low and middle-income) countries (Lawn et al., 2011). Across the developing world, two regions – sub-Saharan Africa and South East Asia – account for the highest number of stillbirths and miscarriages. This is in spite of the contested nature of the definition of stillbirth as well as problems associated with data collection through record keeping, and a general dearth of data arising from inadequate reporting mechanism to assist reporting. These issues however contribute to the controversies that have ensured that proper advances have not been made at international and domestic policy and programmatic levels towards curbing stillbirth and miscarriage rates globally. An important contributor to the levels and trends of stillbirths on a global as well as regional and national scale involves the non-inclusion of stillbirth within the cohort of negative health outcomes that are measured in terms of the estimates of the burden of disease (Phillips & Millum, 2015).

Many studies on stillbirth have emphasised its prevalence within low and middle income countries with sub-Saharan Africa and South East Asia at the helm (Lawn et al., 2011; E. M. McClure, Nalubamba-Phiri, & Goldenberg, 2006; Elizabeth M. McClure et al., 2015). According to a study by Lawn and his colleagues, countries such as Nigeria (in West Africa) and Pakistan (in South East Asia) have rates as high as 41.9 and 46.1 per 1000 total births respectively in comparison to a country like Finland which posts only 2.0 per 1000 total births (Lawn et al., 2011). The study goes further to elaborate on the variation in rates of stillbirth across the regions with the highest burden and indicated the nature of the problem in countries such as Cote D'Ivoire, the Democratic Republic of Congo, Djibouti, Senegal, Somalia and Sierra Leone which, like Nigeria, also post rates that are above 30 per 1000 total births within the sub-Saharan African region (ibid).

Generally, as this 2011 study highlights, Pakistan posts one of the highest rates of stillbirth, globally and within the South East Asian regional bloc – with Nigeria as another country with very high rates with sub-Saharan Africa (Lawn et al., 2011). According to a study on the social meaning of stillbirth, Pakistan stands as the third country with the highest burden of stillbirth (Hamid, Malik, & Richard, 2014). The country is said to be less progressive in adequately tackling the issue of stillbirth. While little improvements seemed to have been made in the country based on a reduction from 46.1 per 1000 total births in 2011 to 32 per 1000 total births in 2012, there seems to remain a lack of prioritisation of stillbirth as a serious public health challenge in the country.

Similarly, in Bangladesh, factors such as intimate partner violence or domestic abuse have been found to play vital roles in the rates of miscarriage and stillbirth among women in the country. According to a study exploring the impact of Intimate Partner Violence, women in this country experience 24 per 1000 live births while over 60 percent of married women experience Intimate Partner Violence (Silverman, Gupta, Decker, Kapur, & Raj, 2007).

In sub-Saharan Africa, countries such as Nigeria, DRC, Djibouti, Sierra Leone and Somalia have the highest burden of Stillbirth. While Lawn et all (2011) noted that Nigeria had the second highest rates in 2011, the case remains that stillbirths and miscarriages remain high within Africa. A study on the determinants of perinatal mortality in Zimbabwe's district of Marondera (in the Mashonaland East Province) showed that in 2007 and 2008, that a perinatal mortality rate of 58.6 per 1000 total births and 64.6 per 1000 live births was recorded – a number beyond the provincial ratio which stood at 32 per 1000 live births. The study thus found a relationship between belonging to a religious sect, labour complications, maternal HIV status, home delivery, low birthweight and antenatal care (ANC) booking to be associated with the stillbirths (as well as neonatal mortality) cases recorded within this district (Tachiweyika et al., 2011).

In Zambia, a study designed to describe specific causes of high rates of stillbirths, neonatal death and early childhood death found that in relation to stillbirths, some of the said causes based on the study included "intrauterine infection (26%), birth asphyxia (18%)" while "factors associated with mortality were lower socio-economic status, inadequate water and sanitation facilities, home delivery and absence of trained delivery attendants (Turnbull et al., 2011)". Another study which focused on urban obstetric population in Lusaka, Zambia between 2006 and 2009 also highlighted the association of factors such as maternal age, baseline body mass, history of stillbirth, placenta disruption, maternal untreated syphilis, caesarean delivery, assisted breech delivery and extremes of neonatal birthweight with stillbirth (Stringer et al., 2011).

Stillbirths and miscarriages as negative pregnancy outcomes within sub-Saharan Africa have remained high in spite of some of minimal improvements. The studies highlighted here that present rates from Nigeria, Zambia, Zimbabwe and a number of other African countries are pointers to the immense public health challenges that Africa faces in relation to stillbirths and

miscarriages. The studies have also pointed out the nature of the factors associated with these public health challenges such as those linked to individual actions (or inactions), environmental circumstances, health and socio-economic status as well as knowledgeability (or level of education) and societal and cultural circumstances. These are some important factors considered in this thesis in relation to stillbirths and miscarriages in South Africa.

2.2.2. Demographic and Socioeconomic Characteristics of Stillbirths and Miscarriages

A discussion on the factors that determine negative pregnancy outcomes from literature involves an outlook on certain socioeconomic and demographic variables such as age, place of residence as well as wealth status, among others. Maternal age has been found to be an important factor associated with negative pregnancy outcomes which can either be maternal or foetal (Althabe et al., 2015). Miscarriage and stillbirths have been found by studies to be more associated with advanced maternal age as well as teenage mainly due to reproductive immaturity of women in their teenage and the incidence of chronic hypertension due to aging (Almeida, Almeida, & Pedreira, 2015; Asiki et al., 2015b; Laopaiboon et al., 2014).

On the other hand, studies have found such a relationship as not straight forward but complex in that contemporary childbearing women aged 35 years and over are more likely to be educated, of higher socioeconomic status and low parity in contrast to their early peers who are more likely to have a low socioeconomic status, high parity and less education (Carolan & Frankowska, 2011; Kenny et al., 2013). In addition, contemporary childbearing women being highly educated are more likely to be healthy and thus make healthy choices (Carolan & Frankowska, 2011). These factors together were found to be associated with better perinatal outcomes such as full-term birth and normal birth weight.

Employment status remains a vital factor associated with adverse pregnancy outcomes. Studies have shown that women who are employed were significantly more likely to have a

miscarriage, preterm birth and low birth weight. Working for long weekly hours during pregnancy have been implicated in compounding the risk of adverse pregnancy outcomes (Jansen et al., 2010; Kiely et al., 2011). This is opposed to the study of (Reime, Jacob, & Wenzlaff, 2009) which shows that maternal unemployment and homemaking status increases the risk of adverse pregnancy outcomes due to lifting heavy objects at home by pregnant housewives. Furthermore, studies on the relationship between maternal employment status and pregnancy outcomes found no association between maternal working status and adverse pregnancy outcomes such as low birth weight and stillbirths (Arafa, Amine, & Fattah, 2007; Khojasteh, Arbabisarjou, Boryri, Safarzadeh, & Pourkahkhaei, 2015). This implies that employment alone does not predict adverse pregnancy outcomes nor constitute a health risk and may however have a no social impact on pregnancy.

Marital status is one influence increasingly recognized as a risk factor for adverse perinatal outcomes (stillbirths and miscarriage) potentially operating through social class and stress mechanism (Auger et al., 2008). A study conducted in Malaysia on the impact of maternal marital status on birth outcomes revealed that the current state of being unmarried was found to be associated with outcomes such as preterm births and low birth weight amongst others (Zain, Low, & Othman, 2015). Furthermore, other studies have presented the prevalence of stillbirths and miscarriage among unmarried women (Auger et al., 2008; Gavin, Nurius, & Logan-Greene, 2012) providing possible explanations to the fact that some of those women become exposed to psychosocial stress and depression due to their unmarried status. These may account for the increased risk of stillbirths and miscarriage unmarried women. On the contrary, a study in Cameroon have shown that was no difference in the pregnancy outcomes between women married and unmarried women (Njim & others, 2016).

Maternal place of residence has been presented by studies to have a strong association with negative pregnancy outcomes. A study in rural India demonstrated that rural residence

significantly increased the risk of adverse pregnancy outcomes with or without the effect of sanitation (Padhi et al., 2015a). According to the findings of (Padhi et al., 2015a), the increase in the risk of negative pregnancy outcomes in relation to sanitation was largely due to food restriction and water intake to cope with sanitation challenges given the disease prevalence associated with food and water contamination (Padhi et al., 2015a). In the same vein, findings from other studies have showed that residence is associated with negative pregnancy outcomes (Agaba, Mugisha, Atuhairwe, Farjando, & Ngonzi, 2016; Garcia-Subirats, Pérez, Rodríguez-Sanz, Muñoz, & Salvador, 2012; Kent, McClure, Zaitchik, & Gohlke, 2013a). According to (Garcia-Subirats et al., 2012), the prevalence of stillbirths and miscarriages varies by mothers residence. This variability was seen as the risk of adverse pregnancy outcomes was lower among births to women residing in an urban neighbourhood with high socioeconomic status.

In addition, the findings of (Kent et al., 2013a) also demonstrated an association between rural residence and adverse perinatal outcomes thus explaining that this burden of adverse pregnancy outcome is due to high level of unintended pregnancies, increased prevalence of smoking and substance abuse which seems to be a characteristic of the Alabama rural area (Kent et al., 2013a). However, the findings by (Ko et al., 2012) which established that the rurality of maternal residence has no association with negative pregnancy outcomes is not consistent with other studies. The presence of adverse pregnancy outcomes in low socioeconomic groups may be indicative of issues with availability/access to health services and related to cultural, traditional as well as political factors which determines different types of policies and interventions in reproductive health (Garcia-Subirats et al., 2012; Ko et al., 2012).

Human Immuno-deficiency virus (HIV) has been identified as one of the risk factors for stillbirths and miscarriages (Kupka et al., 2009). A study conducted in Tanzania on the

predictors of stillbirth among HIV-infected women revealed that the risk of stillbirths among HIV infected women was about 50 per 1000 deliveries which is very high (Kupka et al., 2009). According to the findings of Kupka and others, HIV infection accounts for the high risk of stillbirths because it operates through opportunistic infections such as gonorrhoea, maternal syphilis amongst others (Kim et al., 2012). Another study conducted in the United States on the effects of viral load burden on pregnancy loss among HIV-infected women found an association between high viral load and pregnancy loss (stillbirths and miscarriages) and observed an absolute 14% increase in the stillbirth and miscarriage (Cates et al., 2015). This increased rate of stillbirths and miscarriages, according to Cates and colleague was largely due to the immunosuppressive effect of HIV infection.

In the same vein, findings from other studies have shown an association between increased risk of stillbirths and miscarriage among HIV positive mothers compared to women who tested negative (Ezechi et al., 2013; Kim et al., 2012; Rollins et al., 2007). These findings demonstrated that HIV infection accounted for about 48.3% increase in miscarriage in Nigeria due to poverty, poor health systems and malnutrition, four-fold increase in stillbirth and miscarriage due to high plasma viral load and a CD4 < 350 cells/mm3 in Zambia and 75% increase in stillbirths and miscarriage rate in South Africa respectively (Ezechi et al., 2013; Kim et al., 2012; Rollins et al., 2007). On the contrary, a systematic review and meta-analysis on the association between perinatal outcomes and maternal HIV infection found no association (Wedi et al., 2016b) In addition, Sedgh and others found no association between maternal HIV infection and pregnancy outcome (stillbirths and miscarriages) (Sedgh, Larson, Spiegelman, Msamanga, & Fawzi, 2006).

Education is another key determinant of stillbirths and miscarriages as identified in many studies. This was evidenced by the findings of Ashish and others whose study borders on the risk factors for antepartum stillbirths: a case-control study in Nepal. They found that the risk

of stillbirth was high among women with less than five years of education and women with no educational attainment (Ashish et al., 2015). A plausible explanation to this could be that women with no education or less have limited access to antenatal care as a result maternal morbidity and foetal growth is not checked (Ashish et al., 2015; Elizabeth M. McClure et al., 2009a). Furthermore other studies conducted on maternal education and stillbirths and miscarriages demonstrated an association between the level of education completed and the risk of stillbirths and miscarriage among women primary or no education compared to women wo have attained higher levels of education (Auger et al., 2008; Luque-Fernández, Lone, Gutiérrez-Garitano, & Bueno-Cavanillas, 2012; Rom et al., 2012).

The role of education in understanding the burden of stillbirth and miscarriage is not very clear as it is expected that higher level of education could reduce the risk of stillbirths and miscarriages (Asiki et al., 2015). This is because the highly educated expectant mothers are more informed about the use of antenatal care and are more socioeconomically advantaged. Nevertheless, levels of education cannot totally eliminate the chances of having stillbirths and miscarriages.

2.2.3. Household Characteristics of Stillbirths and Miscarriages

The studies reviewed above highlighted a number of socio-economic and demographic variables that determine negative pregnancy outcomes. This included variables such as maternal age, place of residence as well as wealth status, among others. These variables however speak to the individual and how such individual variables play important roles in determining stillbirths and miscarriages. However, as the studies reviewed in the previous section on the levels and trends of stillbirths and miscarriages in developing countries show, the factors that come to play are multiple and divergent in many cases. In fact a study on stillbirth by Lawn and colleagues in 2009 identified some of the widely highlighted conditions or risk (as well as contextual) factors linked to stillbirth as follows: maternal age at

pregnancy or birth spacing practices; maternal nutritional status before pregnancy; maternal medical condition during pregnancy; exposure to harmful substances; socioeconomic disadvantage; and access to care, with special focus on obstetric care (Lawn, Yakoob, et al., 2009b).

It should be said that while many of these factors are individual factors, there are a number of them that are also household factors that impact on stillbirths and miscarriages among pregnant women (14-35years). Some of the household variables in this light include: sex of the household head, source of drinking water, toilet facility, household wealth index, ownership of radio, television and means of communication, level of education of the household head, and the household socio-economic status.

Many studies that focus on stillbirths and miscarriage draw on the possible role of individual demographic and socio-economic variables. However there has been little attention on household variables – such as sex of the household head, toilet facilities, sources of drinking water, amongst others – and their impacts on stillbirths and miscarriages. These are important variables to consider, because, for example, when the household head is male various possibilities abound including violence and abuse. A woman in a physically abusive home faces the prospects of losing her unborn child either through miscarriage or stillbirth and she may also lose her own life as a result. The source of drinking water and type of toilet facility available are also important variables that play potentially important roles in determining negative pregnancy outcomes. The same can be said of the family socio-economic status.

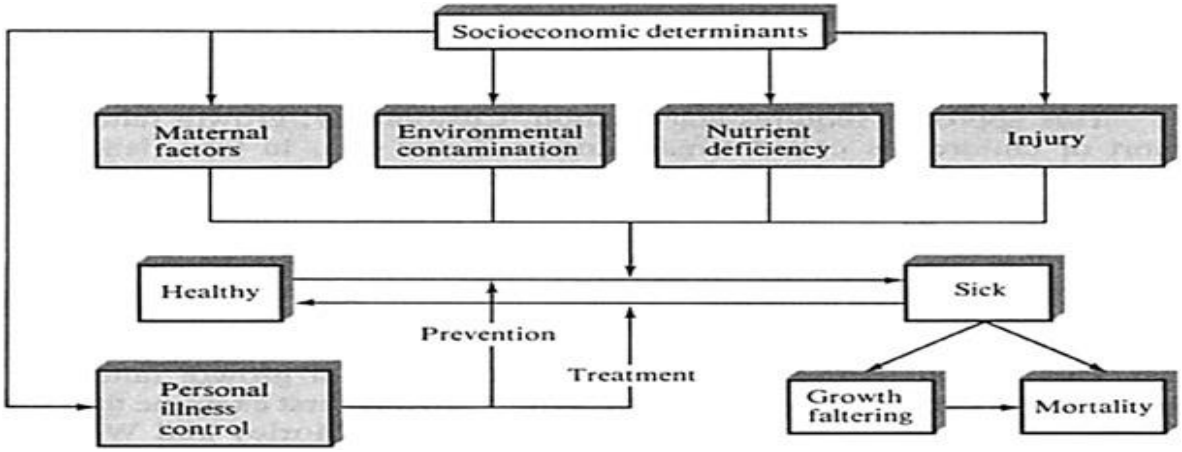
2.3. Theoretical and Conceptual framework

2.3.1. Theoretical Framework

This study draws on the Mosley and Chen framework of 1984 – a proposed analytical framework for studying the determinants of child survival in developing countries. This framework is particularly relevant for this study since it postulates that "all social and economic determinants of child mortality necessarily operate through a common set of biological mechanisms, or proximate determinants, to exert an impact on mortality" (Mosley & Chen, 1984). These proximate determinants as stated by Mosley and Chen are grouped into five categories such as maternal factors, environmental contamination, nutrient deficiency, injury and personal illness control. Maternal factors comprise of age, parity and birth interval while air, food/water/fingers, skin/soil/inanimate objects as well as insect vectors make up environmental factors.

In addition, nutrient deficiency factors considered are calories, protein and micronutrients (vitamins and minerals) while accidental and intentional injury as well as personal preventive measures and medical treatment constitute injury and personal illness control factors. Each of the identified maternal factors has been shown to wield an independent impact on pregnancy outcome and infant survival through its effects on maternal health. Considering the environmental factors, the four main routes through which infectious organisms are transmitted to the human host are air, food, water and fingers. Mosley and Chen highlighted these routes as the principal media for the spread of diarrhoea and other intestinal disease, skin infection and parasitic/viral diseases. Other proximate determinants such as Injury, Nutrient deficiency and Personal illness control have also been implicated for exerting an influence on pregnancy outcomes and infant survival through physical injury, lack of proteins, calories and macronutrients and medical treatment. The original framework is shown below.

Figure 2. 1: Mosley and Chen Framework for analysing determinants of child survival



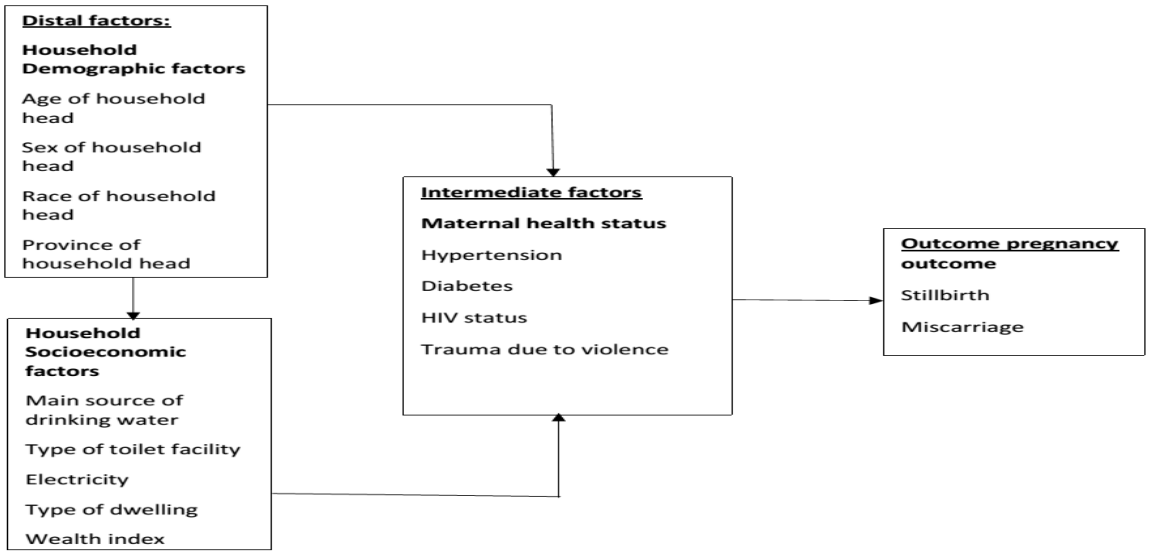
Framework for analysing the determinants of child survival (Mosley and Chen, 1984)

2.3.2. Conceptual framework

While Mosley and Chen framework for analysing the determinants of child survival considered a list of proximate determinants that exert direct influence on pregnancy outcomes and child survival, an unexplained set of determinants are the household characteristics. This study therefore adapts the Mosley and Chen (1984) framework to examine the association between Household socioeconomic, demographic, biological factors and Stillbirths and miscarriages in South Africa. Also, the outcome in this framework was modified to "Pregnancy outcomes" whose categories are stillbirths and miscarriage as opposed to "Child survival" in the original framework. From the categories of determinants stated in the original framework, this study operationalized only the distal (socioeconomic and demographic) factors and maternal factors (health status). Again, since the outcome of this study is foetal mortality (Stillbirths and miscarriages), the child's bio-demographic factors were not investigated and included in the conceptual framework. This modified conceptual framework demonstrates how the household demographic and socioeconomic factors are associated with pregnancy outcomes (stillbirths and miscarriages) through maternal factors which were regarded in this study as indicators. The household demographic and

socioeconomic factors which include Sex of household head, Main source of drinking water amongst other operates through the maternal factors (HIV positive status, diabetes, trauma due to violence and hypertension) to impact on stillbirths and miscarriages. While these factors were not identified by Mosley and Chen in their original framework, this study understands the need for the inclusion of these variables. This is because of the exiting high burden of HIV and high prevalence of Gender-Based Violence (GBV) in the South African context. This study thus assumes that the inclusion of these variables in examining stillbirths and miscarriages will provide a great deal of insight into how the household factors interact in explaining these outcomes in the country. The conceptual framework is shown below.

Figure 2. 2: Conceptual Framework



This is adapted from the Framework for analysing the determinants of child survival (Mosley and Chen, 1984).

CHAPTER 3: METHODOLOGY

3.1. Introduction

This chapter discusses the methodology applied to the current study which focuses on the levels, trends, and Household determinants of stillbirths and miscarriages among South African women aged 15-49 years old. This chapter includes a description of the variables, the study design, study hypothesis, ethical considerations, data management as well as the data analysis plan.

3.2. Data source

This study utilizes secondary data drawn from the South African General Household Survey (SAGHS) from 2010 to 2014. The SAGHS is a household survey that has been implemented yearly by Statistics South Africa (STATS SA) since 2002. This survey was established to address a need acknowledged by the Government of South Africa to identify the level of development in the country and to measure the performance of programs and projects that were implemented (Stats SA, 2012; Stats SA, 2014).

3.3. Study Design

The South African General Household Survey is cross-sectional as it collects information on the South African population at one point in time. The data was pooled together from four cross sectional surveys (2010-2014) to increase the sample size of the study. It was chosen due to the fact that it is an overall representative of the country's population. The sample design for the GHS was based on a Master Sample (MS) that was originally designed for the Quarterly Labour Force Survey (QLFS). The MS made use of a two-stage, stratified design with probability-proportional-to-size (PPS) sampling of primary sampling units (PSUs) from within strata, and systematic sampling of dwelling units (DUs) from the sampled PSUs (Stats SA, 2012). Sample thus comprises of all provinces in South Africa as the GHS covers all nine

provinces namely Gauteng, Limpopo, Mpumalanga, Eastern Cape, North West, Western Cape, Free State, Northern Cape and KwaZulu-Natal (Stats SA, 2012).

3.4. Study Population

The population of interest in this study will be South African women aged 15-49 years who reported to be pregnant during the past 12 months prior to the survey and have had a negative pregnancy outcome.

3.5. Sample size

The study sample comprises of women of reproductive age 15-49 years who were resident in the households selected to participate in the SAGHS. A sample of 248,057 women was included in the study; these are women who reported to have been pregnant in the last 12 months preceding the survey from the appended dataset (2010-2014).

3.6. Study variables

3.6.1. Dependent Variable

The outcome variable used in this study was coined through the use of two specific questions on the SAGHS questionnaire: In order to identify women who were pregnant within the survey the question "Has any female member of the household been pregnant in the last 12 months" is asked, this is then responded to with either a "yes" or "no" answer. Only those who answered "yes" will be included in the study. Respondents were further asked "What is the current status of this pregnancy?", responses given included "Currently still pregnant", "The child has been born alive", "The child died in the womb or during childbirth on / after the 7th month of pregnancy (stillbirth)", "The child died in the womb or the pregnancy ended before the 7th month of pregnancy (spontaneous abortion/miscarriage)", "The pregnancy was ended by choice before the child was born (termination of pregnancy/abortion by choice)". The study will focus only on those who reported that "the

child died in the womb or during childbirth on/ after the 7th month of pregnancy (stillbirth) and "the pregnancy ended before the 7th month of pregnancy (miscarriage).

Table 3. 1: Description and definition of the dependent variable

Variable	Definition	Categorized list
Dependent variable		
Pregnancy outcome	Current pregnancy outcome	Stillbirth (1)
		Miscarriage (2)
		Other outcomes (3)

3.6.2. Independent Variables

Table 3.2 below shows a list of all the independent variables (demographic and socioeconomic) used in the study which are relevant in understanding the household determinants of stillbirths and miscarriages in South Africa.

The variables "maternal age", "race of household head" and "province of household head" are considered demographic factors. In addition, variables such as "source of drinking water", "sex of household head", "electricity", "toilet facility", "geographic type" and "household wealth index" are used as socioeconomic factors while "hypertension", "HIV positive status" and "violence" are investigated as maternal factors (health indicators). These variables serve to provide background characteristics of the women in the households included in this study. Furthermore, the selection of these variables was guided by the evidence of their association with stillbirths and miscarriages provided by relevant literature across Sub-Saharan Africa and other regions where they thrive. Although there is dearth of literature on the association between household determinants and adverse pregnancy outcomes broadly in South Africa, this study provides an avenue to demonstrate this association.

Maternal age has been implicated as one of the most crucial variable that exerts influence on demographic processes such as fertility, mortality, morbidity and migration. In this study, maternal age has been identified as a key variable in predicting stillbirths and miscarriages because most stillbirths and miscarriages occur among teenagers and women aged 35 and over (Asiki et al., 2015a). With regards to the construction of variables, "maternal age" was grouped into five-year age groups from 15-19 years to 45-49 years and refers to mother's age at birth. Other demographic variables such as Race of household head have categories such "Black", "Coloured", "White" and "Indian/Asian" while Province of household cuts across the nine provinces of South Africa.

Furthermore, type of toilet facility was categorized as "No toilet", "Flush toilet" and "Other". This variable was defined as the type of toilet facility used in a household. In the same vein, water source refers to the source of drinking water in a household and is categorized as "Piped water" and "Other". Additionally, Household wealth index was defined in this study as the economic status of the household. This variable was created using a principle component analysis (PCA) which is an asset based analysis that is used to generate socioeconomic indices of a household (Vyas & Kumaranayake, 2006). Household wealth index was further categorized as "Poor", "Middle", and "Rich" based on the number of assets owned in a household. The health indicator variables such as Hypertension, HIV positive and trauma due to violence were all categorized as "Yes", and "No".

Table 3. 2: Description and definition of the Independent variables

Variables	Definition	Categorized list
Demographic Variables		
Maternal Age	Mothers age at birth in five-year age group	15-19 (1), 20-24 (2), 25-29 (3), 30-34 (4), 35-39 (5), 40-44 (6), 45-49 (7)
Race	Population group	Black (1), Coloured (2), White (3), Indian/Asian (4)
Province of residence	Current province of residence	Western cape (1), Eastern cape (2), Northern Cape (3), Free state (4), KwaZulu-Natal (5), North west (6), Gauteng (7), Mpumalanga (8), Limpopo (9)
Household Socio-economic variables		
Sex of Household head	The biological and physiological characteristics of the household head	Male (1), Female (2)
Source of drinking water	Main source of drinking water for household	Piped water (1), Other (2)
Toilet facility	Household type of toilet facility	No toilet (1), Flush toilet (2), Other (3)
Geographic type	Household type of place of residence classification according to settlements characteristics	Urban areas (1), Rural areas (2)
Electricity	The access and use of electricity in the household	Yes (1), No (2)
Household Wealth index	The economic status of the household	Poor (1), Middle (2), Rich (3)
Health indicators		
Hypertension	Illness suffered by women	Yes (1), No (2)
HIV Positive	HIV status of women	Yes (1), No (2)
Violence	Trauma suffered by women due to violence	Yes (1), No (2)

3.7. Hypothesis

H_0: There is no association between Household socioeconomic and demographic factors and stillbirths and miscarriages among women aged 15-49 years in South Africa.

H_A: There is an association between Household socioeconomic and demographic factors and stillbirths and miscarriages among women aged 15-49 years in South Africa.

3.8. Data Management and Analysis Plan

3.8.1. Data management

The 2011-2015 General Household Survey will be downloaded from the Statistics South Africa website (statssa.gov.za.) in STATA format. STATA version 13 was used to weight, manipulate, describe and analyse the data quantitatively.

3.8.2. Analysis plan

Objective 1: To examine the levels and trends of stillbirths and miscarriages among women aged 15-49 years in South Africa.

This objective was achieved using frequency and percentage distributions which aids in understanding the levels of stillbirth and miscarriages in the country. Furthermore, the rate of stillbirth and miscarriage was calculated from 2010-2014 to understand the trend of these negative outcomes of pregnancy overtime in South Africa.

3.8.2.1. Calculation of Stillbirth and Miscarriage Rates (2010-2014)

From the data, it is evident that the sample women in this study are different for all five (5) 2010 – 2014. Thus, calculating the rates of stillbirths and miscarriages will provide a dynamic view of stillbirths and miscarriages overtime with regards to the distinct sample of women for each year. For international comparison, stillbirths and miscarriages are calculated using the formulas below;

Number of Stillbirths/All births × 1000

For 2010, Stillbirth rate is given as;

53/1768 × 1000 = 29.9 Stillbirths per 1000 births.

Number of Miscarriages/Number of pregnancies that had an outcome × 1000

For 2010, Miscarriage rate is given as;

59/2,500 × 1,000 = 23.6 Miscarriages per 1000 pregnancies

Objective 2: To explore the demographic and socioeconomic factors associated with negative pregnancy outcomes among women aged 15-49 years in South Africa.

Firstly, bivariate analysis using cross tabulations will be performed. The use of cross-tabulations will be useful in testing for associations between different demographic and socio-economic characteristics of women who reported to have had a stillbirth or miscarriage in South Africa. For the purpose of the study, a chi -square test will be performed to examine the association between individual demographic, socio-economic and biological characteristics of women and stillbirth and miscarriage. The formula for the chi square test is given below:

$X^2 = \Sigma \frac{(o-e)2}{e}$ Where;

O = Observed frequency in each category

E = Expected frequency in the corresponding category

Df =Degree of freedom (n-1) (Plackett, 1983)

Secondly, a multivariate analysis was performed by fitting a binary logistic model first to understand how stillbirths and miscarriages as separate entities relate to live births and a multinomial logistic regression to understand how stillbirths and miscarriages relate with each other. The multinomial logistic regression model is best suited for this study as the outcome variable (Pregnancy outcomes) has three mutually exclusive categories. In addition, the model was selected in order to examine the association between selected household demographic and socio-economic variables and the outcome. The formula for the multinomial logistic regression is given below:

$$\text{Log } Pr(Y=j)/(Y=j') = \beta 0 + \beta_1 Xi_1 + \beta_2 Xi_2 + \beta_3 Xi_3 + \beta_4 Xi_4 + \beta_5 Xi_5 + \beta_6 Xi_6 + \beta_7 Xi_7 + i$$

Where:

Log $Pr(Y=j)/Pr(Y=j')$ = log-odds ratio

$Pr(Y=j)$ = Probability of identified category

$Pr(Y=j')$ = Probability of reference category

β = parameters

$\beta 0$ = beta for intercept

βxi = beta for predictor variables

i = variation in the model

Level of Significance to be restricted to: *p<0.1; **p<0.05; ***p<0.01. The results for both objective one and two also include descriptive components, frequency tables and graphs.

3.9. Ethical Issues

The study uses secondary data from the General House Survey 2010-2014. Hence, no ethical issues pertaining to respondent's confidentiality and anonymity as no personal information was shared in the data set.

CHAPTER 4: RESULTS

4.1. Introduction

This chapter focuses on the findings gained in the study. The results presented here are based on the objectives of this study. For the first objective, which entails the univariate examination of all the household demographic and socio-economic characteristics, including the independent variable, percentage distributions of all the variables are presented to show an exhaustive description of the demographic background of the respondents. Also, the calculated rates of stillbirths and miscarriages were highlighted using a line graph to show the trends of the dependent variable of interest from 2010-2014 and a bar-chart to observe the levels of stillbirths and miscarriages. Furthermore, in response to the second objective of this study, bivariate analysis results from binary logistic model and a chi-squared test are shown. Lastly, findings obtained from the multivariate test using a multinomial logistic regression portray an association between household demographic and socio-economic factors and pregnancy outcomes (stillbirths and miscarriages). This was presented with a table comprising of an adjusted and unadjusted relative risk ratio.

4.2. Descriptive Results

The first Objective of this study was to examine the levels and trends of stillbirths and miscarriages in South Africa (2010-2014). Below are the results and interpretations of the results.

4.3. Univariate Results

The following section demonstrates descriptive analyses of all the independent and the dependent variable that were employed in the study. These variables are presented using a series of percentage and frequency distribution tables and discussions. In addition, the first objective was achieved by showing a Bar chart and a trend line graph highlighting the levels and trends of stillbirths and miscarriages from 2010 to 2014 in South Africa.

Figure 4. 1: Percentage distribution of Stillbirths and Miscarriages across a five (5) year period in South Africa, SAGHS 2010-2014

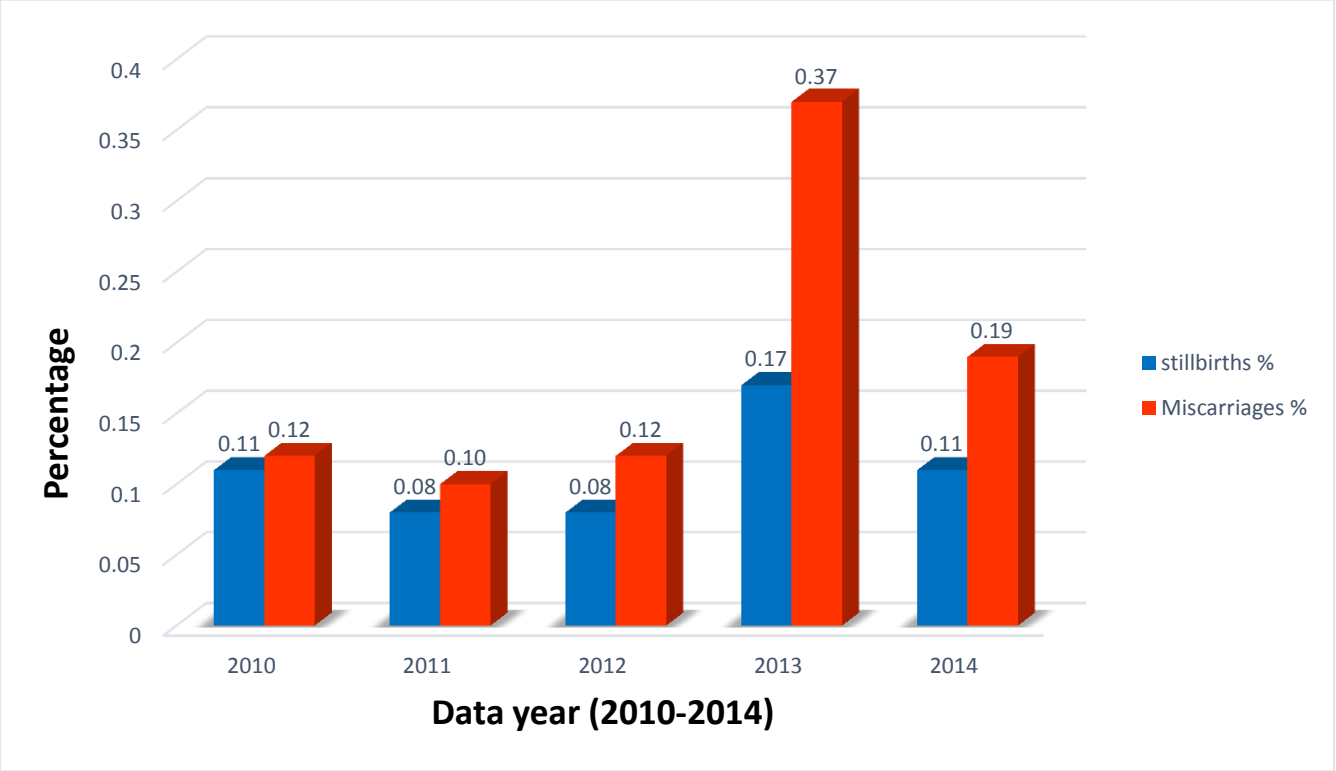
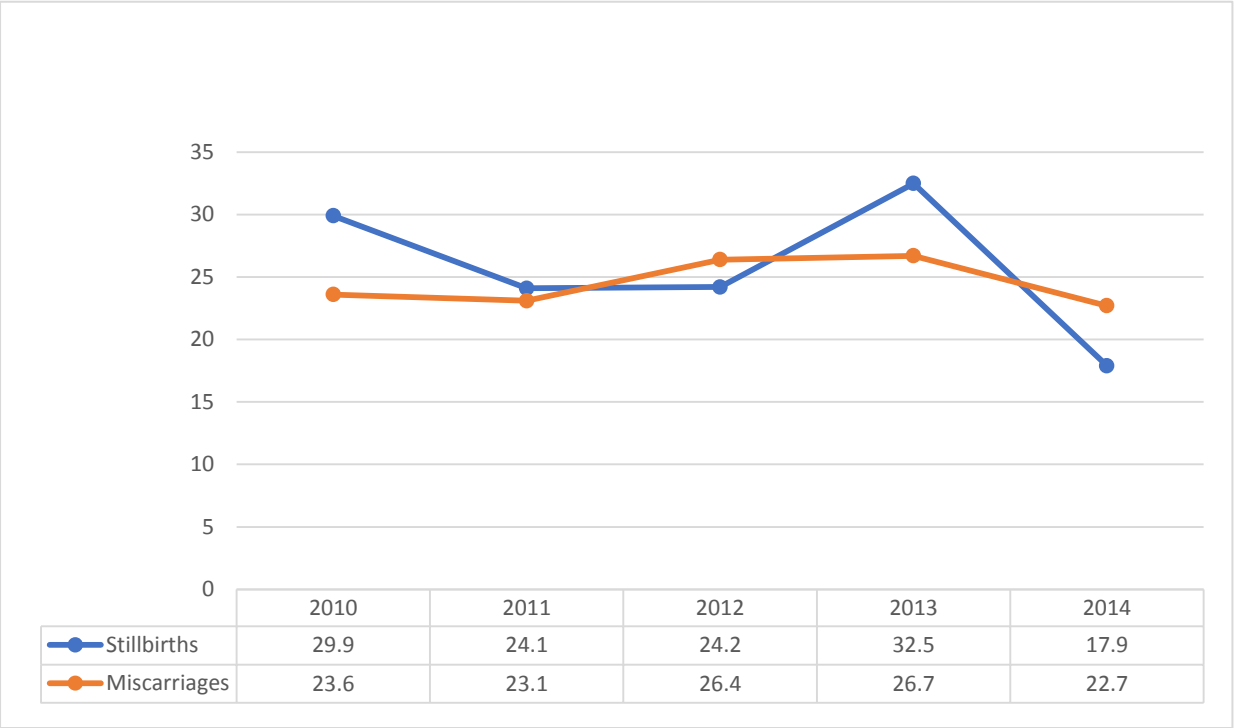


Figure 4.1 above presents the level of stillbirths and miscarriages among women aged 15-49 years in South Africa from 2010-2014. It shows that overall; levels of stillbirth and miscarriage were highest in the year 2013 and lowest in 2011. The level of stillbirths was highest in 2013 (0.17%), followed by 2010 and 2014 (0.11%) and lowest in both 2011 and 2012 (0.08%). In the same vein, miscarriage level remained within 0.10% to 0.12% from 2010-2012, with the highest level in 2013 (0.37%) although it reduced to about 0.19% in the year 2014. These results suggest that there were more foetal deaths in the year 2013 compared to other years considered for this study.

Figure 4. 2: Trends of Stillbirths and Miscarriages across a five (5) year period in South Africa, SAGHS 2010-2014



	2010	2011	2012	2013	2014
Stillbirths	29.9	24.1	24.2	32.5	17.9
Miscarriages	23.6	23.1	26.4	26.7	22.7

Figure 4.2 above illustrates the trends of stillbirths and miscarriages among women in South Africa. These results were obtained from the calculated rates of stillbirths and miscarriages using data from the SAGHS 2010-2014. Over a period of 5 years (2010-2014), Stillbirth rate was remarkably high in 2010 and 2013 (29.9 and 32.5 per 1000 births) respectively. In 2014, there was a significant decrease of stillbirth rates to 17.9 per 1000 births which thus indicates a 40.1% decrease compared to the rate in 2010. Furthermore, an outlook on the trends of miscarriage rate shows that the phenomenon has remained high overtime. The rates of miscarriage were highest in 2013 (26.7 per 1000 pregnancies) and lowest in 2014 (22.7 per 1000 pregnancies). In addition, comparing the rates in 2010 and 2014 thus indicates a 3.8% decrease in miscarriage rates in South Africa. Regardless of the decrease seen in the rates of stillbirths and miscarriages within 2010 – 2014, the rates remain unacceptably high and therefore persist as a public health problem in the South African context.

Table 4. 1: Percentage distribution of pregnancy outcome among females aged 15-49 in South Africa, 2010-2014

CHARACTERISTICS	FREQUENCY	PERCENTAGE (%) DISTRIBUTION
Dependent Variable		
Pregnancy outcome		
Stillbirth	211	0.09
Miscarriage	281	0.11
Others	247,565	99.8
Total	**248,057**	**100**

Table 4.1 above shows the percentage distribution of pregnancy outcomes among females aged 15-49 years in South Africa. Out of the 248,057 females who reported to be pregnant 12 months preceding the surveys (2010-2014), 0.09% of females had a stillbirth, 0.11% had a miscarriage while 99.8% of females had other birth outcomes which include a live and an induced abortion. These figures may suggest that stillbirths and miscarriages are underreported in South Africa.

Table 4. 2: Percentage distribution of respondents' demographic and household socioeconomic background characteristics, South Africa 2010-2014

CHARACTERISTICS	FREQUENCY	PERCENTAGE (%) DISTRIBUTION
Independent Variables Demographic variables		
Maternal Age		
15-19	19,917	19.58
20-24	18,262	17.95
25-29	16,020	15.75
30-34	13,112	12.89
35-39	11,993	11.79
40-44	11,405	11.21
45-49	11,025	10.84
Total	**248,057**	**100**
Race		
Black	218,586	81.46
Coloured	28,198	10.51
White	5,053	1.88
Indian/Asian	16,500	6.15
Total	**248,057**	**100**

Province of residence		
Western cape	29,952	11.16
Eastern cape	32,404	12.07
Northern cape	15,905	5.92
Free state	22,462	8.37
KwaZulu-Natal	46,000	17.14
North west	22,946	8.55
Gauteng	38,323	14.28
Mpumalanga	27,271	10.16
Limpopo	33,177	12.36
Total	**248,057**	**100**
Household socio-economic variables		
Sex of Household Head		
Male	130,292	48.56
Female	138,045	51.44
Total	**248,057**	**100**
Source of drinking water		
Piped water	243,310	90.76
Other	24,785	9.24
Total	**248,057**	**100**
Type of Toilet Facility		
No toilet	10,469	3.91
Flush toilet	143,695	53.6
Other	113,927	42.5
Total	**248,057**	**100**
Geographic type		
Urban areas	124,456	57.85
Rural areas	90,682	42.15
Total	**248,057**	**100**
Electricity		
Yes	189,145	88.04
No	25,705	11.96
Total	**248,057**	**100**
Household Wealth index		
Poor	75,818	47.18
Middle	36,391	22.65
Rich	48,487	30.17
Total	**248,057**	**100**

Table 4.2 above provides the profile of the respondents by their demographic and socioeconomic characteristics. With regards to maternal age, 19% of females were aged 15-19 years at birth while 11% of them were aged 45-49 years. This implies that majority of

women in this study gave birth as teenagers compared to other age groups. Also, 81% of women in the household are black followed by women who are coloured (10%) and white women (2%). The percentages show that majority of respondents in the household enrolled for this study belongs to the black population group while the least are white. Conversely, 48% of the household in this study are headed by males while 51% are headed by females.

Furthermore, most women within a household reported to be from KwaZulu-Natal province (17%) compared to the women who are from North West and the Free State province (8%). With respect to the socioeconomic variables, 91% of household drink water from piped tap while about 9% drink water from other sources. This indicates that most households predominantly use piped water as their drinking water source compared to other sources of water. Again, 54% of households have a flush toilet facility, 43% use other types of toilet facility while 4% have no toilet in the household. This also point to the fact that majority of households in South Arica have adequate toilet facility compared to a few households that reported to have no toilet facility. Looking at geographic type, most households are situated in urban areas (58%) while only 42% are situated at rural areas. In addition, majority of the households are poor (47%), followed by rich households (30%) and households classified as middle class (23%).

Table 4. 3: Percentage distribution of health indicators among females aged 15-49 in South Africa, 2010-2014

CHARACTERISTICS	FREQUENCY	PERCENGTAGE (%) DISTRIBUTION
Health indicator variables		
Hypertension		
Yes	28,492	11.49
No	219,565	88.51
Total	**248,057**	**100**
HIV positive status		
Yes	5,465	2.2
No	242,592	97.79
Total	**248,057**	**100**
Violence suffered by women		
Yes	193	0.08
No	247,864	99.93
Total	**248,057**	**100**

Table 4.3 above shows the percentage distribution of health indicator variables among females aged 15-49 years. In terms of health indicator variables, 11% of women in a household reported to be hypertensive while 88% reported otherwise. This clearly shows that while only few women reported to be hypertensive, a good number of women in the household are not hypertensive. In the same vein, 98% of women in a household reported a negative HIV status as opposed to about 2% of women who reported to be HIV positive. This again is indicative of a high level of underreporting of HIV status which highlights the sensitive nature of HIV/AIDS and how it is perceived among women in South Africa. Again, most women reporting their HIV status in households have not been tested and thus do not know their HIV status. Another important variable is trauma due to violence. About 99% of women in the households reported not to have suffered trauma due to violence while only 0.08% indicated to have been traumatized due to violence. Violence has remained very prevalent in the South African community although the magnitude of the problem is not portrayed by the percentages here stated.

Table 4. 4: Percentage distribution of Pregnancy outcomes (Stillbirths and Miscarriages) by Household Demographic and Socioeconomic characterisation, SAGHS, 2010-2014.

Characteristics	Stillbirths		Miscarriages		Other outcomes		P-value
	N	%	N	%	N	%	
Maternal age							**0.000**
15-19	20	*11.24*	18	*7.93*	19,879	*19.62*	
20-24	52	*29.21*	41	*18.06*	18,169	*17.93*	
25-29	40	*22.47*	63	*27.75*	15,917	*15.71*	
30-34	24	*13.48*	44	*19.38*	13,044	*12.87*	
35-39	33	*18.54*	44	*19.38*	11,916	*11.76*	
40-44	6	*3.37*	13	*5.73*	11,386	*11.24*	
45-49	3	*1.69*	4	*1.76*	11,018	*10.87*	
Total	**178**	***100%***	**227**	***100%***	**101,329**	***100%***	
Race of household head							**0.014**
Black	178	*84.76*	232	*82.86*	199,973	*80.85*	
Colored	28	*13.33*	34	*12.14*	27,238	*11.01*	
White	3	*1.43*	9	*3.21*	4,816	*1.95*	
Indian/Asian	1	*0.48*	5	*1.79*	15,324	*6.2*	
Total	**210**	***100%***	**280**	***100%***	**247,351**	***100%***	
Sex of household head							**0.003**
Male	109	*51.90*	146	*52.14*	109,541	*44.29*	
Female	101	*48.10*	134	*47.86*	137,810	*55.71*	
Total	**210**	***100%***	**280**	***100%***	247,351	***100%***	
Province of household head							**0.000**
Western Cape	25	*11.9*	37	*13.21*	28,211	*11.40*	
Eastern Cape	24	*11.43*	25	*8.93*	30,000	*12.12*	
Northern Cape	13	*6.19*	22	*7.86*	14,709	*5.94*	
Free state	18	*8.57*	19	*6.79*	20,596	*8.32*	
KwaZulu-Natal	27	*12.86*	27	*9.64*	42,727	*17.27*	
North West	29	*13.81*	38	*13.57*	20,553	*8.31*	
Gauteng	26	*12.38*	54	*19.29*	34,625	*13.99*	
Mpumalanga	21	*10.00*	29	*10.36*	25,009	*10.11*	
Limpopo	27	*12.86*	29	*10.36*	31,024	*12.54*	
Total	**210**	***100%***	**280**	***100%***	**247,454**	***100%***	
Source of drinking water							**0.282**
Piped water	192	*91.43*	261	*93.21*	223,909	*90.54*	
Other	18	*8.57*	19	*6.79*	23,400	*9.46*	
Total	**210**	***100%***	**279**	***100%***	**245,434**	***100%***	
Type of toilet facility							**0.100**
No toilet	11	*5.24*	5	*1.79*	9,254	*3.74*	
Flush toilet	100	*47.62*	162	*57.89*	132,139	*53.47*	
Other	99	*47.14*	113	*40.36*	105,737	*42.79*	
Total	**210**	***100%***	**280**	***100%***	**247,130**	***100%***	

Geographic type							**0.185**
Urban areas	97	*53.89*	142	*62.56*	113,932	*57.41*	
Rural areas	83	*46.11*	85	*37.44*	84,526	*42.59*	
Total	**180**	***100%***	**227**	***100%***	**198,458**	***100%***	
Electricity							**0.000**
Yes	136	*79.53*	197	*85.65*	175,783	*88.85*	
No	75	*20.47*	33	*14.35*	22,060	*11.15*	
Total	**171**	***100%***	**230**	***100%***	**197,843**	***100%***	
Household Wealth index							**0.562**
Poor	52	*42.98*	81	*49.39*	71,431	*48.25*	
Middle	27	*22.31*	33	*20.12*	34,002	*22.97*	
Rich	42	*34.71*	50	*30.49*	42,621	*28.79*	
Total	**121**	***100%***	**164**	***100%***	**148,054**	***100%***	
Hypertension							**0.019**
Yes	17	*8.10*	20	*7.12*	28,455	*11.58*	
No	193	*91.90*	261	*92.88*	217,268	*88.42*	
Total	**210**	***100%***	**281**	***100%***	**245,723**	***100%***	
HIV positive status							**0.000**
Yes	15	*7.14*	18	*6.41*	5,432	*2.21*	
No	195	*92.86*	263	*93.59*	240,291	*97.79*	
Total	**210**	***100%***	**281**	***100%***	**245,723**	***100%***	
Violence suffered by women							**0.825**
Yes	0	*0.00*	0	*0*	193	*0.08*	
No	211	*100.00*	281	*100.00*	246,859	*99.92*	
Total	**211**	***100%***	**281**	***100%***	**247,052**	***100%***	

Table 4.4 shows the percentage distributions of pregnancy outcomes (Stillbirths and Miscarriages) by demographic and household socioeconomic characteristics. With regards, to Maternal age, the table above shows that 29% of women who had a stillbirth were between 20-24 years which represents majority of the respondents. In addition, 22% of women whose pregnancy ended in a stillbirth are within the age range of 25-29 years old while women aged 15-19 and 45-49 years makes up a small percentage of women who had a stillbirth, 11% and 2% respectively. Conversely, about 28% of women aged 25-29 years had a miscarriage while only 2% aged 45-49 years had a miscarriage. It is also evident from the table that 20% of pregnancies resulted in other pregnancy outcomes among women aged 15-19 years while

about 11% of women aged 45-49 years had other pregnancy outcome. The chi2 test of association shows that the relationship between pregnancy outcomes and maternal age is statistically significant.

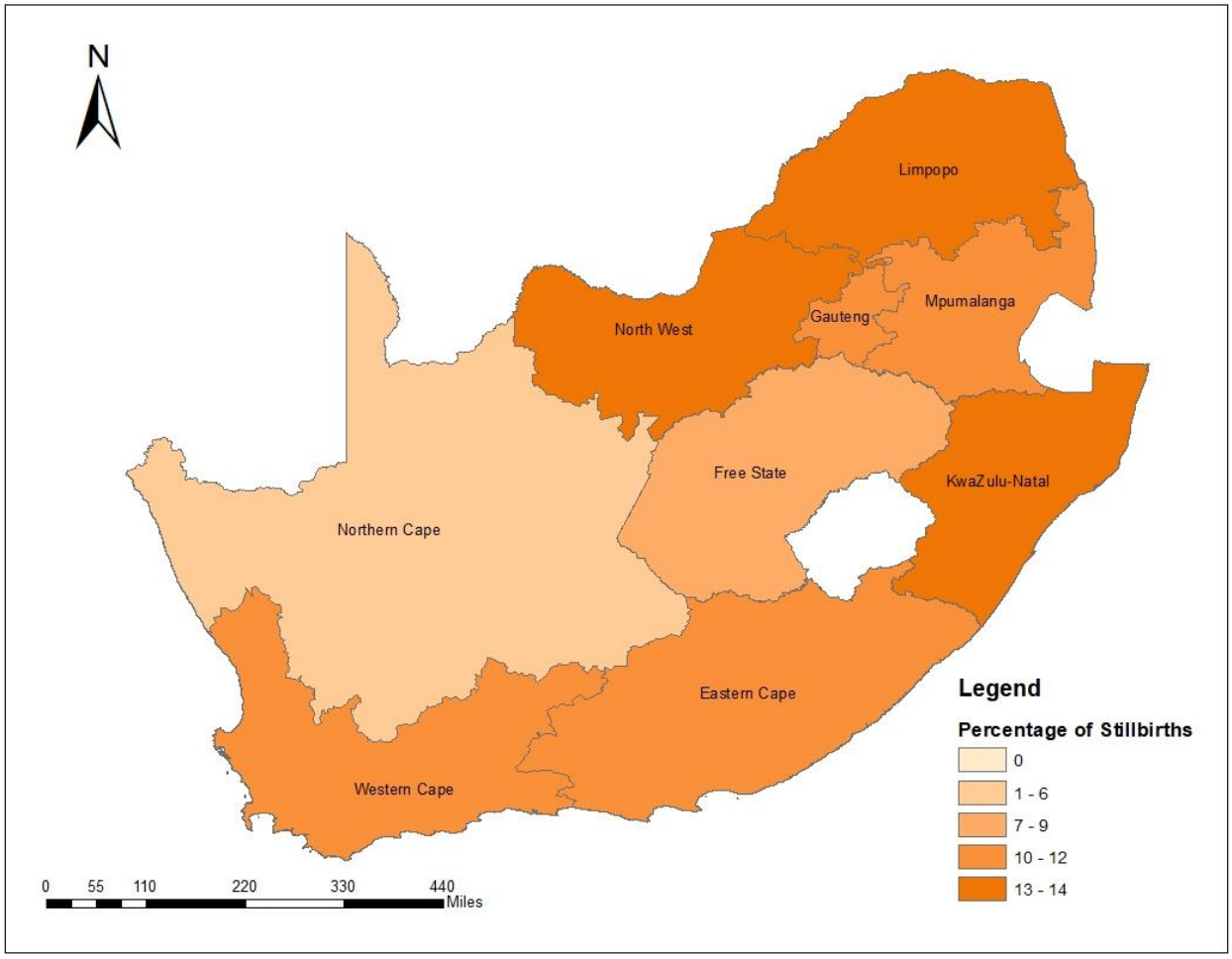
In addition, the racial distribution of women who had a stillbirth, miscarriage and other pregnancy outcomes reveals that 85% of black women have had a stillbirth, 83% a miscarriage and 80% other outcomes of pregnancy. In the same vein, over 13% and 12% of coloured women experienced a stillbirth and miscarriage respectively. It is seen from the table that there are no stillbirths reported for Indian and Asian women while only 2% reported to have had a miscarriage and about 6% reported other pregnancy outcomes. This thus indicates that stillbirths and miscarriages are occurring most among black women compared to women from other racial descent within South Africa.

With regards to the sex of household head, the results demonstrate that negative pregnancy outcomes (Stillbirths and miscarriages) is higher in male headed households (52%) as opposed to female headed households (48%) although the differences in the level of stillbirths and miscarriages among male and female headed households are minimal. Again, about 44% and 56% of women in male and female headed household respectively had other pregnancy outcomes.

Additionally, the provincial distribution of stillbirths, miscarriages and other pregnancy outcomes as seen in figure 4.3 and 4.4 below thus indicates that about 14% of pregnancies resulted in a stillbirth among women who reside in the North West province and 13% among women residing KwaZulu-Natal and Limpopo respectively. Furthermore, a fewer percentage of stillbirths were reported by women residents' provinces such as Western Cape (12%), Eastern Cape (11%), Gauteng (12%) and Mpumalanga (11%). Stillbirth was lowest among women in Northern Cape (6%) and Free State (9%) provinces. These findings suggest that

KwaZulu-Natal, Limpopo and North West provinces are burdened with the highest level of stillbirths compared to other provinces while Northern Cape and Free State have the least reported stillbirths. This further shows that majority of the pregnancies among women residing in KwaZulu-Natal, Limpopo and North West ended in a stillbirth. This is represented geographically on the hotspot map below;

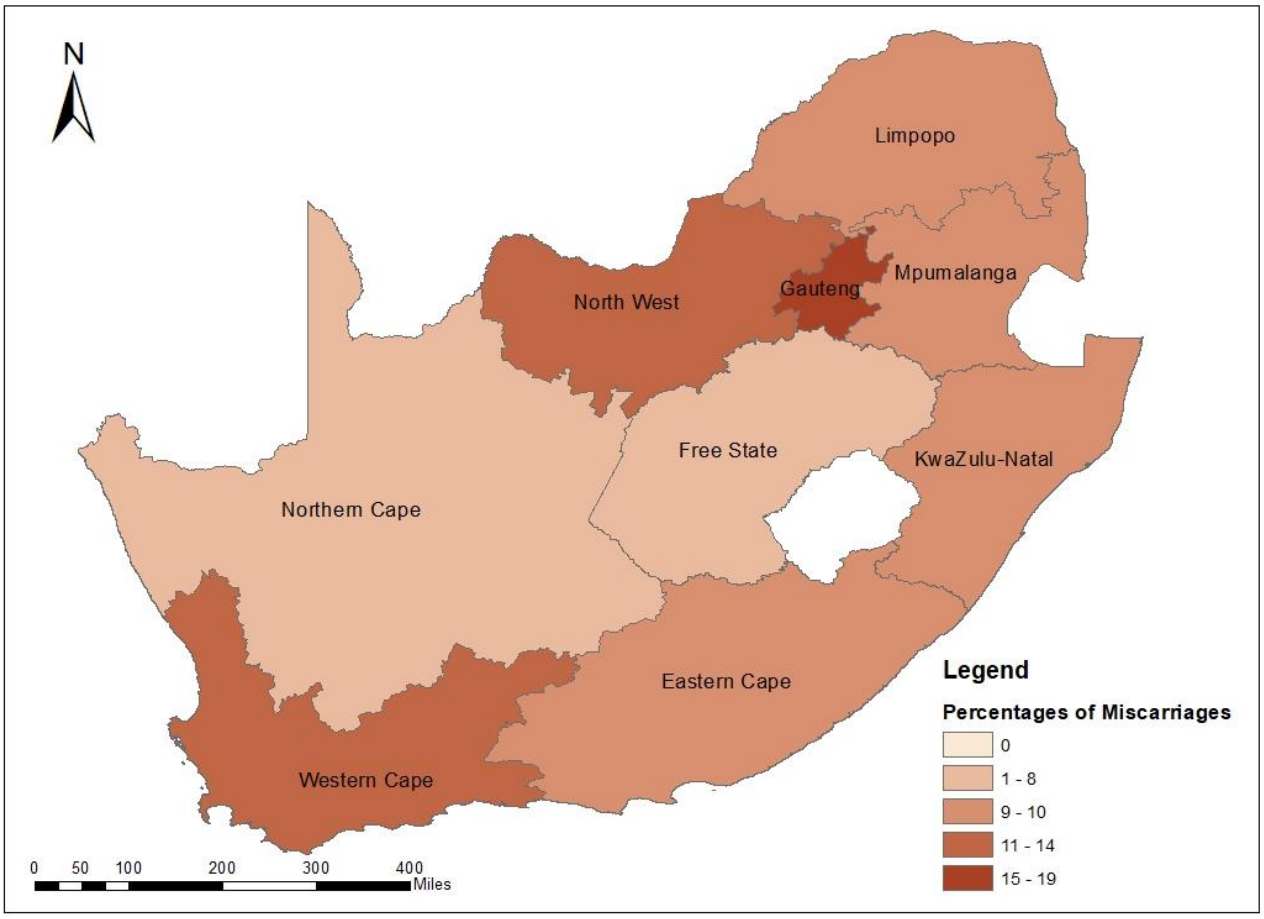
Figure 4. 3: Percentage distribution of pregnancy outcomes (stillbirths) among women per province of residence, South Africa 2010-2014



Similarly, about 19% of pregnancy resulted in a miscarriage among women who reside in Gauteng, 14% in North West and 13% in Western Cape provinces. This implies that majority of women reporting miscarriages are residents in these three provinces relative to others in South Africa. Conversely, table 4.2 also shows that women residing in Limpopo (10%), Mpumalanga (10%) and KwaZulu-Natal (10%) also constituted the same percentage

distribution of pregnancies that ended in a miscarriage. In contrast to these findings, women residing in Eastern Cape and Northern Cape reported low levels of miscarriage as the outcome of their pregnancy compared to other provinces as they make up 9% and 8% of miscarriages respectively. This is further demonstrated in the map below;

Figure 4. 4: Percentage distribution of pregnancy outcomes (miscarriages) among women per province of residence, South Africa 2010-2014



In the same light, 17% of women who are residents of KwaZulu-Natal and Gauteng reported other pregnancy outcomes which include a live birth. On the other hand, only about 6% of women from Northern Cape reported to have had other pregnancy outcomes in South Africa. As seen from table 4.4 above, women whose main source of drinking water are piped (tap) water have a high level of stillbirth 91%, miscarriage (93%) and other pregnancy outcomes

(90%). Also, about 18% of women who drink water from other sources had a stillbirth, 7% had a miscarriage and 9% had other pregnancy outcomes. The chi2 test of association between source of drinking water and pregnancy outcomes is statistically insignificant.

In terms of the type of toilet facility, 5% of all women who reported not owning any toilet facility in their household had a stillbirth; 2% had a miscarriage; and 3% had other pregnancy outcomes. Similarly, majority of women who use a flush toilet within their household reported pregnancy outcomes as follows: stillbirth (49%), miscarriage (59%) and other outcomes (55%). In addition, over 44% of women who use other types of toilet facility had a stillbirth, 39% had a miscarriage while 41% of the women had pregnancies ended in other outcomes of pregnancy. This implies that most women whose pregnancy ended negatively – stillbirths and miscarriages – have a flush toilet and other types of toilet facilities in their households in South Africa.

Regarding geographic type, the findings from table 4.4 confirms that stillbirths and miscarriages are higher in the urban areas compared to the rural areas based on the fact that more women residing in Urban areas reported that their pregnancy resulted in a stillbirth (54%) and miscarriage (63%) as opposed to 46% and 37% of women from the rural settings reporting a stillbirth and miscarriage respectively. Contrary wise, only about 7% and 5% of women reported to have had a stillbirth and miscarriage from the rural areas. In addition, more women from urban areas reported other outcomes of pregnancy (57%) relative to rural areas (42%).

Furthermore, table 4.4 above shows that 79% of women in a household with electricity supply have had a pregnancy that resulted in stillbirth (79%), Miscarriage (86%) and other pregnancy outcomes (89%). Also, women with no electricity supply reported a stillbirth (20%), miscarriage (14%) and other pregnancy outcomes (11%). Similarly, regarding

household wealth index, women from poor household have experienced the highest level of negative pregnancy outcomes (stillbirth and miscarriages) compared to women from middle and rich household. Specifically, 43% of women from poor households had pregnancies that resulted in a stillbirth, 49% reported a miscarriage while 48% reported other pregnancy outcome. These findings show that there is a minimal difference in pregnancy outcomes among women from a poor household. In addition, women from a rich household have a lower of negative pregnancy outcome as 35% had a stillbirth, 30% a miscarriage and 29% other pregnancy outcomes.

In terms of the health indicators, only 7% and 8% hypertensive women reported a miscarriage and stillbirth respectively. Also, 93% of women who are not hypertensive reported a stillbirth, 94% had a miscarriage while 98% had other pregnancy outcomes. This thus suggest that majority of women whose pregnancy ends in a stillbirth and miscarriage are not hypertensive compared to hypertensive women in South Africa.

Furthermore, 7% of women with HIV positive status had pregnancies that resulted in a stillbirth while 6% had a miscarriage. However, most women with a negative HIV status had a stillbirth (93%) and a miscarriage (94%). Other pregnancy outcomes were reported by women who are HIV positive (12%) and negative (88%). Lastly, there no negative pregnancy outcome reported by women who had suffered from trauma due to violence while about 100% of women who have not suffered from trauma due to violence reported a stillbirth, miscarriage and other pregnancy outcomes.

4.4. Relationship between demographic and household socioeconomic status and negative birth outcomes

The second objective of this study was to explore the household demographic and socioeconomic factors associated with stillbirths and miscarriages among women in South

Africa. This section thus provides inferential findings from the unadjusted (bivariate level) and adjusted (multivariate level) Multinomial logistic regression models. These models aided in assessing the relative risk of having a negative pregnancy outcome (stillbirths and miscarriages) which are the outcomes of interest. Tables 4.3 and 4.4 below thus display the unadjusted and adjusted relative risk ratios, p-values and confidence intervals of each household demographic and socioeconomic variable against miscarriages and other pregnancy outcomes; Other pregnancy outcome is the base outcome and it entail livebirths and abortion by choice.

Figure 4. 5: Unadjusted Multinomial logistic regression showing Household Demographic and Socioeconomic variables and Pregnancy outcomes (Stillbirths, Miscarriages and Other pregnancy outcomes).

Other pregnancy outcomes (Base outcome)	**Stillbirth**			**Miscarriage**		
Characteristics	**RRR**	**P-value**	**CI**	**RRR**	**P-value**	**CI**
Maternal Age						
15-19 (RC)						
20-24	1.93*	0.000	1.84 – 2.01	0.41*	0.000	0.39 - 0.42
25-29	3.16*	0.000	3.03 – 3.29	0.38*	0.000	0.36 - 0.39
30-34	3.59*	0.000	3.43 – 3.75	0.52*	0.000	0.50 - 0.53
35-39	2.06*	0.000	1.97 – 2.15	0.35*	0.000	0.34 - 0.37
40-44	5.23*	0.000	4.92 – 5.57	2.15*	0.000	2.04 - 2.25
45-49	0.88*	0.006	0.80 – 0.96	2.29*	0.000	2.17 - 2.41
Race of Household Head						
Black (RC)						
Coloured	0.52*	0.000	0.51 - 0.54	0.67*	0.000	0.65 - 0.68
White	2.30*	0.000	2.17 - 2.44	5.25*	0.000	4.99 - 5.53
Indian/Asian	-	-	-	-	-	-
Sex of Household Head						
Male (RC)						
Female	0.83*	0.000	0.82 - 0.85	1.07*	0.000	1.06 - 1.08
Province of residence						
Western cape (RC)						
Eastern cape	0.88*	0.000	0.84 - 0.91	1.44*	0.000	1.40 - 1.46
Northern cape	1.08*	0.000	1.02 - 1.13	0.85*	0.000	0.82 - 0.88
Free state	0.99	0.815	0.95 - 1.04	1.24*	0.000	1.20 - 1.28
KwaZulu-Natal	1.16*	0.000	1.12 - 1.19	1.69*	0.000	1.66 - 1.73
North west	1.42*	0.000	1.37 - 1.47	1.06*	0.000	1.03 - 1.09
Gauteng	2.86*	0.000	2.78 - 2.94	2.02*	0.000	1.97 - 2.06

Mpumalanga	2.79*	0.000	2.67 - 2.90	2.30*	0.000	2.22 - 2.38
Limpopo	1.16*	0.000	1.12 - 1.99	1.02*	0.004	1.00 - 1.04
Source of drinking water						
Piped water (RC)						
Other	0.54*	0.000	0.53 - 0.56	1.04*	0.000	1.01 - 1.06
Type of toilet facility						
No toilet (RC)						
Flush toilet	3.65*	0.000	3.43 - 3.87	1.22*	0.000	1.17 - 1.25
Other	3.64*	0.000	3.42 - 3.86	1.09*	0.000	1.06 - 1.13
Geographic type						
Urban areas (RC)						
Rural areas	0.71*	0.000	0.69 - 0.72	0.96*	0.000	0.95 - 0.98
Electricity						
Yes (RC)						
No	1.40*	0.000	1.37 - 1.43	0.53*	0.000	0.52 - 0.54
Household Wealth index						
Poor (RC)						
Middle	0.57*	0.000	0.56 - 0.59	0.74*	0.000	0.72 - 0.76
Rich	1.10*	0.000	1.07 - 1.13	0.72*	0.000	0.71 - 0.74
Hypertension						
Yes (RC)						
No	1.47*	0.000	1.42 - 1.53	0.64*	0.000	0.62 - 0.66
HIV positive status						
Yes (RC)						
No	0.64*	0.000	0.62 - 0.66	2.81*	0.000	2.74 - 2.89

[RC = Reference Category, $p < 0.05$ = Category significance]

The result represented in Table 4.5 above shows that all demographic and socioeconomic variable entered in the model were significantly associated with stillbirths and miscarriages having other pregnancy outcomes as the base outcome. Thus, the risk of a pregnancy resulting in a miscarriage as compared to stillbirths is 1.93 times greater for women aged 20-24 years relative to women aged 15-19 years old. Also, the risk of having a miscarriage as compared to a stillbirth is 3.16 and 3.59 times higher for women aged 25-29 and 30-34 years respectively in relation to women aged 15-19 years old. Again, women who are 40-44 years and 45-49 years old compared to those aged 15-19 years have 5.23 times higher and 0.88 times lower risk of having a miscarriage pregnancy outcome as against a stillbirth.

Furthermore, the risk of having other pregnancy outcomes as likened to stillbirths is 0.41, 0.39 and 0.52 times lower for women aged 20-24, 25-29 and 30-34 years relative to women aged 15-19 years. Looking at the relative risk pattern for maternal age, the findings therefore suggest that the risk of having a negative pregnancy outcome increases as age increases. Although this not the case for women aged 45-49 years with regards to miscarriages and broadly for other pregnancy outcomes as the relative risk ratio decreased with an increase in age.

The risk of having a miscarriage as compared to a stillbirth is 0.52 times lower for coloured women and 2.30 times greater for white women in relation to women who are black. Also, women who are coloured and white compared to black women have a 0.67 times lower risk and 5.25 times higher risk of having other pregnancy outcomes as against a stillbirth. Women from a female headed household compared to a male headed household have a 0.83 times lower risk of having a miscarriage and 1.07 times higher risk of having other pregnancy outcomes relative to stillbirths.

The relative risk of having a miscarriage as opposed to a stillbirth is 2.86 and 2.79 times greater for women residing in Gauteng and Mpumalanga provinces respectively in relation to women who reside at Western Cape Province. In contrast, the risk of a pregnancy ending in a miscarriage versus a stillbirth is 0.88 and 0.99 times lower for residents of Eastern Cape and Free State provinces relative to women residing in Western Cape. In addition, women who reside in Free State (1.24), KwaZulu-Natal (1.69), Gauteng (2.02) and Mpumalanga (2.30) relative to women residing in Western Cape Province all have an increased risk of having other pregnancy outcomes compared to a stillbirth while those residing at Northern Cape have reduced risk of having other pregnancy outcomes relative to a stillbirth.

Women from households whose drinking sources are other water sources water compared to piped water have a 0.54 times lower risk of a miscarriage pregnancy outcome relative to a stillbirth. Conversely, women drinking from other sources of water relative to piped water have a 1.04 times greater risk of having a pregnancy that results in other outcomes as compared to stillbirths.

Findings from Table 4.5 further reveal that the risk of a pregnancy resulting in a miscarriage as compared to stillbirths is 3.65 times greater for women who use a flush toilet relative to those with no toilet facility. Also, the risk of having a miscarriage as compared to a stillbirth is 3.64 times higher for women who use other toilet facilities compared to women with no toilet facility within their household.

Furthermore, women who reside at rural areas compared to urban areas have a 0.71 times lower risk of having a miscarriage relative to a stillbirth while the risk of having other outcomes of pregnancy as likened to a stillbirth is 0.96 times lower for women who reside at rural areas compared to urban areas. Similarly, the risk of having a miscarriage versus stillbirth is 1.40 times greater for women who dwell in households with no electricity supply compared to those have electricity supplied to their household, 1.10 times higher for women from a rich household compared to a poor household, 1.47 times higher for women who are not hypertensive in relation to hypertensive women and 0.64 times lower for women who are HIV negative compared to those who are positive. However, the risk of a pregnancy resulting in other outcomes compared to stillbirths is 0.53 times lower for women in households with no electricity relative to households with electricity, 0.72 times lower for women from rich households compared to poor households, 0.64 times lower for non-hypertensive women in relation to hypertensive women and 2.81 times higher for women who are HIV positive as opposed to HIV positive women. Violence as a predictor was omitted from the model.

Figure 4. 6: Adjusted Multinomial logistic regression showing Household Demographic and Socioeconomic variables and Pregnancy outcomes (Stillbirths, Miscarriages and Other pregnancy outcomes).

Other pregnancy outcomes (Base outcome)	Stillbirth			Miscarriage		
Characteristics	**RRR**	**P-value**	**CI**	**RRR**	**P-value**	**CI**
Maternal Age						
15-19 (RC)						
20-24	0.91*	0.000	0.85 - 0.93	0.19*	0.000	0.18 - 0.20
25-29	0.87*	0.000	0.81 – 0.95	0.13*	0.000	0.12 - 0.14
30-34	0.83*	0.000	0.78 – 0.91	0.24*	0.000	0.23 - 0.26
35-39	1.74*	0.000	1.64 - 1.84	0.26*	0.000	0.25 - 0.29
40-44	1.39*	0.000	1.39 – 1.40	1.92*	0.000	1.74 - 2.12
45-49	-	-	-	1.14*	0.000	1.04 - 1.25
Race						
Black (RC)						
Colored	0.53*	0.000	0.50 - 0.56	0.37*	0.000	0.36 - 0.39
White	-	-	-	-	-	-
Indian/Asian	-	-	-	-	-	-
Sex of Household Head						
Male (RC)						
Female	0.38*	0.000	0.36 - 0.39	0.78*	0.000	0.78 - 0.80
Province of residence						
Western cape (RC)						
Eastern cape	0.66*	0.000	0.62 - 0.69	0.87*	0.000	0.84 - 0.90
Northern cape	4.49*	0.000	4.08 - 4.94	2.96*	0.000	2.72 - 3.21
Free state	1.22*	0.000	1.14 - 1.29	1.17*	0.000	1.12 - 1.22
KwaZulu-Natal	1.96*	0.000	1.86 - 2.07	2.21*	0.000	2.12 - 2.31
North west	1.62*	0.000	1.53 - 1.72	1.15*	0.000	1.10 - 1.20
Gauteng	2.27*	0.000	2.16 - 2.38	1.86*	0.000	1.80 - 1.93
Mpumalanga	3.64*	0.000	3.41 - 3.89	2.69*	0.000	2.54 - 2.83
Limpopo	0.82*	0.000	0.77 - 0.87	1.17*	0.000	1.12 - 1.22
Source of drinking water						
Piped (tap) water (RC)						
Other	0.78*	0.000	0.74 - 0.84	1.04	0.106	0.99 - 1.08
Type of toilet facility						
No toilet (RC)						
Flush toilet	1.47	0.000	1.22 – 1.75	1.07	0.014	1.07 – 1.14
Other	1.21	0.000	1.19 – 1.24	1.73	0.000	1.65 – 1.82
Geographic type						
Urban areas (RC)						
Rural areas	1.96*	0.000	1.84 - 2.11	1.44*	0.000	1.36 - 1.54
Electricity						
Yes (RC)						

No	0.72	0.000	0.69 – 0.76	0.44	0.000	0.42 – 0.46
Household Wealth index						
Poor (RC)						
Middle	0.58*	0.000	0.56 - 0.60	0.81*	0.000	0.79 - 0.83
Rich	0.66*	0.000	0.64 - 0.68	0.70*	0.000	0.68 - 0.72
Hypertension						
Yes (RC)						
No	1.14*	0.000	1.05 - 1.23	1.19*	0.000	1.13 - 1.22
HIV positive status						
Yes (RC)						
No	0.54*	0.000	0.51 - 0.56	2.09*	0.000	2.01 - 2.17

[RC = Reference Category, $p < 0.05$ = Category significance]

Table 4.6 above shows the adjusted multinomial logistic regression model. The model predicts the association between all demographic and household socioeconomic factors and pregnancy outcomes precisely stillbirths, miscarriages and other pregnancy outcomes. Findings from the table indicates that 'Maternal age', 'Race', 'Sex of household head', 'Province of residence', 'Source of drinking water', 'Toilet facility', 'Geographic type', 'Electricity', 'Wealth of household', 'Hypertension' and 'HIV positive status' were all significantly associated with pregnancy outcomes (stillbirth and miscarriage) with other pregnancy outcomes as the base category. In addition, the variable 'Violence' was omitted from the model.

Results from the table 4.6 above show that the risk of a pregnancy resulting in a miscarriage as compared to stillbirths is greater for women aged 35-39 and 40-44 years relative to women aged 15-19 years old [RRR = 1.74 and 1.39 respectively]. On the other hand, women who are aged 20-24, 25-39 and 30-34 years old compared to younger women aged 15-19 years are at a lower risk of having a miscarriage as relative to a stillbirth. Also, the risk of having other pregnancy outcomes as compared to a stillbirth is 0.19 times lower for women aged 20-24 years, 0.24 times reduced for women aged 30-34 years and 0.26 times lower for 35-39 years old women compared younger women aged 15-19 years in South Africa. Furthermore, the

risk of having other pregnancy outcomes as likened to stillbirths is 1.92 and 1.14 times greater for women of advanced ages 40-44 and 45-49 years compared to those who aged 15-19 years old. In terms of the relative risk pattern for maternal age, the findings therefore advocate that the risk of having a negative pregnancy outcome increases among women aged 35 and over.

In addition, the risk of a pregnancy ending in a miscarriage compared to stillbirths is reduced for women who are coloured [RRR=0.53 CI; 0.50-0.56] and are from female headed households [RRR= 0.38 CI; 0.36-0.39], all compared to black women and women from male headed households. In terms of province of residence, the relative risk of having a miscarriage as opposed to a stillbirth is 0.66 and 0.82 times lower for women residing in Eastern Cape and Limpopo provinces respectively in relation to women who reside at Western Cape Province. In contrast, the risk of a pregnancy ending in a miscarriage versus a stillbirth is 4.49 and 3.64 times higher for residents of Northern Cape and Mpumalanga provinces relative to women residing in Western Cape. Furthermore, while women residing in Eastern Cape have a 0.87 times reduced risk of having other pregnancy outcomes relative to a stillbirth, women who reside in Free State (1.17), KwaZulu-Natal (2.21), Gauteng (1.86), North West (1.15) and Mpumalanga (2.69) relative to women residing in Western Cape province all have an increased risk of having other pregnancy outcomes compared to a stillbirth.

Women who belong to households with other sources of drinking water sources have 0.78 times reduced risk of having a miscarriage pregnancy outcome relative to a stillbirth. In addition, women drinking water from other sources are at a greater risk of having other pregnancy outcomes relative to a stillbirth.

Findings from Table 4.6 further show that the risk of a pregnancy resulting in a miscarriage as compared to stillbirths is 1.47 times greater for women who use a flush toilet relative to those with no toilet facility. Also, the risk of having a miscarriage as compared to a stillbirth is 1.27 times higher for women who use other toilet facilities compared to women with no toilet facility within their household. Similarly, women using flush toilet and other toilet facilities have a 1.07 and 1.73 times increased risk of having other outcomes of pregnancy relative to a stillbirth.

In the same vein, women who reside in rural areas and are non-hypertensive have a 1.96 and 1.14 times increased risk of having a miscarriage relative to a stillbirth while those who are rich and belong to the middle class, have no electricity and are HIV negative have a reduced risk of having a miscarriage and other pregnancy outcomes as opposed to a stillbirth.

CHAPTER 5: DISCUSSION

5.1. Introduction

This chapter serves to provide a discussion and interpretation of the results obtained from the study by integrating the findings with those from existing literature that has been utilised in this study. The main purpose of this research was to examine the levels, trends and household determinants of stillbirths and miscarriages among women in South Africa. This study is perhaps the first study in South Africa that examines the levels, trends and household determinants of stillbirths and miscarriages. This study further investigated the influence of household demographic and socioeconomic characteristics such as sex of household head, source of drinking water, household wealth index, province of residence, race, maternal age and geographic type on stillbirths and miscarriages.

This paper has addressed two specific objectives: to examine the levels and trends of stillbirths and miscarriages in South Africa; and to examine the household demographic and socio-economic factors associated with stillbirths and miscarriages in South Africa. Frequency and percentage distributions obtained and represented with a bar chart and line graph showed the levels and trends of these negative pregnancy outcomes. A calculation of the rates of stillbirth and miscarriage from 2010 to 2014 proved vital to understand these trends overtime in the country. In addition, fitting unadjusted (bivariate) and adjusted (multivariate) multinomial logistic regression models was vital in attaining the second objective of the study.

5.2. Discussion on the levels and trends of Stillbirths and Miscarriages in South Africa (2010 – 2014)

Generally, the results obtained from this study indicate that the level of stillbirths and miscarriages among women in South Africa has constantly increased from 2010 to 2014 and was highest in 2013, 0.17% and 0.37% respectively. This resonates with findings from

existing reports and literatures on perinatal deaths in South Africa and other Sub-Saharan African countries where stillbirths and miscarriages rates were found to be high such as Namibia (23 per 1000 births) and Nigeria (43 per 1000 births) (Bhati, 2014; Tshibumbu & Blitz, 2016). Similarly, the trend of stillbirths and miscarriages as suggested by the findings of this study remained steadily high from 2010 to 2014, having peaked in 2013 with 32.5 per 1000 births and 26.7 per 1000 pregnancies respectively. This is not congruent with the findings of the perinatal death reports in South Africa as the rates of stillbirth appeared to be lower for 2013 (12.4 per 1000 births) (Stats SA, 2014).

This disparity in the stillbirth and miscarriage rate is plausibly explained by the fact the data used for the estimation of these rates were drawn from different sources. For example, Stats SA (2014) data was drawn from the South African Civil Registration System maintained by the Department of Home Affairs while estimates of stillbirth and miscarriage rates obtained for specific research are drawn from verbal autopsy which is based on mothers' recall of previous stillbirths and miscarriages (Tshibumbu & Blitz, 2016). As a result, mothers may be susceptible to recall bias which can either lead to an over-reporting or underreporting of the occurrence of stillbirths and miscarriages (Aggarwal, Jain, & Kumar, 2011). Furthermore, some news platforms in South Africa suggested that the high rates of stillbirths and miscarriages as evidenced by the findings from this research are perpetuated broadly by lack of education and smoking during pregnancy among women as well as poor quality of care and under-reporting (Feature, n.d.; Hofman, n.d.).

Results of this study established that the rates of stillbirth were higher than the rate of miscarriage during the period studied. This result suggests that stillbirths are more likely to be reported than miscarriages amongst pregnant women. This is because most pregnancy ends in a miscarriage before they are clinically detected thus women would only report

miscarriages for pregnancies that are recognized (Hure et al., 2012). In addition, the issue of under reporting of miscarriage and self-reporting of stillbirths in surveys and even public hospitals in South Africa may account for the high rates of stillbirth as women tend to recall and report a stillbirth more than they report a miscarriage (Hure et al., 2012).

5.3. Discussion on demographic determinants of Stillbirths and Miscarriages in South Africa.

Generally, the study identified household level and individual level factors, such as maternal age, race, sex of household head, and province of residence as important demographic factors associated with both stillbirths and miscarriages in South Africa even after adjusting for the effects or influence of other covariates. Considering maternal age, the results of the bivariate (Table 4.3) and multivariate analysis (Table 4.4) of this study confirmed this as an important factor associated with stillbirths and miscarriages among women in South Africa. Thus, an increasing maternal age was associated with the increase in the risk of stillbirths and miscarriage. Previous studies suggest that ovarian ageing, impaired placental development, obesity, hypertension, pre-eclampsia and broadly chromosomal abnormality accounts for the increased risk of stillbirths and miscarriages amongst women aged 30 years and over (Cooke & Nelson, 2011; Gordon, Raynes-Greenow, McGeechan, Morris, & Jeffery, 2013; Waldenström, Cnattingius, Norman, & Schytt, 2015).

With regards to obesity as a risk factor for stillbirth operating through an increased maternal age, it was evidenced by findings from other studies which explored the mechanism through which Obesity is linked to stillbirth and miscarriages. For instance, a study on maternal Obesity and stillbirth established that obesity contributes to lower sensitivity to fetal movements in obese women during pregnancy as well as fetal growth restriction and complications during labour and child birth which may lead to fetal loss or death (Salihu, 2011). This is mostly true in the South African context as a study that focused on Obesity and

it's outcome among pregnant South African women postulated that Stillbirths and Miscarriages has thrived and is still thriving in South Africa due to the high prevalence of Obesity among women aged 30 years and over in the country (Basu, Jeketera, & Basu, 2010).

Furthermore, the results gained from this study reveals that women who are Colored exhibited much lower risk of having a stillbirth and miscarriage in relation to Black women in South Africa. This result resonates with findings from previous studies on the association between maternal race and the risk of stillbirths and miscarriages in South Africa and elsewhere (Akolekar, Bower, Flack, Bilardo, & Nicolaides, 2011; Bryant, Worjoloh, Caughey, & Washington, 2010; Burgard, 2004; Khalil, Rezende, Akolekar, Syngelaki, & Nicolaides, 2013; Mukherjee, Velez Edwards, Baird, Savitz, & Hartmann, 2013).

The study by Burgard on race, pregnancy-related care and outcomes in South Africa found a substantial racial disparities in stillbirths and miscarriages - with an increased risk of stillbirths and miscarriages among Black South African women compared to Colored South Africa Women (Burgard, 2004). A plausible explanation to this racial disparity may be due to late access to quality prenatal care among black women which is reflective of the long history of racial segregation and high inequality in the distribution of socioeconomic resources and medical care in South Africa. This was further noted by Lawn, Yakoob and others in 2010, who explained that late access to quality perinatal care increases the risks of stillbirths and other adverse obstetric outcomes as pregnant women are unable to recognize potential complications, labour and delivery problems early in pregnancy (Lawn, Lee, et al., 2009; Yakoob, Lawn, Darmstadt, & Bhutta, 2010). It is important to state that this racial disparity is further rooted in maternal health behaviour, genetics, the social environments, low education and previous occurrence of stillbirths and miscarriages (Bryant et al., 2010).

Furthermore, certain traditional practices known as *Kgaba* and *Isihlambezo* were identified from findings of previous studies to have played a role in explaining the racial difference in stillbirths and miscarriages among black South African women (Mogawane, Mothiba, & Malema, 2015). *Kgaba* and *Isihlambezo* are traditional practices mainly prevalent among Black South African women especially the Tswana and Zulu speaking. They are both indigenous practices of pregnant women used as complementary medicine to western medicine in the treatment of pregnancy-related complication, witchcraft and malevolent intentions from family and friends during pregnancy (Mogawane et al., 2015). The services for *Kgaba* and *Isihlambezo* are provided by traditional healers when consulted by about 70% to 80% of pregnant black South African women with the aim of protecting the mother and unborn child from stillbirths, miscarriage and or witchcraft.

For instance, a study conducted in South Africa on the practice of *Kgaba* among the Tswana speaking South African women revealed that the practice of *Kgaba* which involves the ingestion of decoction made of plants, animals and minerals is common among black women and is done to compliment the flaws of western medicine and the medical services during pregnancy to ensure a complication-free pregnancy and the delivery of a healthy baby (Van der Kooi & Theobald, 2006). Additionally, studies have established the risk of the practice of *Kgaba* as it involves the use of herbal substances which may work contrary to western medicine been used concurrently. Also, *Kgaba* may be prepared in an unhygienic condition thus exacerbating the risk of stillbirths and miscarriages through exposure to infections and harmful substances, leading to the rupture of the uterus which will further increase the risk foetal stress and death (du Preez, 2012; Mogawane et al., 2015). This could possibly suggest that apart from inequality, lack of education and access to quality health care, traditional practices by Black South African women may expose them to adverse pregnancy outcomes

and thus lends credence to the increased risk of stillbirths and miscarriages among Black women compared to their Colored counterparts.

Furthermore, sex of household head was established in this study as an important factor which influences stillbirths and miscarriages among women in South Africa. In terms of sex of household head, findings from this study demonstrates that the risk of stillbirths and miscarriage are much lower among women in female headed households compared to male headed households in South Africa. This finding is consistent with results from previous studies that focused on Household headship and pregnancy outcomes and which found that women from a Female headed had better outcomes of pregnancy compared to those from a Male headed household (Adhikari & Podhisita, 2010; Doctor, 2011). A possible reason for this difference in the risk of stillbirths and miscarriages among women from a female headed household compared to a male headed household is that women in a female headed household discuss more easily with the female household head and other women about their reproductive health issues compared to male household head. In addition, female household heads could better understand maternal and obstetric health problems and thus encourage women within the household to visit health facilities for perinatal care (Adhikari & Podhisita, 2010; Doctor, 2011).

Expounding further in the South African context, a report by the Department of Health Medical Research Council stated that nearly half of all households are headed by women. The primary reason for this can be linked to male labour migration and non-marriage thus leaving females behind as the head of the home (Posel, 2001). Women thus become autonomous, having control over household resources and making key decisions in the household which affect the women in the household especially their demand for health care (Schatz, Madhavan, & Williams, 2011). In support of the statement above, the buffering role

of remittances and social grants in female headed household thus reduces the economic disadvantages expected in a female headed household as they are more likely to receive remittances and are prioritized in the social grant systems of South Africa compared to male household (Schatz et al., 2011). This economic advantage thus gives women the economic capacity to access quality health care during pregnancy.

The foregoing highlights the advantages associated with having a female household head especially as it pertains to pregnancy outcomes (stillbirths and miscarriages). This is however in sharp contrast with the results of studies conducted previously which found that female headed households are usually marked with poverty, low education and lack of household resources. Furthermore, Goebel and colleagues in 2010 stated in their study on the urban disadvantage of female headed households in relation to health outcomes in South Africa that apartheid reinforced the patriarchy that exists in most Sub-Saharan countries in South Africa (Goebel, Dodson, & Hill, 2010). This therefore suggest that patriarchy will continue to explain the gendered pattern of poverty and why women are generally disadvantaged in the country with respect to the distribution of income, job opportunities and the unfavourable socio-political environment. While studies may argue against the economic disadvantage of female headed households in South Africa, their findings may not be reflective of the true nature of female headed households in the country given the fact that about 50% of households are female headed which implies that women within these households are thriving especially with regards to their health outcomes.

The findings obtained in this study provide empirical backing that the province of residence has an association with stillbirths and miscarriage in South Africa. The result indicates that women residing in Eastern Cape and Limpopo province had a lower risk of stillbirths and miscarriages compared to the Western cape province while residing in other provinces

increased the risk of a stillbirth and miscarriage among women compared to the Western cape. A previous study suggested that province of residence is equally effective in explaining stillbirths and miscarriages given that diverse provinces may have diverse levels of economic growth (Palamuleni, Kalule-Sabiti, & Makiwane, 2007). In addition, the variations that exist among provinces may be a reflection of differences in social, economic and cultural development which further express themselves in the different levels of education, industrialization and access to health care facilities particularly maternal and child health services (Palamuleni et al., 2007). This is particularly true in the South African context as the nine provinces of South Africa are culturally heterogeneous and have exhibited different patterns of stillbirths and miscarriages which can be explained by the economic capacity, cultural and population dynamics unique to each province.

Furthermore, the breakdown of health facilities by province where the Perinatal Problem Identification Program (PPIP) exist shows that KwaZulu-Natal has the highest number of PPIP health facility (52). This is closely followed by the Eastern Cape (43) and Limpopo (35). In contrast, the Northern Cape has the least number of PPIP health facility (10) followed by the North West Province (17) (Pattinson, Rhoda, & others, 2014). It can be argued that the small number of health facility in the Northern Cape Province which offers Perinatal care services may thus explain the findings of this study which asserts that women in the Northern Cape province has the highest risk of a stillbirth and Miscarriage. With regards to access to quality health care services during pregnancy, this means that there are very few facilities in the province that provide health care to women during pregnancy leading to a low access and usage of antenatal care services and an increased risk of adverse pregnancy outcomes as pregnancy complications go unrecognized.

5.4. Discussion on household socioeconomic determinants of Stillbirths and Miscarriages in South Africa

With regards to the source of drinking water, the bivariate and multivariate results obtained in this study showed that source of drinking water in a household has a statistically significant influence on stillbirths and miscarriages among women in South Africa. The results indicated that women from households who drink water from other sources that are not piped water had a reduced risk of having a stillbirth or a miscarriage.

The findings of this study corroborates existing studies which found an association between poor quality drinking water and adverse pregnancy outcomes (Kwok, Kaufmann, & Jakariya, 2006; Milton et al., 2017; Padhi et al., 2015b; Sen & Chaudhuri, 2008). They further stated that the poor quality of drinking during pregnancy may pose a potential foetal toxicity risk and may lead to a stillbirth or miscarriage (Sen & Chaudhuri, 2008). A possible explanation for this is that piped water although treated may have been contaminated with natural occurring harmful chemicals, high doses of chemicals used for treatment and microorganisms which may increase the risk of infection and further cause downstream effects such as stillbirths and miscarriages. Furthermore, the source and poor quality of water can promote infection and induce stress during pregnancy through influencing the practice of sanitation among women in each household during pregnancy thus exposing them to poor sanitary conditions leading to an increased risk of an adverse pregnancy outcome (Padhi et al., 2015b).

As has been found before (Abdel-Latif et al., 2006; Hillemeier, Weisman, Chase, & Dyer, 2007; Kent, McClure, Zaitchik, & Gohlke, 2013b; McElroy et al., 2012), this study established that place of residence, which is regarded as geographic type in this study, has an influence on stillbirths and miscarriages. The results obtained showed that women residing in rural areas had an increased risk of a stillbirth and miscarriages compared to women who are

urban dwellers. This may be due to the fact that rural areas are marked with poverty which causes women to face unique stressors such as increased isolation, socioeconomic vulnerability and lack of access to quality health care which may be perpetrated by lack of transport and even longer travel times to cover substantial distances to health care. This can negatively influence the health seeking behaviour of women especially during pregnancy. This is mostly true in the context of South Africa as confirmed by Sibeko's study which found that rural women lack antenatal care mainly due to financial problems. This cost implication was attributed to transportation even though ANC services have been free in public hospitals since 1995 (Sibeko & Moodley, 2006).

While this is an expected finding and well documented in existing literature, it is not consistent with the findings of previous studies that reported a significant increase in the risk of stillbirths and miscarriages among women who are urban residents (Nankabirwa et al., 2011; Simonet et al., 2010). This can be attributed to the fact that living in an urban area may present significant new challenges such as overcrowding which foster the spread of diseases, lack of traditional community support and social network (Simonet et al., 2010). In addition, pregnant women living in urban areas may have poor access to traditional nutritious diets and even a possible lack of health care access due to barriers such as lack of Medical aid and are thus unable to afford private medical care. These women are then forced to use public hospitals which are more often than not overcrowded and offer low quality and inadequate care to pregnant women, thus leaving preventable health conditions and pregnancy complications unnoticed.

Wealth index covariate is another important household socioeconomic determinant of stillbirths and miscarriages that was established in this study. The result obtained in this study showed that belonging to a middle class and rich household was risk-protective against

stillbirths and miscarriages among pregnant women compared to their counterparts from poor households. This finding corresponds with a study which found that pregnant women from poor households were more likely to have an adverse pregnancy outcome than those from a rich household (Izugbara & Ngilangwa, 2010). This can be attributed to the fact that pregnant women from poor households are unable to afford and access quality maternal health care services. While been poor may hinder their utilization of adequate antenatal care services, it may also negatively affect the health seeking behaviour of pregnant women. This was evidenced by the study of Izugbara and colleague where they found that poor women suffered mistreatment when presented at formal health facilities and health care providers were generally unkind to them (Izugbara & Ngilangwa, 2010). This poor patient-provider relationship and provider inattention to poor pregnant women during consultations and hospital visits may thus discourage the uptake of formal and adequate health care services by poor pregnant women which puts them at risk of stillbirths, miscarriages and other adverse pregnancy outcomes. In addition, these women from poor household take to the services of Traditional Birth Attendants (TBAs) rather than formal antenatal care services at a hospital because they considered TBAs to be more accessible, affordable and kind to them.

Elaborating further, a study associates household poverty and poor pregnancy outcomes among women in terms of exposure to intimate partner violence. The study found that pregnant women from poor household are more likely to be physically abused by their partner (Dunkle et al., 2004). This is particularly the case in the context of South Africa and very severe among economically-disadvantaged pregnant women. A study conducted in a rural district of KwaZulu-Natal found that almost 79% of pregnant women especially those with no formal education, unemployed and from poor household are exposed to physical and psychological violence for their partners (Hoque, Hoque, & Kader, 2009). A possible reason for this is that men who are partners to these pregnant women in a poor household are

burdened with the cost associated with pregnancy which predisposes them to violent behaviour because of their inability to afford the necessary maternal care for their partner and preparations for the unborn child.

Another possible explanation for the results obtained in this study is that pregnant women from poor households may lack adequate nutrition during pregnancy which may elevate their risk of having a stillbirth and or miscarriage. This was established by a study which found that maternal nutrition plays a major role in foetal outcomes among women of poor household socioeconomic status (Darnton-Hill & Mkparu, 2015). The study further argued that the overall nutrient requirement of women is increased during pregnancy due to the needs of the pregnant woman and the foetus. This thus suggest that women from poor households who are unable to afford food that provide them with the necessary nutrient are at greater of risk of pregnancy related morbidity arising from the deficiency of certain nutrients and may further lead to foetal outcomes such as stillbirths and miscarriages. Similarly, another plausible explanation as to why women from poor households have an increased risk of stillbirths and miscarriages may be due to the heavy workload that poor women take on. Turshen Meredeth's edited book on African Women's health – which focused on Heavy workload and safe motherhood reports that in Several African communities, poverty compels women to do heavy work during pregnancy in order for them to save their income from the work to prepare for birthing (Turshen, 2000). While the aim of working heavily is to prepare to bear the financial burden of child birth, it also increases their risk of having a stillbirth, miscarriage and other negative pregnancy outcome.

5.5. Discussion on Health indicators of Stillbirths and Miscarriages in South Africa

As seen in table 4.3 and 4.4 above, Hypertension and HIV positive status which serve as health indicators were included in the Multivariate model to substantiate previous findings on factors associated with stillbirths and miscarriages in South Africa. The results obtained from this study indicate that hypertension is significantly associated with stillbirths and miscarriage. However, from the result, women who reported to be non-hypertensive had a greater risk of stillbirths and miscarriages compared to hypertensive women. This finding is in sharp contrast with a study which found that hypertensive disorders during pregnancy is associated with a higher risk of stillbirths, miscarriages and other negative outcomes of pregnancy among women who reported to be hypertensive compared to non-hypertensive women (Browne et al., 2015). Additionally, other studies established that hypertension during pregnancy increases the risk of foetal loss among South African women with pregnancy induced hypertension by exposing them to the risk other disorders due to the high blood pressure (Akolekar et al., 2011; Moodley, 2011; Muti, Tshimanga, Notion, Bangure, & Chonzi, 2015). A possible reason for this can be ascribed to the fact hypertension in itself is a risk factor certain pregnancy morbidity such as pre-eclampsia which puts women at risk of having a foetal death (stillbirths and miscarriages). It is therefore vital to state here that it is an unexpected finding for non-hypertensive women to have an increased risk of stillbirths and miscarriages as stated in the results of this study. This may be due to the fact that respondents who reported to be non-hypertensive may be larger compared to those who reported to be hypertensive in the South African General Household Survey (2010-2014) utilized for this study.

Human Immuno-Deficiency Virus (HIV) positive status was found to be significantly associated with stillbirths and miscarriages in this study from both the bivariate and

multivariate models. Results obtained further showed that respondents who reported to be HIV negative had lower risk of stillbirths and miscarriages in South Africa compared to those who reported to be HIV positive. This is not compatible with a study which found that an association exist between maternal HIV and pregnancy outcomes although no difference in stillbirths and miscarriages exist between HIV infected and uninfected women regardless of the stage of the HIV positive women (Coley et al., 2001). Interestingly, another study which focused on the predictors of stillbirths in Sub-Saharan Africa found that HIV virus was not associated with a greater risk of stillbirths and miscarriages among HIV infected women. However, decreasing CD4 cell count was inversely related to stillbirth risk (Chi et al., 2007). A plausible explanation for this lack of difference in pregnancy outcomes among women who are HIV infected and uninfected may be due to fact that women who are positive receive Ante-Retroviral drugs (ARVs) and maternal micronutrients supplements during antenatal care visit which helps in boosting their immune systems; keeping their CD4 cell count below 400 and providing their body with the required nutrients during pregnancy.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

This study set out to examine the levels and trends of stillbirths and miscarriages among women in South Africa as well as to identify the household demographic and socioeconomic factors that are associated with stillbirths and miscarriages. It found that household demographic and socioeconomic factors such maternal age, sex of household head, province of residence, source of drinking water, type of toilet facility, electricity, geographic type, household wealth index, hypertension and HIV positive status substantially determine stillbirths and miscarriages among women in South Africa. This suggests that the hypothesis tested in this study which says that there is no association between household demographic and socioeconomic factors and stillbirths and miscarriages is rejected.

This study has shown that adverse pregnancy outcomes particularly stillbirths and miscarriages still remain a persistent phenomenon across all provinces in South Africa. While the magnitude of this public health and social problem is tied to the participation of respondent's, the problem cannot be ignored even though many women who have suffered foetal death do not discuss it in the open because of the stigmatization associated with having a miscarriage and stillbirths in South Africa. Thus, this study represents women in South Africa who have suffered the loss of their pregnancy in the form of a stillbirth and miscarriage even though it does not incorporate all women.

The study addresses broadly the issue of child health and perinatal mortality in Africa. Child health issues especially mortality in Africa are relevant to development and the achievement of the 3rd Sustainable Development Goals (SDGs) which emphasizes good health and wellbeing. This study has attempted to bring to the fore the salient issue of adverse pregnancy outcomes as it pertains to child health, thus contributing to research that is lacking in Africa especially South Africa.

With regards to this study's initial research question, what are the demographic and household socioeconomic factors associated with stillbirths and miscarriages among women in South Africa; the finding is that demographic and household socioeconomic factors are indeed associated with stillbirths and miscarriages among women in South Africa. The health of a foetus, success of a pregnancy and the actual delivery of a healthy baby is linked to demographic factors such as maternal age, race, sex of household and the province of residence. The study has shown that despite higher rates of obstetric intervention, advanced maternal aged women are at greater risk of a stillbirth and miscarriage. Therefore, the recent social trend of delayed child bearing which is mainly due to the reduced marriage rate in South Africa will thus have an increasing impact on the demand for health care services and population health trends.

From this study, it was proven that racial disparity or variability in stillbirths and miscarriages highlight the overall health status needs and general health disparities of racial groups in South Africa, thus Black South African women may benefit from targeted interventions to improve pregnancy outcomes. The role of the urban-rural differential in stillbirths and miscarriages among South African women cannot be over-emphasized. As shown in this study, women residing in rural areas had poorer pregnancy outcomes. This suggests that inequality remains rife in the country, beyond racial lines, and also manifests among women residing in rural areas and in certain provinces. In addition, the contextual factors that exist in urban and rural areas may therefore foster advantages that may protect women against these birth outcomes or create disadvantages that exacerbate their risks.

This study has revealed that household socioeconomic factors are in fact contributory to stillbirths, miscarriages and other poor pregnancy outcomes in South Africa. These identified factors have shown to influence stillbirths and miscarriages directly and indirectly. It is here suggested that poor socioeconomic conditions come with myriads of stress to pregnant

women within a household in ways that even influences their behaviour towards self-care. Thus, stillbirths and miscarriages are more likely to occur if pregnant women are faced with poor socioeconomic conditions.

Based on this, it is critical for the South African government to scale up strategies that not only improve maternal health care services but also pay special attention to mother's socioeconomic factors. This is possible through a multifaceted approach that pays attention to the socioeconomic problems of poor households and addresses the negative maternal behaviour with supportive laws based on their needs and a more focused obstetric attention. Such measures may eventually result in the elimination of the socioeconomic gradient in stillbirths and miscarriages among South African women.

Although the issue of stillbirths and miscarriages as adverse pregnancy outcomes has been explored in literature, knowledge gaps exist particularly in the South African context, in gaining an all-inclusive overview in the drivers and approaches that are beneficial in the reduction of the high level of stillbirths and miscarriages. The significant contribution of this study to the body of literature is that it has highlighted the fact that stillbirths and miscarriages is considerably driven by household socioeconomic and demographic factors while cultural and contextual factors come into play.

The effort to eradicate the burden of stillbirths and miscarriages were not specifically addressed in Goal 4 and 5 of the Millennium Development Goals (MDGs) which thus played a role in the lack of achievement of the other development goals. Therefore, failure to adequately address the issue of stillbirths and miscarriages as stand-alone indicators of health and development, not just merged with perinatal mortality would hinder the strides towards achieving the SDG goals particularly goal 3 (good health and wellbeing). Thus, intensifying efforts around the reduction of foetal loss and or mortality would bring about a great deal of transformation in terms of the developmental challenges Africa faces.

Finally, this study attests that the theoretical framework that underpinned this study should be expanded to incorporate household factors in conjunction with maternal factors and environmental factors in the Mosley and Chen (1984) framework of child survival (Mosley & Chen, 1984). As stated by Mosley and Chen (1984), five categories of determinants were established such as maternal factors, environmental contaminants, nutrient deficiency, injury and personal illness control. This study thus highlights the need for an additional household factors category which will explain poor pregnancy outcomes or foetal death on its own or operate through other factors. The findings of this study thus emphasize the need of this inclusion.

6.2. Recommendations

6.2.1. Further research

This study has identified specific household demographic and socioeconomic predictors that may contribute to public discourse pertaining to the issue of stillbirths and miscarriages, which will generate scholarly research. This study thus advocates that further research be conducted to investigate the association between quality antenatal care and stillbirths and miscarriages in South Africa. This could be done by examining whether women who used high quality antenatal care versus low quality are more or less likely to have a stillbirth and or miscarriage. Quality antenatal care as the main independent variable will be constructed using the WHO guideline of ANC and the South African guideline of maternity care which takes into account the number and type of services received during each antenatal visit. The variables will be derived from questions given to respondents on whether they received all services recommended by the WHO and the South African guideline which will then be categorized into high and low quality of ANC. The findings of the study could prove extremely beneficial in establishing whether or not quality of ANC determines the outcome

of pregnancy. It could also be a needs assessment study to understand the maternal services that are lacking or fall short of the recommendations by the WHO.

Furthermore, further research could be conducted on the role of cultural practices on birth outcomes. That is, in the South African context, detailed studies that engage with cultural and ethnic norms that amplify negative birth outcomes would be of great importance in understanding the contributory role of these practices and would therefore inform necessary measures towards improving the outcomes of birth in South Africa. Cultural practices within South Africa were not considered in this study, as this study's focus was on the association between demographic and household socioeconomic factors and adverse pregnancy outcomes. However, to gain a deeper understanding of adverse pregnancy outcomes and to also develop an all-encompassing body of research, a focus as this would be useful.

Lastly, further studies conducted on the contextual determinants of stillbirths and miscarriages in South Africa using a multilevel analysis would be of utmost importance to this growing body of research. That is, a study that investigates the association between individual, household and community level variables such as distance to healthcare, community maternal level of education, community poverty inter alia to stillbirths and miscarriages would produce an all-encompassing finding on the predictors of stillbirth and miscarriages. In addition, a better understanding of the importance of characteristics of the community contexts in relation to birth outcomes would be necessary for there to be significant reduction in the levels of poor birth outcomes. Also, findings from studies as this would inform the scale up of strategies geared toward addressing contextual factors that exacerbate the risks of poor birth outcomes in South Africa.

6.2.2. Policy significance

Findings from this study have important policy significance. In terms of policy recommendation, this study advocates an increased investment in female education. Education, especially because female education plays a critical role in determining their socio-economic position and therefore represents one of the most important policy tool that can potentially address poverty. Thus, an intensified effort towards ensuring that women are educated would reduce the inherent household poverty that comes with maternal illiteracy paying particular attention to areas with very low literacy levels in South Africa. This should be done if progress is to be made in reducing the high rates of stillbirths and miscarriages in the country.

Furthermore, there is need for government at national and provincial level to scale up strategies that are aimed at improving socio-economic development in the socially and economically deprived communities through the funding of policies, programmes and interventions that are geared towards fast tracking socio-economic development which will then reduce the poverty level of households and further lead to the decline of stillbirths and miscarriages among women. These policies and programmes include National Perinatal Mortality and Morbidity committee (NAPEMMCO), Maternal, Newborn, Child, Women Health and Nutrition Plan (MNCWH) and Campaign for Accelerated Reduction in Maternal and Child mortality in Africa (CARMMA). All three programmes are aimed at reducing the maternal, newborn and child death and thus collectively strive towards combating the burden of adverse pregnancy outcomes in South Africa.

Additionally, the current infrastructural deficiencies (in terms of lack of drinkable water, poor toilet facilities and lack of electricity in a household) across provinces in South Africa which impact negatively on pregnancy outcomes as established in this study need to be urgently

addressed. Without this, significant reductions in the occurrence of stillbirths and miscarriages will remain hindered.

In the same vein, strides that will reduce stillbirths and miscarriage urban-rural differentials must include policies, programmes and interventions that address rural area disadvantage through the equitable distributions of community infrastructures such as health facilities. In addition, the government must consider sighting the health facilities in locations that are central and accessible to women in rural settings in order to reduce the cost of access, distance to the facilities and other factors which may discourage the use of these maternal health care services. Lastly, high quality maternal health care service is pertinent for the reduction of the high stillbirth and miscarriage rate in South Africa. Thus, it is imperative for efforts to be made in ensuring that the standard of maternal care given to women at health care facilities is aligned with the recommendations of the WHO and the maternal care guidelines in South Africa which emphasizes that all pregnant women receives nutritional supplementation during visits, HIV testing and counselling, maternal and foetal assessment and maternal education on pregnancy and signs of complication.

6.3. Limitations

6.3.1. Underreporting

Underreporting on foetal death especially stillbirths and miscarriages have remained persistent (Lander & others, 2006). Thus, women who do not report their stillbirths and miscarriages could be a limitation to this study. A plausible explanation could be due to stigma, taboo and embarrassment attached to being unable to produce a life birth especially given the context of this study. Another possible reason for underreporting is that both mother and the recording mechanism (health professional) may want to avoid the tedious process of registration because they are unsure of the requirements. Women may not want to

pay the required registration fee or generally not see the benefit or purpose of reporting. Furthermore, due to underreporting, there is no available information on type of stillbirth; antepartum or intrapartum. This lack of information limits this study's ability to understand which type of stillbirth occurs more and the specific factors associated although the results obtained in this study is not affected. Knowledge on this would have paramount significance for policy and programmes as each type of stillbirth is an indicator of maternal socioeconomic condition and the quality of obstetric care (Elizabeth M. McClure, Goldenberg, & Bann, 2007; Elizabeth M. McClure, Saleem, Pasha, & Goldenberg, 2009b).

6.3.2. Survey Questionnaire

Data excludes information on Antenatal care utilization, type of occupation, planned or intended pregnancy as well as maternal weight (Obesity) which would have given a better insight into the influence of obstetric care, exposure to occupational hazard and the psychological/emotional state of the mother on stillbirths and miscarriage especially in the context of South Africa. This is important as it is argued that the emotional condition of the mother is linked to the birth outcomes and survival of the child (Butchart & Villaveces, 2003). This study may be limited in scope because analyses on these variables were not performed. However, the results that emanated from this study may not be affected by the lack of information on these variables as the purpose of this study is not to investigate maternal factors but to examine household determinants of stillbirths and miscarriages.

6.3.3. Study design

The design for this study is cross-sectional hence it is difficult to establish the temporal sequence of predictors and the outcomes (stillbirths and miscarriages) thereby limiting the causal inference inherent in any cross-sectional study. That is, the direction of the association between the predictors and the outcome cannot be identified. In addition, the data used for this study are based on self-report, thus subject to recall and social desirability bias.

REFERENCES

Abdel-Latif, M. E., Bajuk, B., Oei, J., Vincent, T., Sutton, L., & Lui, K. (2006). Does rural or urban residence make a difference to neonatal outcome in premature birth? A regional study in Australia. *Archives of Disease in Childhood-Fetal and Neonatal Edition*, *91*(4), F251–F256.

Adhikari, R., & Podhisita, C. (2010). Household headship and child death: Evidence from Nepal. *BMC International Health and Human Rights*, *10*(1), 13.

Agaba, E., Mugisha, J., Atuhairwe, C., Farjando, Y., & Ngonzi, J. (2016). Factors Associated with Stillbirths at Mbarara Regional Referral Hospital. *Journal of Health, Medicine and Nursing*, *24*(0), 8–19.

Aggarwal, A. K., Jain, V., & Kumar, R. (2011). Validity of verbal autopsy for ascertaining the causes of stillbirth. *Bulletin of the World Health Organization*, *89*(1), 31–40.

Akolekar, R., Bower, S., Flack, N., Bilardo, C. M., & Nicolaides, K. H. (2011). Prediction of miscarriage and stillbirth at 11–13 weeks and the contribution of chorionic villus sampling. *Prenatal Diagnosis*, *31*(1), 38–45.

Almeida, N. K. O., Almeida, R. M., & Pedreira, C. E. (2015). Adverse perinatal outcomes for advanced maternal age: a cross-sectional study of Brazilian births. *Jornal de Pediatria*, *91*(5), 493–498.

Althabe, F., Moore, J. L., Gibbons, L., Berrueta, M., Goudar, S. S., Chomba, E., … others. (2015). Adverse maternal and perinatal outcomes in adolescent pregnancies: the Global Network's Maternal Newborn Health Registry study. *Reproductive Health*, *12*(Suppl 2), S8.

Arafa, M. A., Amine, T., & Fattah, M. A. (2007). Association of Maternal Work with Adverse Perinatal Outcome. *Canadian Journal of Public Health / Revue Canadienne de Sante'e Publique*, *98*(3), 217–221.

Ashish, K. C., Nelin, V., Wrammert, J., Ewald, U., Vitrakoti, R., Baral, G. N., & M\a alqvist, M. (2015). Risk factors for antepartum stillbirth: a case-control study in Nepal. *BMC Pregnancy & Childbirth*, *15*(1), 1.

Asiki, G., Baisley, K., Newton, R., Marions, L., Seeley, J., Kamali, A., & Smedman, L. (2015a). Adverse pregnancy outcomes in rural Uganda (1996–2013): trends and associated factors from serial cross sectional surveys. *BMC Pregnancy and Childbirth*, *15*(1), 279.

Asiki, G., Baisley, K., Newton, R., Marions, L., Seeley, J., Kamali, A., & Smedman, L. (2015b). Adverse pregnancy outcomes in rural Uganda (1996–2013): trends and associated factors from serial cross sectional surveys. *BMC Pregnancy and Childbirth*, *15*(1), 1.

Auger, N., Daniel, M., Platt, R. W., Luo, Z.-C., Wu, Y., & Choinière, R. (2008). The joint influence of marital status, interpregnancy interval, and neighborhood on small for gestational age birth: a retrospective cohort study. *BMC Pregnancy and Childbirth*, *8*, 7. https://doi.org/10.1186/1471-2393-8-7

Aune, D., Saugstad, O. D., Henriksen, T., & Tonstad, S. (2014). Maternal body mass index and the risk of fetal death, stillbirth, and infant death: a systematic review and meta-analysis. *Jama*, *311*(15), 1536–1546.

Basu, J. K., Jeketera, C. M., & Basu, D. (2010). Obesity and its outcomes among pregnant South African women. *International Journal of Gynecology & Obstetrics*, *110*(2), 101–104.

Bhati, D. K. (2014). Stillbirths: A high magnitude public health issue in India. *South East Asia Journal of Public Health*, *3*(1), 3–9.

Blencowe, H., Cousens, S., Jassir, F. B., Say, L., Chou, D., Mathers, C., … Lawn, J. E. (2016). National, regional, and worldwide estimates of stillbirth rates in 2015, with trends from 2000: a systematic analysis. *The Lancet Global Health*, *4*(2), e98–e108. https://doi.org/10.1016/S2214-109X(15)00275-2

Browne, J. L., Vissers, K. M., Antwi, E., Srofenyoh, E. K., Van der Linden, E. L., Agyepong, I. A., … Klipstein-Grobusch, K. (2015). Perinatal outcomes after hypertensive disorders in pregnancy in a low resource setting. *Tropical Medicine & International Health*, *20*(12), 1778–1786.

Bryant, A. S., Worjoloh, A., Caughey, A. B., & Washington, A. E. (2010). Racial/ethnic disparities in obstetric outcomes and care: prevalence and determinants. *American Journal of Obstetrics and Gynecology*, *202*(4), 335–343.

Burgard, S. (2004). Race and pregnancy-related care in Brazil and South Africa. *Social Science & Medicine*, *59*(6), 1127–1146.

Butchart, A., & Villaveces, A. (2003). Violence against women and the risk of infant and child mortality. *Bulletin of the World Health Organization*, *81*(1), 17–18. https://doi.org/10.1590/S0042-96862003000100005

Carolan, M., & Frankowska, D. (2011). Advanced maternal age and adverse perinatal outcome: a review of the evidence. *Midwifery*, *27*(6), 793–801.

Cates, J. E., Westreich, D., Edmonds, A., Wright, R. L., Minkoff, H., Colie, C., … others. (2015). The effects of viral load burden on pregnancy loss among HIV-infected women in the United States. *Infectious Diseases in Obstetrics and Gynecology*, *2015*. Retrieved from http://www.hindawi.com/journals/idog/2015/362357/abs/

Chi, B. H., Wang, L., Read, J. S., Taha, T. E., Sinkala, M., Brown, E. R., … Goldenberg, R. L. (2007). Predictors of stillbirth in sub-saharan Africa. *Obstetrics & Gynecology*, *110*(5), 989–997.

Coley, J. L., Msamanga, G. I., Fawzi, M. C. S., Kaaya, S., Hertzmark, E., Kapiga, S., … Fawzi, W. W. (2001). The association between maternal HIV-1 infection and pregnancy outcomes in Dar es Salaam, Tanzania. *BJOG: An International Journal of Obstetrics & Gynaecology*, *108*(11), 1125–1133.

Darnton-Hill, I., & Mkparu, U. C. (2015). Micronutrients in pregnancy in low-and middle-income countries. *Nutrients*, *7*(3), 1744–1768.

Dellicour, S., Aol, G., Ouma, P., Yan, N., Bigogo, G., Hamel, M. J., … others. (2016). Weekly miscarriage rates in a community-based prospective cohort study in rural western Kenya. *BMJ Open*, *6*(4), e011088.

Doctor, H. V. (2011). Does living in a female-headed household lower child mortality? The case of rural Nigeria. *Rural Remote Health*, *11*(2), 1635.

du Preez, A. (2012). Understanding the phenomenon of dikgaba and related health practices in pregnancy: A study among the Batswana in the rural North West Province in South Africa. *Evidence Based Midwifery-Royal College of Midwives Library*, *10*(1), 29.

du Toit-Prinsloo, L., Pickles, C., & Lombaard, H. (2016). Evaluating current knowledge of legislation and practice of obstetricians and gynaecologists in the management of fetal remains in South Africa. *SAMJ: South African Medical Journal*, *106*(4), 403–406.

Dunkle, K. L., Jewkes, R. K., Brown, H. C., Gray, G. E., McIntryre, J. A., & Harlow, S. D. (2004). Gender-based violence, relationship power, and risk of HIV infection in women attending antenatal clinics in South Africa. *The Lancet*, *363*(9419), 1415–1421.

Duong, V., Davis, B., & Falhammar, H. (2015). Pregnancy and neonatal outcomes in Indigenous Australians with diabetes in pregnancy. *World Journal of Diabetes*, *6*(6), 880.

Ezechi, O. C., Gab-Okafor, C. V., Oladele, D. A., Kalejaiye, O. O., Oke, B. O., Ohwodo, H. O., … others. (2013). Pregnancy, obstetric and neonatal outcomes in HIV positive Nigerian women. *African Journal of Reproductive Health*, *17*(3), 160–168.

Feature, S. (n.d.). Education key to preventing stillbirths. Retrieved June 24, 2017, from https://mg.co.za/article/2011-06-03-education-key-to-preventing-stillbirths/

Flenady, V., Koopmans, L., Middleton, P., Frøen, J. F., Smith, G. C., Gibbons, K., … others. (2011). Major risk factors for stillbirth in high-income countries: a systematic review and meta-analysis. *The Lancet*, *377*(9774), 1331–1340.

Frøen, J. F., Cacciatore, J., McClure, E. M., Kuti, O., Jokhio, A. H., Islam, M., … others. (2011). Stillbirths: why they matter. *The Lancet*, *377*(9774), 1353–1366.

Garcia-Subirats, I., Pérez, G., Rodríguez-Sanz, M., Muñoz, D. R., & Salvador, J. (2012). Neighborhood Inequalities in Adverse Pregnancy Outcomes in an Urban Setting in Spain: A Multilevel Approach. *Journal of Urban Health : Bulletin of the New York Academy of Medicine*, *89*(3), 447–463. https://doi.org/10.1007/s11524-011-9648-4

Gavin, A. R., Nurius, P., & Logan-Greene, P. (2012). Mediators of Adverse Birth Outcomes Among Socially Disadvantaged Women. *Journal of Women's Health*, *21*(6), 634–642. https://doi.org/10.1089/jwh.2011.2766

Gilani, I., & others. (2012). Burden of miscarriages in Azad Jammu and Kashmir: a review of determinants. *Pakistan Journal of Public Health*, *2*(3), 33–37.

Goebel, A., Dodson, B., & Hill, T. (2010). Urban advantage or urban penalty? A case study of female-headed households in a South African city. *Health & Place*, *16*(3), 573–580.

Hamid, S., Malik, A. U., & Richard, F. (2014). Stillbirth—a neglected priority: Understanding its social meaning in Pakistan. *J Pak Med Assoc*, *64*(3), 331–333.

Hillemeier, M. M., Weisman, C. S., Chase, G. A., & Dyer, A.-M. (2007). Individual and community predictors of preterm birth and low birthweight along the rural-urban continuum in central Pennsylvania. *The Journal of Rural Health*, *23*(1), 42–48.

Hofman, K. (n.d.). Stillbirths: a story of tragic neglect across the developing world. Retrieved June 24, 2017, from http://theconversation.com/stillbirths-a-story-of-tragic-neglect-across-the-developing-world-44455

Hoque, M. E., Hoque, M., & Kader, S. B. (2009). Prevalence and experience of domestic violence among rural pregnant women in KwaZulu-Natal, South Africa. *Southern African Journal of Epidemiology and Infection*, *24*(4), 34–37.

Hosken, G. (n.d.). Fight for burial of stillborn babies. Retrieved February 22, 2017, from http://www.timeslive.co.za/thetimes/2016/01/28/Fight-for-burial-of-stillborn-babies1

Hure, A. J., Powers, J. R., Mishra, G. D., Herbert, D. L., Byles, J. E., & Loxton, D. (2012). Miscarriage, preterm delivery, and stillbirth: large variations in rates within a cohort of Australian women. *PLoS One*, *7*(5), e37109.

Izugbara, C. O., & Ngilangwa, D. P. (2010). Women, poverty and adverse maternal outcomes in Nairobi, Kenya. *BMC Women's Health*, *10*(1), 33.

Jansen, P. W., Tiemeier, H., Verhulst, F. C., Burdorf, A., Jaddoe, V. W. V., Hofman, A., … Raat, H. (2010). Employment status and the risk of pregnancy complications: the Generation R Study. *Occupational and Environmental Medicine*, *67*(6), 387–394.

Kenny, L. C., Lavender, T., McNamee, R., O'Neill, S. M., Mills, T., & Khashan, A. S. (2013). Advanced Maternal Age and Adverse Pregnancy Outcome: Evidence from a Large Contemporary Cohort. *PLoS ONE*, *8*(2). https://doi.org/10.1371/journal.pone.0056583

Kent, S. T., McClure, L. A., Zaitchik, B. F., & Gohlke, J. M. (2013a). Area-level risk factors for adverse birth outcomes: trends in urban and rural settings. *BMC Pregnancy and Childbirth*, *13*(1), 1.

Kent, S. T., McClure, L. A., Zaitchik, B. F., & Gohlke, J. M. (2013b). Area-level risk factors for adverse birth outcomes: trends in urban and rural settings. *BMC Pregnancy and Childbirth*, *13*(1), 129.

Khalil, A., Rezende, J., Akolekar, R., Syngelaki, A., & Nicolaides, K. H. (2013). Maternal racial origin and adverse pregnancy outcome: a cohort study. *Ultrasound in Obstetrics & Gynecology*, *41*(3), 278–285.

Khojasteh, F., Arbabisarjou, A., Boryri, T., Safarzadeh, A., & Pourkahkhaei, M. (2015). The Relationship between Maternal Employment Status and Pregnancy Outcomes. *Global Journal of Health Science*, *8*(9), 37.

Kiely, M., El-Mohandes, A. A. E., Gantz, M. G., Chowdhury, D., Thornberry, J. S., & El-Khorazaty, M. N. (2011). Understanding the Association of Biomedical, Psychosocial and Behavioral Risks with Adverse Pregnancy Outcomes. *Maternal and Child Health Journal*, *15*(Suppl 1), 85–95. https://doi.org/10.1007/s10995-011-0856-z

Kim, H.-Y., Kasonde, P., Mwiya, M., Thea, D. M., Kankasa, C., Sinkala, M., … Kuhn, L. (2012). Pregnancy loss and role of infant HIV status on perinatal mortality among HIV-infected women. *BMC Pediatrics*, *12*(1), 1.

Ko, G., Shah, P., Kovacs, L., Ojah, C., Riley, P., Lee, S. K., & Network, C. N. (2012). Neighbourhood Income Level and Outcomes of Extremely Preterm Neonates: Protection Conferred by a Universal Health Care System. *Canadian Journal of Public Health / Revue Canadienne de Santé Publique*, *103*(6), e443–e447.

Kochar, P. S., Dandona, R., Kumar, G. A., & Dandona, L. (2014). Population-based estimates of still birth, induced abortion and miscarriage in the Indian state of Bihar. *BMC Pregnancy and Childbirth*, *14*(1), 1.

Kupka, R., Kassaye, T., Saathoff, E., Hertzmark, E., Msamanga, G. I., & Fawzi, W. W. (2009). Predictors of stillbirth among HIV-infected Tanzanian women. *Acta Obstetricia et Gynecologica Scandinavica*, *88*(5), 584–592.

Kwok, R. K., Kaufmann, R. B., & Jakariya, M. (2006). Arsenic in drinking-water and reproductive health outcomes: a study of participants in the Bangladesh Integrated Nutrition Programme. *Journal of Health, Population and Nutrition*, 190–205.

Lander, T., & others. (2006). *Neonatal and perinatal mortality: country, regional and global estimates.* World Health Organization. Retrieved from https://www.cabdirect.org/cabdirect/abstract/20063202934

Laopaiboon, M., Lumbiganon, P., Intarut, N., Mori, R., Ganchimeg, T., Vogel, J. P., … Gülmezoglu, A. M. (2014). Advanced maternal age and pregnancy outcomes: a multicountry assessment. *BJOG: An International Journal of Obstetrics & Gynaecology*, *121*(s1), 49–56.

Lawn, J. E., Blencowe, H., Pattinson, R., Cousens, S., Kumar, R., Ibiebele, I., … others. (2011). Stillbirths: Where? When? Why? How to make the data count? *The Lancet*, *377*(9775), 1448–1463.

Lawn, J. E., Lee, A. C., Kinney, M., Sibley, L., Carlo, W. A., Paul, V. K., … Darmstadt, G. L. (2009). Two million intrapartum-related stillbirths and neonatal deaths: Where, why, and what can be done? *International Journal of Gynecology & Obstetrics*, *107*(Supplement). Retrieved from http://onlinelibrary.wiley.com/doi/10.1016/j.ijgo.2009.07.016/full

Lawn, J. E., Yakoob, M. Y., Haws, R. A., Soomro, T., Darmstadt, G. L., & Bhutta, Z. A. (2009a). 3.2 million stillbirths: epidemiology and overview of the evidence review. *BMC Pregnancy and Childbirth*, *9*(1), 1.

Lawn, J. E., Yakoob, M. Y., Haws, R. A., Soomro, T., Darmstadt, G. L., & Bhutta, Z. A. (2009b). 3.2 million stillbirths: epidemiology and overview of the evidence review. *BMC Pregnancy and Childbirth*, *9*(1), S2.

Luque-Fernández, M. Á., Lone, N. I., Gutiérrez-Garitano, I., & Bueno-Cavanillas, A. (2012). Stillbirth risk by maternal socio-economic status and country of origin: a population-based observational study in Spain, 2007–08. *The European Journal of Public Health*, *22*(4), 524–529.

McClure, E. M., Goldenberg, R. L., & Bann, C. M. (2007). Maternal mortality, stillbirth and measures of obstetric care in developing and developed countries. *International Journal of Gynecology & Obstetrics*, *96*(2), 139–146.

McClure, E. M., Nalubamba-Phiri, M., & Goldenberg, R. L. (2006). Stillbirth in developing countries. *International Journal of Gynecology & Obstetrics*, *94*(2), 82–90.

McClure, E. M., Pasha, O., Goudar, S. S., Chomba, E., Garces, A., Tshefu, A., … others. (2011). Epidemiology of stillbirth in low-middle income countries: A Global Network Study. *Acta Obstetricia et Gynecologica Scandinavica*, *90*(12), 1379–1385.

McClure, E. M., Saleem, S., Goudar, S. S., Moore, J. L., Garces, A., Esamai, F., … others. (2015). Stillbirth rates in low-middle income countries 2010-2013: a population-based, multi-country study from the Global Network. *Reproductive Health*, *12*(2), S7.

McClure, E. M., Saleem, S., Pasha, O., & Goldenberg, R. L. (2009a). Stillbirth in developing countries: a review of causes, risk factors and prevention strategies. *The Journal of Maternal-Fetal & Neonatal Medicine*, *22*(3), 183–190.

McClure, E. M., Saleem, S., Pasha, O., & Goldenberg, R. L. (2009b). Stillbirth in developing countries: a review of causes, risk factors and prevention strategies. *The Journal of Maternal-Fetal & Neonatal Medicine*, *22*(3), 183–190.

McElroy, J. A., Bloom, T., Moore, K., Geden, B., Everett, K., & Bullock, L. F. (2012). Perinatal mortality and adverse pregnancy outcomes in a low-income rural population of women who smoke. *Birth Defects Research Part A: Clinical and Molecular Teratology*, *94*(4), 223–229.

Michalow, J., Chola, L., McGee, S., Tugendhaft, A., Pattinson, R., Kerber, K., & Hofman, K. (2015). Triple return on investment: the cost and impact of 13 interventions that could prevent stillbirths and save the lives of mothers and babies in South Africa. *BMC Pregnancy and Childbirth*, *15*(1), 1.

Milton, A. H., Hussain, S., Akter, S., Rahman, M., Mouly, T. A., & Mitchell, K. (2017). A Review of the Effects of Chronic Arsenic Exposure on Adverse Pregnancy Outcomes. *International Journal of Environmental Research and Public Health*, *14*(6), 556.

Mogawane, M. A., Mothiba, T. M., & Malema, R. N. (2015). Indigenous practices of pregnant women at Dilokong hospital in Limpopo province, South Africa. *Curationis*, *38*(2), 1–8.

Moodley, J. (2011). Potentially increasing rates of hypertension in women of childbearing age and during pregnancy-be prepared! *Cardiovascular Journal of Africa*, *22*(6), 330–334.

Mosley, W. H., & Chen, L. C. (1984). An Analytical Framework for the Study of Child Survival in Developing Countries. *Population and Development Review*, *10*, 25–45. https://doi.org/10.2307/2807954

Mukherjee, S., Velez Edwards, D. R., Baird, D. D., Savitz, D. A., & Hartmann, K. E. (2013). Risk of miscarriage among black women and white women in a US Prospective Cohort Study. *American Journal of Epidemiology*, *177*(11), 1271–1278.

Muti, M., Tshimanga, M., Notion, G. T., Bangure, D., & Chonzi, P. (2015). Prevalence of pregnancy induced hypertension and pregnancy outcomes among women seeking maternity services in Harare, Zimbabwe. *BMC Cardiovascular Disorders*, *15*(1), 111.

Nankabirwa, V., Tumwine, J. K., Tylleskär, T., Nankunda, J., Sommerfelt, H., Consortium, P. E. R., & others. (2011). Perinatal mortality in eastern Uganda: a community based prospective cohort study. *PloS One*, *6*(5), e19674.

Njim, T. N., & others. (2016). Late Pregnancy Outcomes among Women who Attended and Women who did not Attend First Trimester Antenatal Care Visits in a Suburban Regional Hospital in Cameroon. *International Journal of MCH and AIDS (IJMA)*, *5*(1), 14–23.

Oti, S. O., & Odimegwu, C. (2011). Perinatal mortality in Nigeria: do place of delivery and delivery assistants matter. *Open Demography J*, *4*, 1–10.

Padhi, B. K., Baker, K. K., Dutta, A., Cumming, O., Freeman, M. C., Satpathy, R., … Panigrahi, P. (2015a). Risk of Adverse Pregnancy Outcomes among Women Practicing Poor Sanitation in Rural India: A Population-Based Prospective Cohort Study. *PLOS Medicine*, *12*(7), e1001851. https://doi.org/10.1371/journal.pmed.1001851

Padhi, B. K., Baker, K. K., Dutta, A., Cumming, O., Freeman, M. C., Satpathy, R., … Panigrahi, P. (2015b). Risk of Adverse Pregnancy Outcomes among Women Practicing Poor Sanitation in Rural India: A Population-Based Prospective Cohort Study. *PLoS Med*, *12*(7), e1001851.

Palamuleni, M., Kalule-Sabiti, I., & Makiwane, M. (2007). Fertility and childbearing in South Africa. *Families and Households in Post-Apartheid South Africa*, 113–133.

Pattinson, R. C., Rhoda, N., & others. (2014). Saving babies 2012-2013: Ninth report on perinatal care in South Africa. *Pretoria: Department of Health*.

Phillips, J., & Millum, J. (2015). Valuing stillbirths. *Bioethics*, *29*(6), 413–423.

Pires, G., Rosa, M., Zangarote, M., & Chicumbe, S. (2016). Determinants of stillbirths occurred in health facilities in Zambezia province, Mozambique (2013-2014). *Revista Brasileira de Saúde Materno Infantil*, *16*(4), 415–420.

Plackett, R. L. (1983). Karl Pearson and the chi-squared test. *International Statistical Review/Revue Internationale de Statistique*, 59–72.

Posel, D. R. (2001). INTRA-FAMILY TRANSFERS AND INCOME-POOLING. *South African Journal of Economics*, *69*(3), 501–528.

Reime, B., Jacob, C., & Wenzlaff, P. (2009). Is parental unemployment related to an increased risk for stillbirths? *Journal of Public Health*, *17*(6), 363–369.

Rollins, N. C., Coovadia, H. M., Bland, R. M., Coutsoudis, A., Bennish, M. L., Patel, D., & Newell, M.-L. (2007). Pregnancy outcomes in HIV-infected and uninfected women in rural and urban South Africa. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *44*(3), 321–328.

Rom, A. L., Mortensen, L. H., Cnattingius, S., Arntzen, A., Gissler, M., & Andersen, A.-M. N. (2012). A comparative study of educational inequality in the risk of stillbirth in Denmark, Finland, Norway and Sweden 1981–2000. *Journal of Epidemiology and Community Health*, *66*(3), 240–246.

Salihu, H. M. (2011). Maternal obesity and stillbirth. In *Seminars in perinatology* (Vol. 35, pp. 340–344). Elsevier. Retrieved from http://www.sciencedirect.com/science/article/pii/S0146000511001066

Schatz, E., Madhavan, S., & Williams, J. (2011). Female-headed households contending with AIDS-related hardship in rural South Africa. *Health & Place*, *17*(2), 598–605.

Sedgh, G., Larson, U., Spiegelman, D., Msamanga, G., & Fawzi, W. W. (2006). HIV-1 infection and fertility in Dar es Salaam, Tanzania. *African Journal of Reproductive Health*, *10*(3), 41–52.

Sen, J., & Chaudhuri, A. (2008). Arsenic exposure through drinking water and its effect on pregnancy outcome in Bengali women. *Archives of Industrial Hygiene and Toxicology*, *59*(4), 271–275.

Sibeko, S., & Moodley, J. (2006). Healthcare attendance patterns by pregnant women in Durban, South Africa. *South African Family Practice*, *48*(10), 1.

Silverman, J. G., Gupta, J., Decker, M. R., Kapur, N., & Raj, A. (2007). Intimate partner violence and unwanted pregnancy, miscarriage, induced abortion, and stillbirth among a national sample of Bangladeshi women. *BJOG: An International Journal of Obstetrics & Gynaecology*, *114*(10), 1246–1252.

Simonet, F., Wilkins, R., Heaman, M., Smylie, J., Martens, P., Mchugh, N. G., … Luo, Z.-C. (2010). Urban living is not associated with better birth and infant outcomes among Inuit and First Nations in Quebec. *The Open Women's Health Journal*, *4*, 25.

Stringer, E. M., Vwalika, B., Killam, W. P., Giganti, M. J., Mbewe, R., Chi, B. H., … Stringer, J. S. (2011). Determinants of stillbirth in Zambia. *Obstetrics & Gynecology*, *117*(5), 1151–1159.

Tachiweyika, E., Gombe, N., Shambira, G., Chadambuka, A., Tshimamga, M., & Zizhou, S. (2011). Determinants of perinatal mortality in Marondera district, Mashonaland East Province of Zimbabwe, 2009: a case control study. *Pan African Medical Journal*, *8*(1). Retrieved from http://www.ajol.info/index.php/pamj/article/view/71054

Tshibumbu, D. D., & Blitz, J. (2016). Modifiable antenatal risk factors for stillbirth amongst pregnant women in the Omusati region, Namibia. *African Journal of Primary Health Care & Family Medicine*, *8*(1), 1–6.

Turnbull, E., Lembalemba, M. K., Brad Guffey, M., Bolton-Moore, C., Mubiana-Mbewe, M., Chintu, N., … others. (2011). Causes of stillbirth, neonatal death and early childhood death in rural Zambia by verbal autopsy assessments. *Tropical Medicine & International Health*, *16*(7), 894–901.

Turshen, M. (2000). *African women's health*. Africa World Press. Retrieved from https://books.google.com/books?hl=en&lr=&id=Sdx78njl-xYC&oi=fnd&pg=PR7&dq=+%22African+Women%27s+Health%22+Meredeth+Turshen&ots=LpLzF1aq3e&sig=MDtd5Gjxyw4G0Q7yEZ0udsV5ZQ0

Van der Kooi, R., & Theobald, S. (2006). Traditional medicine in late pregnancy and labour: perceptions of Kgaba remedies amongst the Tswana in South Africa. *African Journal of Traditional, Complementary and Alternative Medicines (AJTCAM)*, *3*(1), 11–22.

Vyas, S., & Kumaranayake, L. (2006). Constructing socio-economic status indices: how to use principal components analysis. *Health Policy and Planning*, *21*(6), 459–468.

Wedi, C. O., Kirtley, S., Hopewell, S., Corrigan, R., Kennedy, S. H., & Hemelaar, J. (2016a). Perinatal outcomes associated with maternal HIV infection: a systematic review and meta-analysis. *The Lancet HIV*, *3*(1), e33–e48.

Wedi, C. O., Kirtley, S., Hopewell, S., Corrigan, R., Kennedy, S. H., & Hemelaar, J. (2016b). Perinatal outcomes associated with maternal HIV infection: a systematic review and meta-analysis. *The Lancet HIV*, *3*(1), e33–e48.

Yakoob, M. Y., Lawn, J. E., Darmstadt, G. L., & Bhutta, Z. A. (2010). Stillbirths: epidemiology, evidence, and priorities for action. In *Seminars in perinatology* (Vol. 34, pp. 387–394). Elsevier. Retrieved from http://www.sciencedirect.com/science/article/pii/S0146000510001102

Zain, N. M., Low, W.-Y., & Othman, S. (2015). Impact of Maternal Marital Status on Birth Outcomes Among Young Malaysian Women A Prospective Cohort Study. *Asia-Pacific Journal of Public Health*, *27*(3), 335–347.