EFFECTS OF SOCIOECONOMIC FACTORS ON SUBOPTIMAL BREASTFEEDING PRACTICES AMONG WOMEN IN ZAMBIA

Master of Arts (Economics) Thesis

By

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DECLARATION

I the undersigned hereby declare that this thesis is my own original work and that it has never been submitted, for similar purposes, to any University or any institution of higher learning. Acknowledgements have been duly made where other people's work has been used. I, therefore, remain fully responsible for all errors herein.

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Name

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Date

STATEMENT OF APPROVAL

The undersigned certify that this thesis represents the student's own work and effort. It has, therefore, been submitted with our approval.

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DEDICATION

To my dear late mum (Mary Namwawa Kaela) may her soul rest in perfect peace

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ABSTRACT

The overall objective of this study was to investigate the effect of socioeconomic factors on suboptimal breastfeeding practices among women in Zambia. The study used data from the 2007 Zambia Demographic and Health Survey to examine selected socioeconomic factors of having a mother feed an infant something other than breast milk before reaching the age of six months. The study chose to study suboptimal breastfeeding because of the effects that it has on infant morbidity and mortality and ultimately child health status in a country. The study employed a partial proportional odds model due to the order and categorical nature of the dependent variable. Discussion of the results is based on marginal effects but both standard coefficients and marginal effects are presented.

Analysis of the study shows that almost all mothers breastfed their children (99%) but apparent differences exist in breastfeeding patterns where 61% of the women breastfed exclusively, 30.1% breastfed partially while 8.1% breastfed predominantly. With exclusive breastfeeding as the optimal breastfeeding practice, factors associated with suboptimal infant breastfeeding practices in the country include attainment of secondary education by the mothers, the mother being in middle and poor household wealth status. The study also shows that in Zambia child's age, marital status of the mother's and place of residence being among the control variables used in the study are major factors affecting choice of suboptimal breastfeeding practices.

The study indicates poor adherence to WHO recommendations for breastfeeding practices and thus, there is need for child breastfeeding education at all levels in society. Improvement in education and wealth status for women will empower women to make right health choices for their children. Further research should pay attention to other factors such as social status, cultural factors and mother's knowledge of recommendations and attitude towards the breastfeeding practices.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
ART	Antiretroviral Therapy
ARV	Anti-Retroviral Drug
ASE	Asymptotic Standard Error
BFHI	Baby Friendly Hospital Initiative
CSO	Central Statistics Office
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
LCMS	Living Conditions and Monitoring Survey
MDG	Millennium Development Goal
MOH	Ministry of Health
NCDs	Non-Communicable Diseases
OLS	Ordinary Least Squares
PDR	People's Democratic Republic
UNICEF	United Nations Children's Fund
VIF	Variance Inflation Factor
WHO	World Health Organization
ZDHS	Zambia Demography and Health Survey

CHAPTER ONE
INTRODUCTION

1.1 Overview

This study focuses on the effects that selected socioeconomic factors have on suboptimal breastfeeding practices among women in Zambia. It assesses whether employment status, wealth status and education affect the choice of breastfeeding practices among women in Zambia for infants below the age of six months. This chapter outlines the background of the study. It provides an overview of the potential mechanisms through which breastfeeding affects children's outcomes especially the importance of breastfeeding to child health. The chapter also states the problem statement, objectives of the study, hypotheses tested and significance of the study.

1.2 Background of the study

The health of a country's population is influenced dramatically by the level and type of economic activity and economic policies. The health of children just like the general health of the population is influenced by many factors among them, the availability of effective health care services which require commitment of both private and public resources. Health care is only but one of the broad arrays of the determinants of health. Thus, spending on health care is only one type of investment in child health. Empirical evidence from different studies has shown the health benefits, protective effects and economic benefits of breastfeeding signifying the importance of promoting and supporting breastfeeding. Breastfeeding can thus be seen as one other investment in child health besides health care that can help reduce child morbidity and mortality (being indicators of child health) and enhance child survival.

Breastfeeding has well established short term and long term health benefits and protective effects, particularly the reduction in morbidity and mortality due to infectious diseases in childhood. A handful of existing studies in public health and epidemiology (Leòn-Cara et al, 2002; Bahl et al, 2005; Black et al, 2013; Edmond, 2007, Lauer et al, 2006) have shown that breastfeeding substantially lowers the risk of death from infectious diseases in

the first two years of life. According to other studies, (Horta and Victoria, 2007; Arenz et al, 2004; Ip et al, 2007, Owen et al, 2006), breastfeeding helps prevent gastrointestinal and respiratory illness and infections as well as certain immunological disorders. It also reduces the likelihood of developing certain serious chronic adult illness such as multiple sclerosis, obesity, cardiovascular diseases, diabetes and cancer. Studies have also shown that breastfeeding enhances intellectual, neurological, psychomotor and social development and is correlated with the development of fewer dental caries among breastfed children.

It is therefore evident that support and promotion of breastfeeding is an effective child health intervention that helps to reduce the risk of morbidity and mortality and enhance child survival. While recognizing that breastfeeding is one of the core determinants of child health, it is only appropriate and optimal breastfeeding practices that would significantly help in reducing the risk of illness and death among infants and enhance child health. Nevertheless, many infants in developing countries including Zambia are either not breastfed or are exposed to suboptimal breastfeeding practices that put them at risk of illness and death.

Using scientific evidence of the health benefits and protective effects of breastfeeding, the World Health Organization (2003) recommended initiation of breastfeeding within one hour of birth, exclusive breastfeeding for the first six months of life and continued breastfeeding for two years and beyond along with nutritionally adequate, safe, age appropriate, responsive complementary feeding starting after six months as the optimal breastfeeding practices. Any deviations from the recommendations are suboptimal breastfeeding practices which put children at risk of illness and even premature death.

High infant morbidity and mortality are of concern because they have impacts on households, firms and the economy at large. Infant morbidity and mortality cause and exacerbate poverty mainly by exerting a high cost burden to households and even the economy as a whole (Hanmer, 2003). The major household burdens range from medical expenses to loss of income during illness and care giving to infants in the case of illness.

Worse still, the impoverishment that comes with coping strategies adopted by the poor like selling off their assets as important (and sometimes scarce) as land and domestic animals is quite devastating. This is because children who are exposed to suboptimal breastfeeding have a higher risk of suffering from certain illnesses and premature death. Infant morbidity and mortality therefore has far reaching welfare catastrophes leading to vulnerability especially for poor families.

There are also other indirect effects on the household through medical and non-medical costs like transport. In the case of death, the premature and untimely death of children and the associated funeral costs are quite impoverishing too. In addition, the impact of poor child health on households is most impoverishing owing to its inter-temporal nature given that early childhood health has an effect on adulthood health which also affects education achievement and ultimately affects human capital (Richards et al, 2002). According to Belli et al (2005), better childhood health results in better educated and more productive adults and sets in motion favourable demographic changes. Therefore, safeguarding health during childhood is more important than at any other age because poor health during children's early years is likely to permanently impair them over the course of their life. Poor health is also a mechanism for the intergenerational transmission of poverty as productivity and future income streams are also affected in the long run.

Infant and under-five mortality rates have been declining in Zambia in the past two decades. The child mortality rates however, are said to still be unacceptably high and thus the observed declines in rates are insufficient and likely to prevent the achievement of the fourth Millennium Development Goal (MDG) of reducing child mortality by two thirds between 1990 and 2015 (MDG Country Report, 2013). Among the factors highlighted to have affected the rates is the exposure of children to suboptimal breastfeeding practices. Therefore, with the impacts that high infant morbidity and mortality rates have on households and the whole economy, optimal breastfeeding as a preventive measure is worth the investment even at household level.

The government of Zambia is committed towards the improvement and promotion of child health as well as towards achieving the Millennium Development Goal (United Nations Statistics Division, 2005). Therefore, the Zambian government has endorsed various international documents including the WHO infant feeding recommendations and the Baby Friendly Hospital Initiative (BFHI) which is based on the ten steps to successful breastfeeding and provides the foundation for optimizing support in health facilities providing services for mothers and babies (Zambia Country Assessment Report, 2008). With the BFHI initiative most health workers have been trained as master-trainers in lactation management for all hospitals in the country. The use of health workers has provided mothers with early support for exclusive breastfeeding for infants below the age of six months. All these explained efforts have been aimed at contributing to the reduction in infant and child morbidity and mortality and enhance child survival.

In Zambia, breastfeeding is traditionally widely practiced; however, other social, demographic, cultural, economic and medical factors have influenced the traditions of breastfeeding which has resulted in suboptimal breastfeeding practices. Many mothers introduce solid food, liquid food or formula to their infants as early as one month, while other mothers never even initiate breastfeeding for their infants (Fjeld et al, 2008) putting children at risk of illness and death. WHO (2003) also reports that inappropriate feeding practices which includes suboptimal breastfeeding practices and their consequences are major obstacles to sustainable socioeconomic development and that governments cannot be successful in any significant long term sense until optimal child growth and development through appropriate feeding practices are ensured.

This study therefore, aims at investigating the effects that selected socioeconomic factors have on suboptimal breastfeeding practices among women in Zambia for infants below the age of six months in relation to the World Health Organization recommendations. Following the recommendations, the optimal breastfeeding practice for infants below six months is exclusive breastfeeding.

1.3 Problem statement and justification

It is a major concern that despite many programmes and health interventions aimed at reducing infant morbidity and mortality especially through the promotion of optimal breastfeeding practices, the rates still remain significantly high which poses a great challenge for child health in Zambia. Probably this can be demystified by the fact that women in Zambia still expose their children to suboptimal breastfeeding practices which has continued to put the infants at risk of illness and death. Generally, breastfeeding is a common practice across all subgroups of women in Zambia and the nation has made substantial improvement in compliance with the WHO recommendations relating to exclusive breastfeeding. This is evidenced by the increase in the proportion of children under the age of six months that are exclusively breastfed from 26% in 1996 to 40% and to 61% as shown in the 2001-2002 ZDHS and 2007 ZDHS. But 30.2% are partially breastfed, 8.1% are predominantly breastfed and 0.8% not breastfed at all. Although exclusive breastfeeding is widely practiced only younger children are more likely to be exclusively breastfed that is, 86% of infants below two months are exclusively breastfed, compared with 35% of infants aged 4-5 months, (CSO, 2009). If at least 90% of children were exclusively breastfed for the full first six months of life, the potential reduction in mortality would be higher and child health improved. Fjeld et al (2008) in the study showed that giving only breast milk and no water or complementary foods to infants is not feasible even if most mothers have knowledge of the benefits of exclusive breastfeeding. Most mothers practice mixed feeding putting children at risk of illness affecting their health.

The government of Zambia being committed to the promotion of child health has abolished user fees for all maternal and child health services. This means that with high rates of preventable illness and death, the limited human, financial and material resources available in the health sector are overstretched leading to more finances needed for health care services provision and thus, hindering the use of the resources on other economic development investments (MOH, 2010; LCMS, 2010). Most of the health facilities also lack essential drugs and medical supplies forcing households to purchase drugs from

pharmacies and alternatively accessing child health care from private hospitals leading to high catastrophic expenditures and the poor are the ones that are affected much.

However, one major challenge with regards to the interventions directed at reducing infant morbidity and mortality in Zambia especially those aimed at promoting exclusive breastfeeding is that the interventions are largely centred within the health sector neglecting other sectors that would have an impact on breastfeeding practices. Mothers are unlikely to change behaviour based on health interventions alone most likely other external factors have a strong influence on infant feeding practices which need to be addressed to achieve the intended goals. WHO (2012) ascertains that health interventions alone are just one of the interventions to increase optimal breastfeeding. There is need for multi-sector action to enhance optimal breastfeeding.

Underpinning this study, too, is the fact that though many studies have investigated determinants that affect breastfeeding practices especially exclusive breastfeeding and in the context of HIV and AIDS in Zambia (Fjeld et al, 2008; Kaliwile and Michelo, 2010; Chisenga et al, 2011; Besa, 2004), the effects of socioeconomic factors on suboptimal breastfeeding practices for infants under six months to my knowledge has not been investigated explicitly especially using econometric analysis. There is evidence from other African and developing countries (Kimani-Murage et al, 2011; Lauer et al., 2004; Pascale et al, 2007) that among other factors, socioeconomic factors have a significant effect on breastfeeding practices especially intensity and duration. Therefore, this study investigates socioeconomic factors that influence the breastfeeding practices for infants below six months of age among women in Zambia so as to provide a basis to incorporate interventions that will promote and encourage optimal breastfeeding practices in policies of other sectors. It is also hoped that this study's outcome will contribute to the growing body of scientific knowledge on infant breastfeeding practices and how to design and position interventions. Furthermore, the study will serve as a basis for future research.

1.4 Objectives of the study

1.4.1 General objective

The main objective of the study is to investigate the effect of socioeconomic factors on suboptimal breastfeeding practices among women in Zambia.

1.4.2 Specific objectives

(i) To estimate the influence of education level on the choice of suboptimal breastfeeding practices.

(ii) To estimate the influence of wealth status on the choice of suboptimal breastfeeding practices.

(iii) To estimate the influence of employment status on the choice of suboptimal breastfeeding practices.

1.5 Hypotheses of the study

The above objectives are achieved by testing the following null hypotheses:

(i) Education level does not influence the choice of suboptimal breastfeeding practices.

(ii) Wealth status does not influence the choice of suboptimal breastfeeding practices.

(iii) Employment status does not influence the choice of suboptimal breastfeeding practices.

1.6 Organization of the paper

The remaining part of the thesis consists of five chapters. Chapter two gives an overview of infant and child health and breastfeeding practices in Zambia as well as the general benefits of breastfeeding as shown by other studies. Chapter three reviews both theoretical and empirical literature. Chapter four addresses the details of the methodology to be used in the study where as the results are presented and discussed in chapter five. Finally, chapter six concludes the study and outlines some policy implications.

CHAPTER TWO
INFANT AND CHILD HEALTH IN ZAMBIA

2.1 Introduction

This chapter provides an overview of infant and child health in Zambia looking at child health indicators and also looks at the breastfeeding practices among women in Zambia. It also gives a brief highlight of the general health benefits and protective effects of breastfeeding especially the important role that optimal breastfeeding plays in enhancing child health and hence the need to invest in child health through supporting and promoting optimal breastfeeding.

2.2 Overview of child health indicators

The most important child health indicators are neonatal, infant and child mortality rates. Estimates of these rates give an overall picture of child health, nutrition and quality of life. These indicators are also a reflection of socioeconomic status and socioeconomic development of a country since infants, more than any other age group of a population; depend heavily on the socioeconomic conditions of their environment for survival. Thus, the level of infant and child mortality would present a measure of how well a society meets the needs of its people (Ahmad, 2000). Among other interventions to help improve child health and survival, a national population policy was developed in 1984 which was targeted at reducing infant mortality rate from 97 to 65 deaths per 1000 live births in 1990 and by 2000 respectively and to 50 deaths per 1000 live birth by 2015 (MOH, 2007). Despite having this strategic vision, children in the country still continue to suffer from preventable diseases which are reflected in high morbidity and mortality rates.

2.2.1 Infant and child morbidity and mortality rates

In recent years, common diseases that have led to high infant and child morbidity and mortality rates in Zambia have been complications arising during pregnancy and birth, malaria, diarrhoea, respiratory infection, anaemia, pneumonia and malnutrition. HIV and AIDS have also contributed highly to the childhood deaths. Figure 1 below shows the leading causes of death from HMIS data (2008):

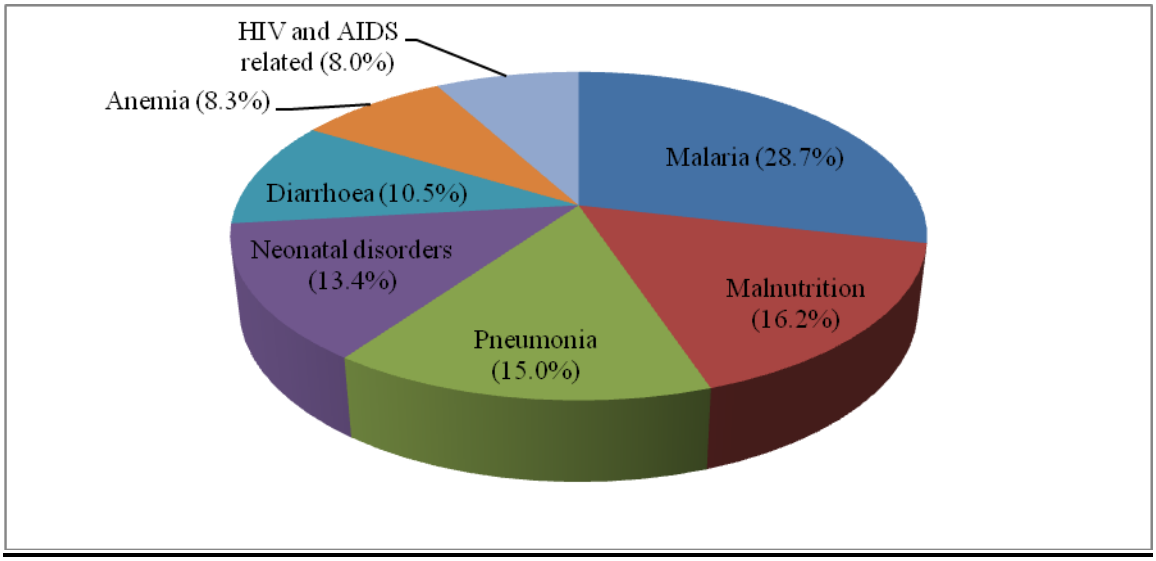

Figure 1: Major causes of infant and child morbidity and mortality in Zambia (HMIS 2008)

Table 1 below shows the trends in early childhood indicators. The last decades have seen a decrease in childhood mortality rates with under-five mortality rate declining from 190.7 to 168 and to 119 deaths per 1000 live births in 1992, 2002 and 2007 respectively (CSO, 1992-2007 ZDHS). However, according to the Living Conditions Monitoring Survey, the rate increased to 137.6 in 2010. A similar pattern has been observed with infant mortality rate which has declined from 107.2 in 1992 to 95 in 2002 to 70 in 2007 and then to 76.2 deaths per 1000 live births in 2010, (LCMS, 2010). Despite the fact that the reductions have been significant, the rates are still unacceptably high and this calls for further efforts in child health interventions.

Table 1: Trends in early childhood indicators

Survey	Approximate calendar period	Neonatal mortality rate	Infant mortality rate	Under-five mortality
ZDHS 1992	1987-1991	43	107.2	190.7
ZDHS 1996	1992-1996	35	109	197
ZDHS 2001-2002	1997-2001	37	95	168
ZDHS 2007	2003-2007	34	70	119
LCMS	2010	27[1]	76.2	137.6

Source: Mortality rates from CSO (1992-2007 from ZDHS and 2010 from LCMS)

[1] Levels and trends in Child Mortality, UNICEF, 2012

2.2.2 Proposed interventions

The first years of life are the most important for promoting growth, development and optimal health for every child. It is therefore this period that is critical for intervention strategies as it affects even the cognitive ability of a child in the later years (Victoria et al, 2008; Grantham-McGregor et al, 2007). The health interventions that have been aimed at reducing child morbidity and mortality in Zambia have made much impact on child survival. This is evidenced by the reduction in child mortality rates (under-five and infant mortality rates). Since the rates are still unacceptably high, there is need for accelerated improvements in the interventions and if need be, try to come up with other interventions that will have an impact. The progress in reducing child mortality has been attributed to among other things, increases in immunization coverage, exclusive breastfeeding, vitamin and mineral supplementation, and malaria prevention and treatment (MDG Country Report, 2013).

This shows that further reduction in child morbidity and mortality to improve child health requires expanding, sustaining as well as accelerating interventions that have contributed to its reduction in the last decades which includes promoting optimal breastfeeding especially exclusive breastfeeding that has a huge potential even to significantly reduce new HIV infections. The role of breastfeeding therefore cannot be overemphasized as a good number of studies have also shown that breastfeeding reduces mortality in infants and young children (Ceesay et al, 1997; WHO, 2000). A study by Bhutta et al (2008) also showed that strategies for breastfeeding promotion have a large effect on child health and survival.

2.3 Infant feeding recommendations

According to WHO (2003) recommendations, optimal infant feeding practice for the first six months of life is exclusive breastfeeding. Evidence is convincing that complementary feeding should only be introduced at the age of six months.

Breastfeeding practices are therefore categorized as follows:

1. Exclusive breastfeeding, where the infant receives only breast milk from his/her mother or a wet nurse, or expressed breast milk and no other liquids, or solids, with

the exception of drops or syrups consisting of vitamins, minerals supplements, or medicines.

2. Predominant breastfeeding, where the infant receives liquids such as water, water-based drinks and ritual fluids in addition to breast milk.
3. Partial breastfeeding, where the infant receives other liquids, non-human milk and food in addition to breast milk.
4. Not breastfeeding where the infant is not breastfed at all only given other liquids and baby foods which act as breast milk substitutes.

In cases where the mother is not able to breastfeed the child due to medical and/or personal reasons, WHO compiled criteria for safe and appropriate replacement feeding[2]. The criteria states that the feeding option has to be safe, feasible, affordable, acceptable and sustainable and also aims to support mothers in making safe and appropriate feeding choices. Some of the breast milk substitutes noted include, but not limited to, the use of condensed milk and cow's milk. Given that most of these breast milk substitutes can increase the risk of infant health problems, the only appropriate replacement feeding for the infant during the first six months of life is formula milk (Kruger and Gericke, 2003).

In recent years, formula feeding manufacturers have made great improvements in terms of modifying and supplementing milk formulae to the composition of breast milk for easy digestion, provide sufficient nutrients and have an acceptable renal solute load (Infant Nutrition Council, 2009; Trahms and McKean, 2007). Home modified animal milk on the other hand is not appropriate for infants as it is said to contain 80% casein that forms curd and is hard for infants below six months to digest. In any case, it has lower levels of nutrients, higher protein and ash content when compared to breast milk, which results in a higher renal solute load. This may cause severe dehydration since more water is required for the excretion of solutes.

[2] Replacement feeding refers to the process of feeding a child who is not receiving any breast milk a diet that provides all the nutrients the child needs until he/she is fully fed on family food. During the first six months a more suitable breast milk substitute is formula milk.

The preparation of formula milk is another concern as over-dilution and over-concentration increase the risk of infant illness. Formula milk and animal milk have a higher content of proteins than breast milk and thus over-concentration leads to increased renal solute load and over-dilution impairs growth as it affects the energy density and the nutrient intake. This means that correct preparation of formula milk is essential. There is also need for a clean environment, safe uncontaminated water as well as an energy source since equipment used in the preparation needs to be washed thoroughly and sterilized and water boiled before use (WHO, 2007).

In the context of HIV and AIDS, mother to child transmission is likely to occur during pregnancy, labour and through breastfeeding. The risk of transmission through breastfeeding depends on different factors which may be maternal and infant factors. Infant factors include oral thrush and damage to the intestinal mucosa due to mixed feeding[3]. Some of the maternal factors include recent infection, low CD4 count, high viral load, advanced HIV, abscesses and mastitis. Apart from all these, prolonged breastfeeding is also believed to increase the transmission of the virus from the infected mother to the uninfected infant (Doherty et al, 2011).

Studies in recent years have shown that mixed feeding during the first six months of an infant's life increases the risk of transmission than exclusive breastfeeding because of the effect it has on the gut of the infant. After sufficient evidence of the protective effect of ART emerged, WHO (2010) revised the HIV and infant feeding recommendations in 2009 which was in support of safer breastfeeding in low-income settings. WHO recommended that lifelong ART or antiretroviral prophylaxis be given to HIV positive pregnant women and also if need be, ARV prophylaxis be provided to breastfeeding infants. ART has the potential to suppress maternal viral load to an undetectable level and thus early and appropriate antiretroviral treatment with strict adherence can decrease the postnatal risk of transmission to 0-1% if the mother is exclusively breastfeeding (Morrison et al, 2011).

[3] Mixed feeding refers to early introduction of fluids and food

Zambia adopted these revised recommendations to reduce the risk of mother to child transmission in order to improve child survival. Exclusive breastfeeding therefore is highly recommended. Furthermore, the entry criteria for lifelong ART were adapted to a CD4 count equal or less than 350/mm3 or the presence of a WHO-defined Stage 3 or 4 illnesses. However, mothers who do not qualify for lifelong ART receive ARV prophylaxis from as early as fourteen weeks of pregnancy for the duration of the pregnancy and the infant receives ARV prophylaxis for the entire period of breastfeeding until one week after breastfeeding cessation.

2.4 Infant feeding practices in Zambia

2.4.1 Breastfeeding initiation

Generally, breastfeeding initiation is very common in most developing countries with rates that are often above 80%. In Zambia specifically, breastfeeding initiation in the five years before the survey (ZDHS 2007) was recorded to be 98% with about 57% of the infants having been put to the breast within one hour of birth and 93% started breastfeeding within the first day. The percentages are higher compared with the levels that were recorded in 2001-2002 where 51% of the infants had been breastfed within the first hour and about 90% breastfeed within one day of birth. Breastfeeding initiation has also been shown to vary across all subgroups of women and those infants that were breastfed within one hour of delivery in urban areas is slightly higher than in rural areas being 59% and 56% respectively.

2.4.2 Duration of exclusive breastfeeding

Despite the high rates of breastfeeding initiation, exclusive breastfeeding for the first six months of life in Zambia is only 61%. Studies have shown that for most of the infants, food is introduced early in life; specifically 86% of infants below two months are exclusively breastfed compared with 35% of infants of 4-5 months. Regardless of these rates, the results have shown that there has been significant improvement in compliance with the WHO recommendations. The evidence being that the percentage of infants below six months that are exclusively breastfed increased from 40% in the 2001-2002 ZDHS to 61% in the 2007 ZDHS.

The median breastfeeding duration in Zambia is approximately 20.3 months while that of exclusive breastfeeding only 3.2 months. The average duration of breastfeeding in rural areas is 21 months which is higher compared with 19 months for the children in urban areas. About 93% of children aged 6-9months are given complementary foods and 55% of those aged 18-23 months have been weaned. However, bottle feeding is not so common with only 3% of infants less than six months of age fed with a bottle with a nipple, the proportion only peaks to 5% among the infants that are 4-5%. Table 2 below illustrates the general picture of the feeding practices in Zambia as depicted by the 2007 ZDHS results.

Table 2: Percent distribution of children under three years by breastfeeding status

Age in months	Not breastfeeding	Breastfeeding and consuming				
		Exclusively breastfed	Plain water only	Non-milk liquids and juice	Other milk	Complementary foods
0-1	0.0	86.0	8.7	2.7	0.8	1.8
2-3	1.1	64.7	7.5	5.1	2.1	19.4
4-5	1.1	35.0	8.2	3.3	1.3	51.1
6-8	0.5	2.6	1.6	1.6	0.0	93.7
9-11	3.8	0.0	2.7	0.0	0.0	93.5
12-17	8.2	0.0	0.8	0.7	0.0	90.3
18-23	45.3	0.0	0.0	0.1	0.0	54.5
24-35	90.8	0.0	0.0	0.0	0.0	9.2

Source: CSO 2009 from ZDHS 2007

2.5 Impact of breastfeeding on health and development of children

Scientific evidence has shown the need for investing in children to enhance optimal breastfeeding. Breastfeeding does not only have short term health benefits and preventive effects but also has long term impact on child health.

2.5.1 Reduction in infant and child morbidity and mortality

Scientific evidence has shown that the quality of life of infants can be improved highly by optimal breastfeeding especially because of its role in reducing the risk of under-nutrition. Under-nutrition in children especially those under the age of two years prevent them from reaching their full development and thus affect their growth. According to WHO (2009), about 35% of total world deaths for children less than five years are from

infectious diseases such as diarrhoea, pneumonia and neonatal infections mainly due to under-nutrition. Promotion of breastfeeding is thus considered to be one of the most cost-effective interventions for child survival especially in areas that are affected by high level of infectious diseases and unsafe water (World Bank, 1993). Figure 2 below (Black et al, 2013) shows evidence that in infants below six months of age, not breastfeeding increases relative risk of all causes of mortality to 14.4 times, diarrhoea mortality to 10.53 times and pneumonia mortality to 15.13 times compared to exclusive breastfeeding.

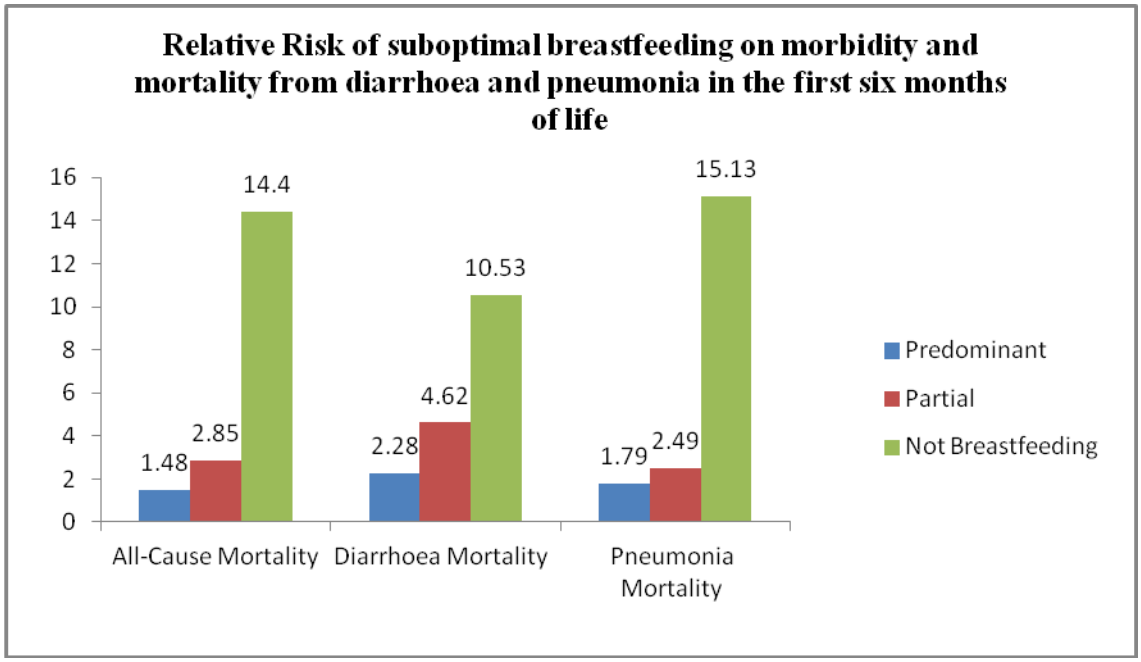

Figure 2: Relative risk of suboptimal breastfeeding (Black et al, 2013)

Studies from countries around the world in developing and developed countries have shown that breastfeeding dramatically reduces the risk of dying (León-Cava et al, 2002). A pooled analysis of studies in Ghana, India and Peru showed that non breastfed infants are 10 times more susceptible to dying when compared to predominantly or exclusively breastfed infants (Bahl et al, 2005). Another review by Lamberti et al (2013) showed that breastfeeding is a key intervention to protect against incidence, prevalence, hospitalization and mortality due to pneumonia in children younger than five years of age. The report also stated that exclusive breastfeeding among infants 0-5 months and any breastfeeding among infants offers protection against the incidence, prevalence,

hospitalization and mortality. An epidemiological evidence of a causal association between early breastfeeding and infection specific mortality in the new-born infants (Edmond et al, 2007) has shown 2.6-fold increased risk of infection-specific neonatal mortality with late initiation of breastfeeding (later than day 1).

A global ecological risk assessment study also found that acute infections, including otitis media, haemophilia influenza meningitis and urinary tract infections are less common and less severe in breastfed infants (Lauer et al, 2006). Exclusive breastfeeding has also been found to result in lower rates of HIV transmission than partial breastfeeding with rates of 1% (Iliff et al, 2005; Coutsoudis et al, 2001) and 4% (Coovadia et al, 2007) being reported from studies in Africa. Even in the USA, where death from infection is relatively uncommon, it was found that there are about 21% to 24% fewer deaths among children who were breastfed than among those prematurely weaned (Chen and Rogan, 2004). In the UK millennium cohort survey of 15,890 infants, six months of exclusive breastfeeding was associated with a 53% decrease in hospital admissions for diarrhoea and 27% decrease in respiratory tract infections each month; partial breastfeeding was associated with 31% and 25% decreases respectively (Quigley, Kelly, Sacker, 2007). The results of this study suggested that the protective effects wore off soon after breastfeeding ceased.

2.5.2 Long term impact on adult health and non-communicable diseases

Early adulthood health has also been found to have effects in later life. Breastfeeding provides protection against numerous diseases in adulthood (Horta et al, 2007), especially over-nutrition or obesity (Arenz et al, 2004) and non-communicable diseases such as hypertension, heart disease, asthma (Ip et al, 2007), malignancies, Type II diabetes (Owen et al, 2006). Basically, the protective effects of breastfeeding extend beyond the first few months of life even after breastfeeding has been terminated. WHO, in its updated 2013 version on long term impact of breastfeeding concludes that breastfeeding has a significant impact on non-communicable diseases, particularly obesity, diabetes and increased performance in intelligence tests in childhood, adolescence and adulthood. It has also shown a small protective effect against systolic blood pressure (Horta and

Victora, 2013). The global report on NCDs envisages expenditure of trillions of dollars in the coming two to three decades to reduce the burden of NCDs. If this is believed to be true, then an investment to increase optimal breastfeeding through policies and appropriate interventions in one cohort of births has the potential of significantly reducing NCDs in one generation.

2.6 Conclusion

This chapter has given a brief overview of Zambia's infant and child morbidity and mortality rates and the infant feeding practices. The child health indicators have been shown to be poor and the infant feeding practices below the WHO recommendations. In addition, it presented the general health and protective effects of optimal breastfeeding basically highlighting the fact that suboptimal breastfeeding puts infants at high risk of illness and death and thus the need to look at the factors that have influence on suboptimal breastfeeding. Having looked at the overview of infant and child health and the importance of breastfeeding, the next chapter presents both theoretical and empirical literature.

CHAPTER THREE
LITERATURE REVIEW

3.1 Introduction

This chapter presents a review of both theoretical and empirical literature on the factors that affect infant breastfeeding practices among women. The theoretical literature contains a description of the household production model and the human capital theory as economic theories in line with breastfeeding practices. Mosley and Chen's (1984) analytical framework explaining how socioeconomic factors affect proximate determinants like breastfeeding practices which in turn have an effect on infant illness and death is also presented separately. Empirical literature concentrating on different studies that have been conducted on the determinants that influence breastfeeding practices is also presented.

3.2.0 Household Production Model

The main theoretical approach used in the study is one that has its origin in Becker's Microeconomic models of household production (Becker, 1965, 1981). In this model, households allocate goods and time to the production of commodities that are either sold on the market, consumed at home, or for which there is no market. The model best suits the study in that it enlightens the household determinants of child health. A child health production function is thus generated to relate the child's health status (in terms of illness and/or death) to a set of health inputs. The health inputs may include, but not limited to, the child's nutrition intake, whether the child is breastfed and the duration of breastfeeding (especially for those below the age of six months), preventive and curative medical care, and the quantity and quality of time of the mother and/or other caregivers in care related activities. Assuming that the household derives utility from the child being health, a child's health status is thus a reflection of combined effects.

The household production function for the production of a child's health can therefore be specified as follows:

$$Child\ Health\ Status = f(B, M, IHE, \theta \dots \dots) \quad (1)$$

Where B denotes breastfeeding practice, M denotes medical inputs; IHE denotes initial health stock or endowments) and θ denotes other child care related activities apart from the ones specified in the model.

All these inputs are likely to be functions of different factors which can also enter the production function. Since children on their own are not able to make decisions independently concerning their health status, the choice of inputs that have an effect on their health is made by the household more especially the mother. Therefore, the decision of whether to breastfed or not and the choice of breastfeeding practice is made entirely by the household (who in this case for simplicity is the mother). Different factors such as demographic, socioeconomic, cultural, biomedical, environmental and biological however, have an influence on the choice of breastfeeding practice and most likely governed by parental preferences. For instance, an employed mother who generates greater income from her employment may reduce quality of time and quantity of breastfeeding reducing the child's health status. This is because the mother would rather spend more time working to earn income to sustain the family and is able to buy other breast milk substitutes.

Theories of social arrangements emphasized on the freedom, equality and justice in social order in the society. John Rawls' (1971) 'Theory of Justice' proposes the universal access is called 'social primary goods' (like liberties, opportunities and self-respect) for all individuals in the society equally. One of the primary good, though not explicit in his theory but implicit, that has to be ensured to every citizen of the society is health. Moreover, it assumes primary significance in the perspectives of human capital, human development and human rights; the health deprivation of children especially through exposure to suboptimal breastfeeding practices can have severe negative implications. But the unfinished reality is that even today many children in most countries are deprived in health.

3.2.1 The Human Capital Theory

The human capital framework is important in this study given that breastfeeding has been said to be economically valuable and strengthens a nation's human capital. Early childhood health is of inter-temporal nature which does not only affect adulthood health but also development and cognitive ability affecting another form of human capital – education and thus affecting productivity and future earnings. Therefore investing in childhood health through promotion of breastfeeding can be looked at as investment in human capital. The theory which is of much importance is the theory to demand for health developed by Grossman in 1972 where health capital is regarded as a component of human capital. The identification of health capital as a component of human capital stock meant that people demand good health in order to realize potential gains in productivity. By implication an increase in the stock of health would lead to increase in wage rates as a result of increase in human capital stock. Therefore the decision to invest in child health through breastfeeding promotion is synonymous with the decision to invest in general human capital except that with a child, the decision is made at household level especially by the mother.

Human capital refers to the stock of economically usable individual knowledge, capability, and skills thus which includes all characteristics of an individual that can increase his or her earnings not only those skills that are acquired through education, but also talents and practical experience. Human capital differs from other forms of capital in that it cannot be sold or separated from its owner. Like other forms of capital, human capital is characterized by; investment where current expenditures are interchanged with future returns in terms of effect of an additional year of schooling on earnings. It is also characterized by depreciation due to new knowledge or technical progress but also because people forget knowledge once it has been acquired. The human capital theory argues that, when there is an increase in an individual's stock of knowledge or human capital, his productivity in the market sector of the economy will increase where he produces money earnings, and in the non-market or household sector where he produces commodities that enter into his utility function (Grossman, 2000). Thus the human capital

theory suggests that individuals and society derive economic benefits from investment in people which also includes investment in early childhood health.

The framework on which human capital theory is developed is that costs of investment include direct outlays on market goods as well as the opportunity cost of the time that has to be withdrawn from competing needs. Becker (1967) and Ben-Porath (1967) developed models that determine the optimal quantity of investment in human capital at any age. Assuming perfect capital market and T periods, wage as a function of human capital is given by:

$$w_t = r_t^H H_T \tag{2}$$

where H_t, is the stock of human capital which is assumed to be homogeneous and r_t^H is the rate of return to capital. The inter-temporal utility function is therefore given by:

$$\sum_{t=1}^{T} \beta^{t-1} U(C_t, \bar{L} - L_t - I_t^z, H_t; t) \tag{3}$$

With leisure defined as $F_t = \bar{L} - L_t - I_t^z$ (4)

U denotes utility whereas C_t is consumption, I_t^z is the time attributed for the accumulation of human capital, $\bar{L}$ is total time available and L_t is the available time put into market work. H_t is the stock of human capital for the t^{th} period and β is the subjective discount rate of the individual. Assume H_t generates direct utility hence it is accumulated by the following process:

$$H_t = (1-\delta)H_{t-1} + \theta(I_{t-1}^Z, I_{t-1}^G, H_{t-1}; t) \tag{5}$$

$$\Delta H_t = \theta(I_{t-1}^Z, I_{t-1}^G, H_{t-1}; t) - \delta H_{t-1} \tag{6}$$

where $\theta(.)$ denotes general human capital investment function, ΔH_t is the change in stock of human capital from period t-1to t and δH_{t-1} is human capital that is lost, that is, depreciation at constant depreciation rate δ.

where $\theta(.)$ denotes general human capital investment function, ΔH_t change in stock of human capital from period t-1 to t and δH_{t-1} is human capital lost through depreciation at constant depreciation rate δ. I_t^Z is time investment needed for acquiring human capital and I_t^G is the investment in goods needed for the human capital investment.

Basically equation (6) implies that the change in human capital from the last period to the current period is a linear combination of the human capital acquired in the previous period through investment and the stock of human capital once acquired that is lost through depreciation. Inter-temporal budget constraint is given by:

$$\sum_{t-1}^{T}(1+r)^{-t+1}W_tL_t + V_o \geq \sum_{t=1}^{T}(1+r)^{-t+1}(P_tC_t + P_t^G I_t^G + P_t^Z I_t^Z) \qquad (7)$$

The left hand side of equation (7) represents the present value individual's life time wealth. The right hand side represents the present value of lifetime uses of financial resources being linear combination of consumption C_t, I_t^Z and I_t^G. V_o is initial level of knowledge, r is the opportunity cost of capital and P is price. Optimal investment in human capital can thus be calculated by:

Max

$$\sum_{t=1}^{T}\beta^{t-1}U(C_t, \bar{L} - L_t - I_t^z, H_t; t)$$

Subject to: (8)

$$\sum_{t=1}^{T}(1+r)^{-t+1}W_tL_t + V_o - \sum_{t=1}^{T}(1+r)^{-t+1}(P_tC_t + P_t^G I_t^G + P_t^Z I_t^Z) \geq 0$$

$$\Delta H_t = \theta(I_{t-1}^Z, I_{t-1}^G, H_{t-1}; t) - \delta H_{t-1}$$

$$w_t = r_t^H H_T$$

With initial human capital stock H_o and V_o given, the economic implications of equation (8) above can explained by two broad scenarios namely an increase in $-I_{t-1}^{Z}, I_{t-1}^{G}$ and a decrease in $-I_{t-1}^{Z}, I_{t-1}^{G}$ conditional upon several factors. On one hand, $-I_{t-1}^{Z}, I_{t-1}^{G}$ increases if there is an increase in $\theta(.)$ implying that efficiency of investment is high. Furthermore an increase in T denoting longer time for paying back of human capital investment, an increase in $U(\ldots., H_t..)$ implying higher utility of human capital and high returns to human capital r_t^H entail an increase in $-I_{t-1}^{Z}, I_{t-1}^{G}$. On the other hand, $-I_{t-1}^{Z}, I_{t-1}^{G}$ decreases if the depreciation rate of human capital δ, is high and where the market rate of interest r, is high also meaning that the present is more important than the future. This theory is important in explaining the role that breastfeeding has on child health as an investment in human capital which actually is likely to affect the human capital stock and the rate of human capital depreciation.

3.2.2 Mosley and Chen's analytical framework on child survival

Mosley and Chen (1984) provided a framework for the examination of the determinants of child survival in developing countries. Basically, their framework explains how the socioeconomic determinants operate through more basic proximate determinants that in turn influence the risk of disease and the outcome of disease processes. The dependent variable, according to their proposition, combines the nutritional status of the surviving children with the level of mortality of the respective birth cohort into a more general health index that can be scaled over all members of the population of interest.

According to their framework, the proximate variables to be measured in population-based research comprise maternal factors such as age at birth, parity and birth intervals. It also includes environmental contamination (the air, food, water and fingers) which are the four categories of transmission of infectious agents to children (mothers); and nutritional deficiency such as nutrients availability to the infant or to the mother during pregnancy and lactation. Further, the framework includes injury or injury related disabilities and personal illness control such as use of preventive services including immunization, malaria prophylactics or antenatal care, and the use of curative measures for specific conditions.

The socioeconomic determinants, which operate through those proximate determinants, are grouped into three broad categories being individual, household and community factors. Individual level factors include individual attributes such as skills, health and time, usually measured by the mother's education level, whilst the father's education level correlates strongly with occupation and household income; tradition/norms/attitudes i.e., power relationships within the household, value of children, beliefs about disease causation and food preferences. Household level factors include income/wealth effects such as food availability, quality of the water supply, clothing, bedding, housing conditions, fuel/energy availability, transportation, means to purchase day to day essential items of hygiene/preventive care, and access to information. Community level factors include the ecological setting such as climate, temperature, altitude, season and rainfall; political economy such as organization of food production, physical infrastructure such as railroad, roads, electricity, water, sewage, political institutions and health system variables.

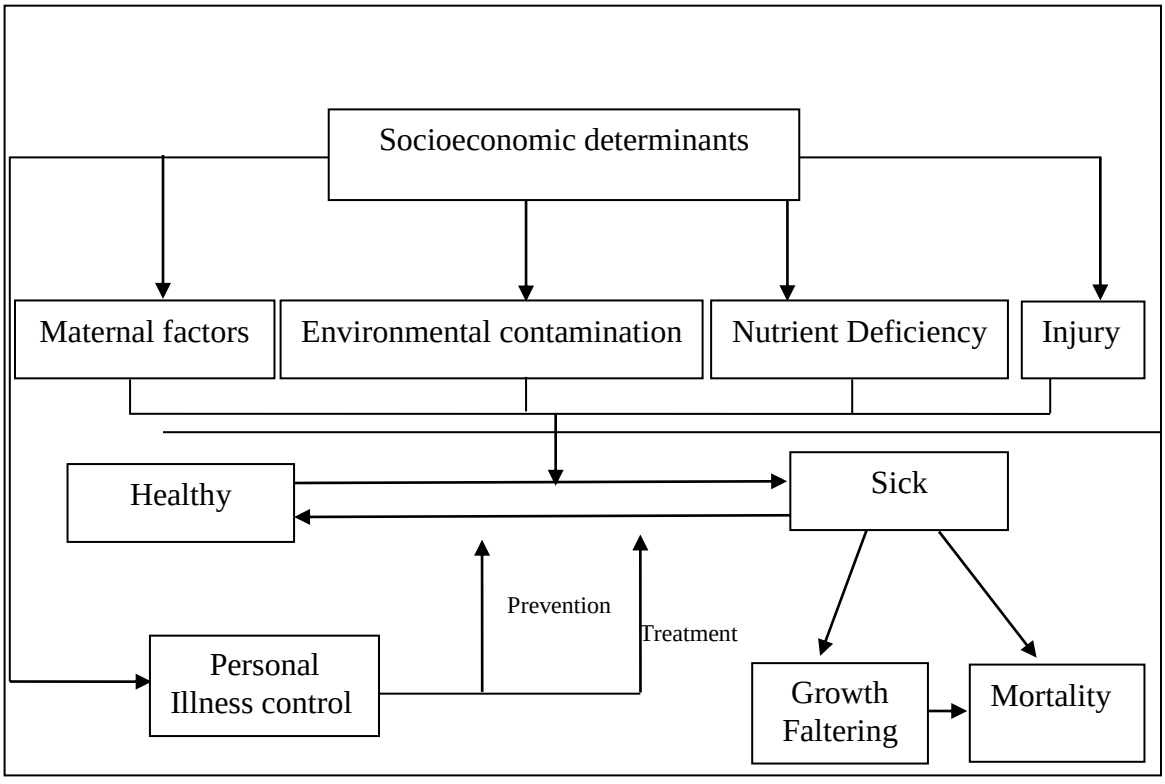

Figure 3: Mosley and Chen's analytical framework (Mosley and Chen 1984)

Figure 3 gives a summary of how socioeconomic determinants affect the health outcome of a child through proximate determinants. Among the proximate variables in the framework, nutrient deficiency is the most important one for this study. This is because it shows how socioeconomic factors in categories mentioned above can affect nutritional intake of an infant such as reduced breastfeeding consequently affecting the health status of the child.

Mosley and Chen's framework helps to clarify an understanding of the many factors involved in the family's production of healthy children in order to provide a foundation for formulating health policies and strategies. The key advantage of the model lies in the organization of seemingly different measures of environmental conditions; of dietary, reproductive, and health care practices; and of disease states into a logical framework in which they are linked to one another and to child survival on the one hand and to socioeconomic factors on the other.

3.3 Empirical Literature

Data from different countries has revealed that there are very large differences in breastfeeding practices between countries and between population groups within counties. In Zambia, most studies on breastfeeding practices have focused on descriptive analysis as opposed to econometric analysis (Fjeld et al, 2008; Kaliwile and Michelo, 2010; Chisenga et al, 2011; Besa, 2004). Much of the literature available on infant feeding practices is from studies in other parts of the world.

Heck et al (2006), while examining multiple dimensions of socioeconomic status and breastfeeding among a large random sample of ethnically diverse women in California (Measures of socioeconomic status included family income as a percentage of the federal poverty level, maternal education, paternal education, maternal occupation, and paternal occupation), found that women with higher family incomes, those who had or whose partners had higher education levels, and women who had or whose partners had professional or executive occupations were more likely than their counterparts to breastfeed. After adjustment for many potential confounders, maternal and paternal

education remained positively associated with breastfeeding, while income and occupation were no longer significant. Interestingly but obviously, the significant association of maternal and paternal education with breastfeeding even after adjustment for income, occupation and many other factors suggested that social policies affecting educational attainment may be important factors in breastfeeding practices. Optimal breastfeeding rates may thus be influenced by health education specifically as a way to disseminate health knowledge or by more general levels of schooling among mothers and their partners.

Kimani-Murage et al (2011) assessed breastfeeding and infant feeding practices in two Nairobi slums with reference to WHO recommendations. The longitudinal study used information on the first year of life of 4299 children born between September 2006 and January 2010 where the women who gave birth during this period were interviewed on breastfeeding and complementary feeding practices at recruitment and the information updated twice at four-monthly intervals. Cox proportional hazard analysis was used to determine factors associated with cessation of breastfeeding in infancy and early introduction of complementary foods. Factors associated with suboptimal infant breastfeeding and feeding practices in these settings included child's sex; perceived size at birth; mother's marital status, ethnicity; education level; family planning (pregnancy desirability); health seeking behaviour (place of delivery) and; neighbourhood (slum of residence). Other independent variables in this study were mother's age, parity and socioeconomic status (defined using the household monthly expenditure per capita).

Another study by Renée F. et al (2007) in Sweden which was aimed at investigating the impact of socioeconomic status on breastfeeding duration in mothers of preterm and term infants, showed that socioeconomic factors; maternal educational level, maternal unemployment benefit, social welfare and equivalent disposable income, were strongly associated with breastfeeding when examined individually in mothers of preterm and term infants[4]. Some of the associations attenuated when investigated simultaneously.

[4] Preterm infants are those born before the 37 completed weeks of gestation while term infants are those born in the interval from the 37 completed weeks to the 42 completed weeks of gestation.

Independent of socioeconomic status and confounders, mothers of preterm infants were at higher risk of weaning before the infant was 2 months, 4 months, 6 months, and 9 months old for other mothers, compared with mothers of term infants. Thus, in Sweden, despite its social welfare support system and a positive breastfeeding tradition, socioeconomic status clearly has an impact on the breastfeeding duration. Mothers of preterm infants' breastfeed for a shorter time compared with mothers of term infants, even when adjustments are made for socioeconomic status and confounders.

The study by Phouvanh (2007) in Lao PDR to determine the patterns of breastfeeding and their contributing factors looked at how the various socioeconomic and maternal risk factors are related to duration of breastfeeding, feeding of infant formula and introduction of complementary food. Results showed that shorter duration of breastfeeding was significantly associated with younger maternal age and mothers who did not attend Antenatal Clinic (ANC) were twice as likely to breastfeed for shorter duration. Infants were introduced to infant formula at a median age of 1 month (range 1-19 months) and other complementary foods at a median age of 4 months (range 1-6 months). Introduction of infant formula was statistically associated with mother education (≤ high school), low family monthly income, mothers who did not attend ANC and low birth weight infants. The early introduction of complementary food was also significantly associated with mother's age (≤ 25 years), low family monthly income, and low birth weight infants. It was noted that duration of breastfeeding for both exclusive and total breastfeeding was shorter than recommended. Infant formula was given as early as within first month of infant's age. Compliance with current recommendations on the timing of introduction of complementary food was relatively poor.

In Norway, Lande et al (2003) investigated infant feeding practices during the first six months of life in relation to recommendations, and to maternal and infant characteristics for 2383 Norwegian infants. The results showed that 21% of the infants were introduced to solid foods before the age of 4 months. For exclusive breastfeeding at 4 months, breastfeeding at 6 months and timely introduction of solid foods (not before 4 months)

significant positive trends were found for maternal age, education and degree of urbanization. Negative associations were found for maternal smoking. Furthermore, exclusive breastfeeding at 4 months was associated with infant gender and marital status, and the odds of breastfeeding at 6 months significantly decreased with decreasing infant birth weight. Finally, both the odds of exclusive breastfeeding at 4 months and of breastfeeding at 6 months increased with increasing numbers of children. These results indicate that a majority of Norwegian infants are fed in accordance with infant feeding recommendations during their first 6mo of life. However, the duration of exclusive breastfeeding is shorter than recommended. Infant feeding practices are significantly associated with maternal and infant characteristics.

In a study by Shirima *et al* (2001) in Tanzania, none of the socioeconomic, demographic or biological variables studied were associated with feeding practices. Urban residence was positively associated with the duration of exclusive but not predominant breastfeeding. Better knowledge about specific breastfeeding issues and ownership of a radio were positively associated with the duration of both exclusive and predominant breastfeeding. Although both rural and urban mothers had a high antenatal clinic attendance rate, 65% of the rural and 14% of the urban mothers delivered at home. Urban mothers informed about breastfeeding at the antenatal clinic had better feeding practices. The study postulated that exclusive breastfeeding was not a traditionally recognized practice and thus its duration was mainly associated with information and knowledge about breastfeeding. Therefore, it was suggested that information programmes to provide knowledge, beginning at antenatal visits, may reduce premature complementation and additional support in other areas may also be required.

Another study by Sunita (2000) which was aimed at examining the patterns of duration of breastfeeding found income, education, and employment as significant variables which influence the duration of breastfeeding. The study revealed that the incidence and duration of breastfeeding are the highest among the mothers of the lower income group followed by those of the upper income groups and only 15% of the mothers in the middle income group weaned their children after one year. The study also showed that a

significantly high proportion of the mothers in the middle income group (37%) weaned their infants in the age group 1-3 months itself as against only 7% of those mothers in the lower income group and 3% of mothers in the upper income group.

Grummer-Strawn (1996) in a review of the breastfeeding trends in 15 developing countries indentified that changes in population characteristics and subgroups culture could influence breastfeeding practices. The population characteristics considered in the study included place of residence (urban/rural), maternal age, educational attainment of the mother and father, mother's work experience, parity, and the use of contraceptives and presence of other children and/or siblings in the home. Mothers without any educational qualifications were 1.9 times as likely to breastfeed as mothers who had at least seven years of formal education. Thus higher educational attainment is negatively related to breastfeeding initiation and duration in developing countries.

Dubois *et al* (2003) also made similar observations in developed countries especially with regard to the mother's educational status and age even though the direction and effect of influence observed was different with that of the developing countries. Mothers with higher educational qualifications were more likely to breastfeed in developed countries which is different from the developing countries and education was observed to have had the most significant impact on breastfeeding duration compared to other measures of socioeconomic status. The study also found a significant association between marital status and infant breastfeeding behaviour and those mothers in a two parent family were more likely to breastfeed than single mother.

3.4 Conceptual Framework

According to the literature reviewed in this study, a conceptual framework is developed as shown in Figure 4 below. Studies have evidenced that certain independent variables have an influence on mothers' choice of breastfeeding practice. These variables can be generally grouped into socioeconomic, demographic, medical, cultural and behavioural factors which are responsible to influence the dependent variable (breastfeeding practice).

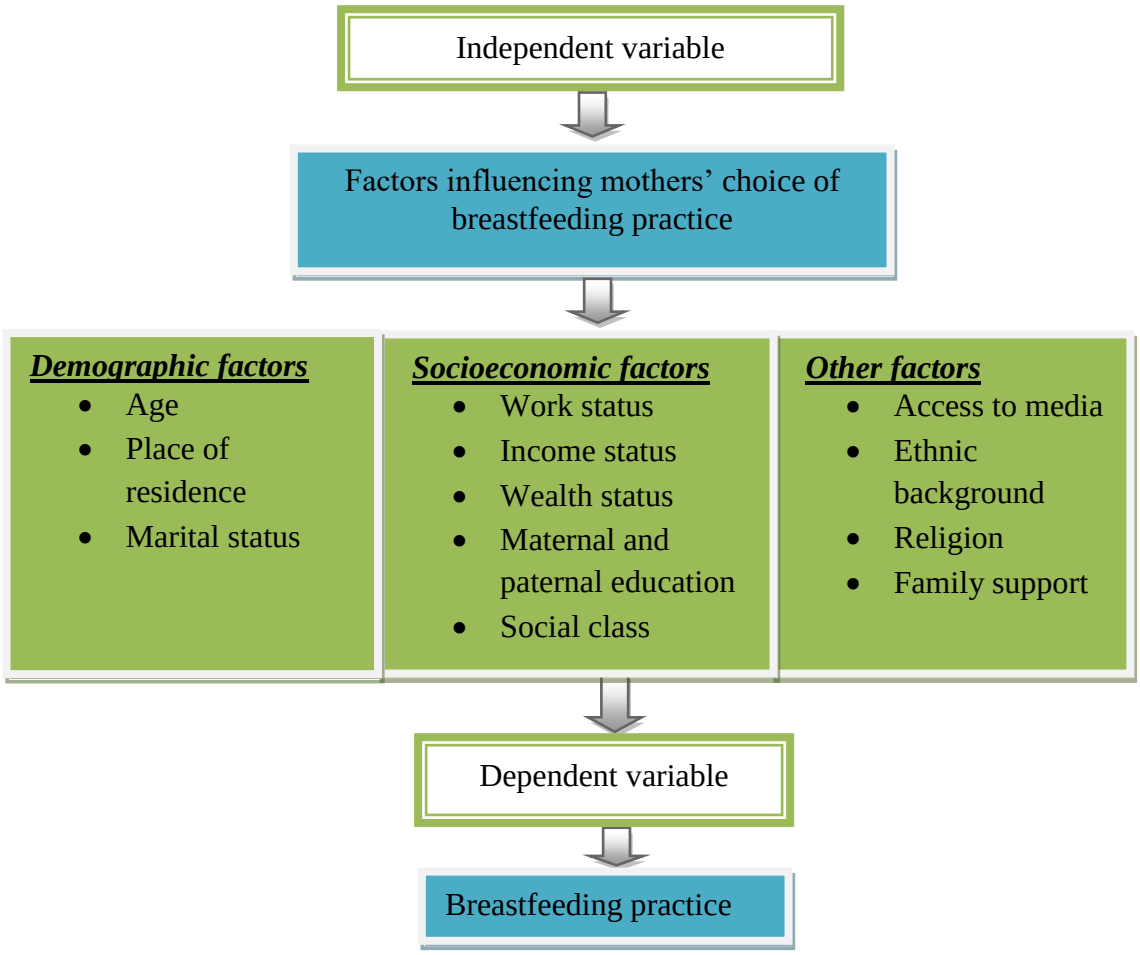

Figure 4: Conceptual framework (Developed by the Author from different literature)

3.3 Conclusion

From the literature reviewed, there are underlying economic foundations that determine the choice of breastfeeding practices and it can be seen that there are many factors that determine the decision of breastfeeding and the choice of the breastfeeding practices among them includes socioeconomic factors which have different effects between countries and within countries. The choice of the variables used in this study was dependent on the availability of the data. However, important maternal and child variables were analyzed. In view of the above, the next chapter presents the methodology used in the study.

CHAPTER FOUR
METHODOLOGY

4.1 Introduction

This chapter presents the tools of analysis employed in the study describing the data used and methods of analyzing them. The methodology of the study is generally motivated by the reviewed literature in chapter three and studies on breastfeeding given in chapter two. Section 4.2 explains the model selection criteria, offers an outline of the ordered logit model, generalized ordered logit model and the partial proportional odds model and the estimation technique. Section 4.3 defines the variables used in the study and their measurement and the empirical model specification. Section 4.4 presents the data sources, analysis and study design while section 4.5 explains the diagnostic tests and section 4.6 concludes the chapter.

4.2 Model selection

The estimation of the impact of socioeconomic factors on suboptimal breastfeeding practices can be achieved by adopting a binary model that takes the value of one if a woman does not breastfeed the child optimally and zero otherwise. This model has two major advantages; it fulfils the objective of analyzing situations whether one decides to breastfeed sub-optimally or not and the estimation is rather uncomplicated. Since we have different choices of infant breastfeeding practices, a binary choice model cannot be used in the current study for analysis because it does not allow the analysis of the more than two choices. A standard ordered as an extension of the binary model is used in this study which allows estimation and analysis for different infant breastfeeding practices given the categorized infant feeding practices.

4.2.1 Standard Ordered Logit Model

With the use of different studies conducted (as revealed in chapter two), one can clearly note that the infant breastfeeding categories are in a way ordered categories and can be said to have a logical order given that when it comes to health benefits and protective effects of breastfeeding, exclusive breastfed infants are more advantaged compared to

predominantly, partially and not breastfed infants. The same can be said with infants that are predominantly breastfed as they receive better benefits than those partially and not breastfed. And those infants that are partially breastfed obtain some benefits than those not breastfed at all. The inherent ordering of the breastfeeding practices cannot be ignored and thus, a model that would be plausible is the ordered logit regression model. With this model, the outcomes are ordered and mutually exclusive. Instead of an ordered logit model, employing a multinomial logit model in the study would lead to misspecification of the data generating process and inference about the dependent variable would be erroneous. Similarly, the use of the ordinary least squares estimation (OLS) is inappropriate in this case because OLS assumes that difference between categories of the dependent variable are equal, that is, the difference between a 1 and a 2 is the same as the difference between a 2 and a 3. Here the dependent variable reflects only an ordinal ranking and not a cardinal ranking, thus, differences may not be equal.

The model employed by Zavonia and McElvey (1975), as discussed by Greene (1997), is used in this study. Consider sample data of $\{y_{ji}, x_{ji}\}$ of size n drawn independently from some population where the dependent variable y_j with j possible outcomes where j=0, 1, 2, 3… J following a natural ordering, that is j+1 is better than j, with this model the values that are assigned to each outcome are not arbitrary. The ordered logit model for y (conditional on explanatory variables x) is built around a latent regression, where y_i^* is the unobserved dependent variable, x a vector of explanatory variables, β an unknown parameter, vector and ε the error term.

$$y_i^* = x_i'\beta + \varepsilon_i \tag{9}$$

Instead of y_i^*, we observe the following;

$y = 0\ if\ y^* < 0$

$y = 1\ if\ 0 < y^* \leq \mu_1$

$y = 2\ if\ \mu_1 < y^* \leq \mu_2$

: : :

$y = J\ if\ \mu_{j-1} \leq y^*$

Where y is the category of breastfeeding practice ranked into 4 categories, μ is the vector of unknown threshold parameters, estimated with the β vector. The condition $0 < \mu_1 < \mu_2 \ldots < \mu_{j-1}$ must hold because probabilities add up to unity and if this condition does not hold we may end up with negatives giving us spurious results. Probability (pr) that the outcome y takes the value j=1,…,J can be stated (Greene, 2008) in a more general case as follows:

$$pr(y_i > j) = \frac{\exp(\mu_j + x_i'\beta)}{1 + [exp(\mu_j + x_i'\beta)]} \quad j = 1, \ldots, J-1 \qquad (10)$$

Deriving the likelihood function subsequently leads to obtaining maximum likelihood estimates of μ and β and in this case it is required that the cumulative density function of ε is the logistic function. The results of the study are interpreted through the analysis of the marginal effects of the regressors of the probabilities which are not equal to the coefficients. The marginal effect of the variable x on the alternative j therefore, refers to the change in the probability of observing that alternative given the change in x.

In our study, we have four categories j= 0, 1, 2, 3;
y=0 …… not breastfeeding
y=1 …… partial breastfeeding
y=2 …… predominant breastfeeding
y=3 …… exclusive breastfeeding

We relate the breastfeeding practice which is unobserved y_i^* to a set of observed characteristics as follows:

$$bfpractice_i = x_i'\beta + \varepsilon \qquad (11)$$

Where bfpractice represents breastfeeding practice; x' represents a vector of explanatory variables of interest, β's are coefficients associated with the variables and ε is a random error term.

One key assumption of the standard ordered logit is that the slope coefficients are equal across all of the outcomes or categories. This means that the slope parameters, the β's are assumed to be equal. For instance, with the four breastfeeding practice outcomes, identical slope coefficients imply that the effect that a change in one of the independent variables will be the same across all outcomes or categories. For instance, education level of the mother will have the same effect on the probability of predominant breastfeeding as it will have on partial breastfeeding, not breastfeeding and exclusive breastfeeding. This in practice may not be true in that probabilities may differ leading to the violation of the assumption. One way to allow for varying slope coefficients is to adopt the approach of Williams (2006) and specify a generalized ordered logit ordered model.

4.2.2 Generalized ordered logit

The generalized ordered logit model is a model that is suitable to be used in case that the standard ordered logit model violates the proportional odds assumption. This model allows not only for different slope parameters but it also allows for different intercepts across outcomes. This means that the generalized ordered logit model can be specified as:

$$pr(y_i > j) = g(x_i'\beta_j) = \frac{\exp(\mu_j + x_i'\beta_j)}{1 + [exp(\mu_j + x_i'\beta_j)]};\ j = 1, \dots, J-1 \qquad (12)$$

Where β is allowed to differ for each of the outcomes, j=1,…, J-1. The generalized ordered logit model nests the standard ordered logit model under the restriction that $\beta_2 = \cdots = \beta_J$. The probabilities that y will take on values j=1,…, J-1 are given as;

$$pr(y_i = 1) = 1 - \frac{\exp(\mu_1 + x_i'\beta_1)}{1 + [exp(\mu_1 + x_i'\beta_1)]}$$

$$pr(y_i = j) = 1 - \frac{\exp(\mu_{j-1} + x_i'\beta_{j-1})}{1 + [exp(\mu_{j-1} + x_i'\beta_{j-1})]} - \frac{\exp(\mu_j + x_i'\beta_j)}{1 + [\exp(\mu_j + x_i'\beta_j)]}$$

$$pr(y_i = J) = \frac{\exp\left(\mu_{J-1} + x_i'\beta_{J-1}\right)}{1 + \left[exp\left(\mu_{J-1} + x_i'\beta_{J-1}\right)\right]} \quad (13)$$

Using the generalized ordered logit model allows for ordered outcome systems that violate the proportional odds by allowing the slope coefficients to vary across the values of the outcomes. Thus, the generalized ordered logit model is more flexible compared to the standard ordered logit model. However, this model also has some drawbacks. The model is too permissive such that it can lead to the estimation of more parameters than necessary. This means that not all slope coefficients are necessarily different because some of them may be equal. This limitation can be overcome by using the partial proportional odds logit model which is just a special case of the generalized ordered logit model.

4.2.3 Partial proportional odds model

The partial proportional odds model permits a relaxation of the proportional odds constraint for those variables that violate it. In this model, some of the slope coefficients can be the same for all outcomes while others can vary. The model is more parsimony than the generalized ordered logit model but most importantly even less restrictive compared to the standard ordered logit model.

$$pr(y_i > j) = \frac{\exp\left(\mu_j + x_1\beta_1 + x_2\beta_2 + x_3\beta_{3j}\right)}{1 + \left[exp\left(\mu_j + x_1\beta_1 + x_2\beta_2 + x_3\beta_{3j}\right)\right]} \quad for\ j = 1, \ldots, J-1 \quad (14)$$

Looking at equation 14 above, the β's (which are the slope coefficients) for x_1 and x_2 are the same for all values of the outcomes (j) but those for x_3 are allowed to vary.

Of the models explained above (of which one is just a special case of the other), the choice of the most appropriate and good model for estimation depends on the Brant test (Long and Freese, 2006). The Brant test provides a global test of whether any variable violates the proportional odds assumption and also tests the assumption for each variable separately. The Brant test will be used to check whether using the standard ordered logit

model for estimation violates the proportional odds assumption or not. If the assumption is violated then the generalized ordered logit model will be used and if not all variables violate the assumption, the partial proportional odds model will be used for estimation.

4.3 Model specification and estimation

Based on the econometric model described in section 4.2 above, this section specifies the empirical model used in the study. The present study uses breastfeeding practice as the dependent variable being a function of selected socioeconomic factors and also includes other control variables.

The dependent variable has shown earlier has four categories depicting not breastfeeding, partial breastfeeding, predominant breastfeeding and exclusive breastfeeding as breastfeeding practices. Thus, the ordered logit function will have three equations with exclusive breastfeeding category being the optimal breastfeeding practice as the reference category. The four categories can be depicted as P_0, P_1, P_2 and P_3 for not breastfeeding, partial, predominant and exclusive respectively.

$$logit(P_0) = log\frac{P_0}{1-P_0} = (not\ breastfed/exclusive) = \beta_1 Emplstat_i + \beta_{\ 2} Prim_i + \beta_3 Sec_i + \beta_4 Tetiary_i + \beta_5 Middle_i + \beta_6 Poor_i + \beta_7 Placeres_i + \beta_8 Married_i + \beta_9 Oncemarried_i + \beta_{10} Agemh_i + \beta_{11} Agesq_i + \beta_{12} Agech_i + \beta_{13} Sexch_i \quad (14)$$

$$logit(P_0 + P_1) = log\frac{P_0+P_1}{1-P_0-P_1} = (partial/exclusive) = \beta_1 Emplstat_i + \beta_{\ 2} Prim_i + \beta_3 Sec_i + \beta_4 Tetiary_i + \beta_5 Middle_i + \beta_6 Poor_i + \beta_7 Placeres_i + \beta_8 Married_i + \beta_9 Oncemarried_i + \beta_{10} Agemh_i + \beta_{11} Agesq_i + \beta_{12} Agech_i + \beta_{13} Sexch_i \quad (15)$$

$$logit(P_0 + P_1 + P_2) = log\frac{P_0+P_1+P_2}{1-P_0-P_1-P_2} = (predominant/exclusive) = \beta_1 Emplstat_i + \beta_{\ 2} Prim_i + \beta_3 Sec_i + \beta_4 Tetiary_i + \beta_5 Middle_i + \beta_6 Poor_i + \beta_7 Placeres_i + \beta_8 Married_i + \beta_9 Oncemarried_i + \beta_{10} Agemh_i + \beta_{11} Agesq_i + \beta_{12} Agech_i + \beta_{13} Sexch_i \quad (16)$$

4.3.1 Definition of variables and their measurement

Dependent variable

Breastfeeding practices

This represents the breastfeeding practices *(bfpractice)* that the mother chooses according to the WHO categories; exclusive, predominant, partial or no breastfeeding at all. These breastfeeding practices will be represented as ordered categories. Breastfeeding practices will take on the following values; 0 if bfpractice= not breastfed at all, 1 if bfpractice=partial, 2 if bfpractice=predominant and 3 if bfpractice=exclusive.

In the survey, information about breastfeeding practices was captured for the women in the age group of 15-49 who had one or more births three/five years preceding the 2007 Zambia Demographic Health Survey. The women were asked whether they breastfed or not, and for those that breastfed if they fed breast milk with other milk, plain water, non-milk liquids or any other complementary foods. The responses are used to categorize the choice of breastfeeding practice.

Independent variables

Age of the child

This refers to the age of the index child in months *(agech)* from zero to five months of age. It is expected to have a positive effect on the choice of breastfeeding practices. Studies by Tewodros et al, 2009 and Shirima et al, 2000 show that suboptimal breastfeeding tends to increase with the age of the child.

Sex of the child

This is the sex/gender of the index child *(sexch)* and it is a dummy variable which equals 1 if male and 0 if the child is female. Expected sign of the coefficient would be positive. A study by Kimani-Murage et al (2011) found a positive association between sex of a child and early introduction of complementary foods.

Age of the mother

This refers to the age of the child's mother *(agemh)* measured in years and covers the age group 15-49. It is a continuous variable and proxy's women preferences towards breastfeeding patterns. It is expected to have either positive or negative effect on the choice of breastfeeding practices. Studies have consistently shown that older women especially those who are 25 years or older are more likely to initiate and continue breastfeeding particularly exclusive breastfeeding, compared to younger women (Dubois L. Girard M., 2003).

Age of the mother squared

Age squared *(agesq)* variable refers to the square of the age of the mother variable. It is expected that the variable will assume the sign opposite of the age variable. The variable is included to capture the non linearity of age reflected by the hypothesized U-shape relationship between age and choice of breastfeeding practices.

Education level of the mother

The education level of the mother is represented by four categorical variables: no education, primary education *(prim)*, secondary education *(sec)* and tertiary education *(tertiary)*. The categories are presented as dummy variables that capture the level of education of the mother which equal 1 if the woman is in that category and 0 otherwise and the reference category for this variable is "no education'. The primary education dummy is expected to have a positive sign while the secondary and tertiary education dummies are expected to have negative signs. Various studies have found education to be a significant determinant of breastfeeding. Grummer-Strawn (1996) found that in the developing countries, mothers without any educational qualifications were 1.9 times as likely to breastfeed as mothers who had at least seven years of formal education.

Employment status of the mother

This variable portrays whether a woman is employed or not *(emplstat)*. In this study it is treated as a dummy which takes the value of 1 if a woman is employed, 0 if a woman is

not employed. This variable is expected to have a positive sign. A study by Sunita (2000) found employment as a significant factor in influencing breastfeeding practices.

Marital status of the mother

Marital status of the mother is represented by three categorical variables: married, divorced/separated/widowed (once married) and never married. Married is the *'Married'* dummy variable which is equal to 1 if the woman is married and 0 otherwise. The variable is expected to have a negative association with the choices of breastfeeding practices. Oncemarried is a *'once married'* dummy variable which is equal to 1 if the woman is widowed/divorced/separated and 0 otherwise. This dummy is also expected to have a negative relationship with the choice of breastfeeding practices. Never married is the reference category for this variable. A study by Arora et al (2000) found that being married and duration of marriage were positively associated with the choice of breastfeeding practices.

Place of residence

This is the woman's place of residence at the time of the survey *(placeres)* capturing the location of the household of the woman. It is also a dummy variable which equals 1 if the woman resides in the urban setting and 0 if in a rural setting. Expected sign of the coefficient would be positive. A study by Aye (2000) revealed that urban women had a higher likelihood of introducing complementary foods to infants at an early age.

Household wealth status

This variable is represented by a household wealth index and presented by three categorical variables indicating the five wealth quintiles: poorest, poorer, middle, richer and richest. The categories are presented as dummy variables each taking the value of 1 if the mother falls in that particular category and 0 other wise. Poor includes the poorest and poorer quintiles, middle includes the middle and richer quintiles and the rich category including the richest group as the reference category. A prior, the dummies are expected to have a positive or negative association with the breastfeeding practices.

The household wealth index is a proxy indicator for household long term standard of living based on data from the household's ownership of consumer goods, dwelling characteristics, and type of drinking water source, toilet facilities, and other characteristics that are related to a household's socioeconomic status. The index was constructed by assigning a weight (factor score) to each of the assets through principal component analysis, and the resulting asset scores standardized in relation to a standard normal distribution with a mean of zero and standard deviation of one (Gwatkin et al., 2000). Each household was then assigned a score for each asset, and the scores were summed for each household. Individuals were ranked according to the total score of the household in which they resided. The sample was then divided into five quintiles from lowest to highest.

4.4 Data Source and Analysis

The study has used cross-section data extracted from the Zambia Demographic and Health Survey data set which was conducted in 2007 by the Central Statistical Office. The survey covered 13,664 households countrywide of which 7,408 women aged 15-49 were identified as eligible for the individual interviews. Interviews were completed for 7,146 women representing a response rate of 97% and 4148 women reported to have had one or more births three/five years preceding the survey. At the time of the survey, infants below the age of six months were 628. This study therefore used a sample size of 628 during analysis. The survey obtained information on the following subjects: female respondents' background characteristics; including age, marital status, education, employment, area of residence and region where respondents come from. Data on their reproductive histories was also collected and included knowledge and use of family planning, antenatal care, delivery and postpartum care.

The analysis includes a report of statistical results of the variables and econometric analysis to estimate the slope coefficients and marginal effects associated with suboptimal breastfeeding practices among women for infants below the age of six months. Stata Package Version 12.0 is used in the analysis and maximum likelihood

method of estimation is applied due to inherent non-linearity of the ordered probit regression model.

4.5 Diagnostic Tests

In the study, diagnostic tests are used to check any possible problems that may make the analysis less meaningful. Since the data utilized in the study is cross section, problems that may arise in estimation are multicollinearity, heteroscedasticity and model specification (Gujarati, 2003). Multicollinearity can be taken care of by the choice of explanatory variables and checked by running the OLS model instead of the ordered logit and the Variance Inflation Factor (VIF) calculated for each explanatory variable by doing a linear regression of that variable on all the other explanatory variables and then obtaining the R-squared from that regression. It estimates how much the variance of a coefficient is inflated because of linear dependence with other explanatory variables. As a rule of thumb, a variable poses collinearity problem when its VIF is greater than 10. Overall, multicollinearity is suspected when the mean VIF is sufficiently greater than one. The diagnostic test used for heteroscedasticity is the Breusch-Pagan test and the presence of heteroscedasticity is corrected by using standard robust errors, which is done by selecting the robust option in Stata.

One other important test is examining how well the model fits the data. This test hypothesizes that all the coefficients in the model:

$H_0: \beta_{1j} = \beta_{2j} = \cdots = \beta_{Nj} = 0$, and is tested against the alternative;

$H_1: \beta_{kj} \neq 0$; for some k; where k=1,2,….,N

In maximum likelihood method of estimation, three classical tests; likelihood ratio, LaGrange multiplier and the Wald principles are employed. These tests, asymptotically, have the same distribution and are analogous to the F-test from linear regression. In this study, we adopt the log likelihood ratio which is the simplest of the three. The significance of the individual coefficients will be tested by the use of the Wald test which

is analogous to the t-test in linear regression. It tests the hypothesis that a coefficient is equal to zero, against the alternative that it is not equal to zero.

$$H_0: \beta_i = 0$$
$$H_0: \beta_i \neq 0$$

The test statistic is *z* - distributed as;

$$Z_0 = \frac{\hat{\beta}_i - \beta_i}{ASE(\hat{\beta}_i)}$$

where; $\hat{\beta}_i$ is the maximum likelihood estimator of β_i and *ASE* is the asymptotic standard error of the estimator. When $H_o: \beta_i = 0$ is true/holds, then

$$Z_0 = \frac{\hat{\beta}_i}{ASE(\hat{\beta}_i)}$$

The results for the Wald test are reported as p-values in Stata.

4.6 Conclusion

This chapter presented the model selection used in the study by describing the standard ordered logit model, generalized ordered logit model and the partial proportional odds model and how they can be employed in the analysis. The chapter also presented the regression equations and definition of the variables used in the study as well as the diagnostic tests carried out in the study. The results of the study are presented in the next chapter.

CHAPTER FIVE
RESULTS AND DISCUSSION

5.1 Introduction

This chapter presents and discusses the results of the study. Section 5.2 presents statistical analysis of the dependent and independent variables. The dependent variable is defined as breastfeeding practices while the independent variables include the selected socioeconomic factors as well as the control variables. Econometric analysis of the study is given in section 5.3 presenting details of model selected and used for the estimation and the marginal effects of the independent variables. Section 5.4 concludes the chapter.

5.2 Statistical Analysis

A total of 7146 women aged 15-49 were interviewed during the Zambia Demographic and Health Survey. 4148 reported to have had one or more births in the three/five years preceding the survey and at the time of the study, infants below the age of six months were 628. This study therefore used a sample size of 628 during analysis.

5.2.1 Descriptive statistics for the dependent variable

The results from the sample show that almost all the children (99%) were breastfed; however, of the children that were breastfed, more than one third (39%) were not breastfed according to the WHO recommendations. The results of the study show that at the time of the survey, only about 1% of the infants below the age of six months were not breastfed at all, 30.1% were partially breastfed, 8.1% were predominantly breastfed and about 61% were exclusively breastfed.

5.2.2 Descriptive statistics for the independent variables

The descriptive statistics for independent variables presented below include; employment status of the mother , education level of the mother, household wealth status (household wealth index) and control variables including marital status of the mother, place of residence, age of the mother, age of the child in months (0-5 months), sex of the child.

5.2.2.1 Employment status and breastfeeding practices

As indicated in Table 3 below, the results from the sample show that of the total number of women, more than half (56%) of them are not employed and 44% are employed. During the survey women were asked if they had done any work in the last 12 months preceding the survey, which included any work besides own house work whether paid in cash or in kind such as selling things, small businesses, work on family farm or in family business. Therefore, the employment status includes both formal and informal employment. In this sample, women who are not employed have a higher likelihood of breastfeeding optimally with about 65% exclusively breastfeeding compared to 56% of the employed women. In addition, employed women partially breastfed their children (35%) which is more than those who are not employed (27%). This shows that employed women are more likely to practice suboptimal breastfeeding than those not employed.

Table 3: Breastfeeding practice by employment status of the mother (%)

Breastfeeding practice	Employment status		Total
	Not employed	Employed	
Not breastfed	1.42	0	0.80
Partial	26.50	34.66	30.10
Predominant	7.41	9.03	8.12
Exclusive	64.67	56.32	60.99
N	*351*	*277*	*628*

x^2-value= 11.50 significant at 1%.

5.2.2.2 Education level of the mother and breastfeeding practices

From Table 4 below, majority of the women had gone up to primary level in their education accounting for 61% while those with tertiary education accounted for the least, 3%. In terms of breastfeeding practices, those with secondary education are more likely to exclusively breastfeed their children (67%) than those with no education who actually have a higher percentage of suboptimal breastfeeding at 42%. Those with no education reported the highest percent of predominant breastfeeding (12%) while those with tertiary education reported the highest percent of partial breastfeeding at 35%

Table 4: Breastfeeding practice by education level of the mother (%)

Breastfeeding practice	Education level				Total
	No education	Primary	Secondary	Tertiary	
Not breastfed	0.00	0.00	3.55	0.00	0.80
Partial	29.21	32.02	24.82	35.29	30.10
Predominant	12.36	8.92	4.26	0.00	8.12
Exclusive	58.43	59.06	67.38	64.71	60.99
N	*89*	*381*	*141*	*17*	*628*

x^2-value= 26.13 significant at 1%.

5.2.2.3 Household wealth status and breastfeeding practices

As depicted in Table 5 below, the highest percentage of not breastfeeding is common among the richest group followed by the richer group with the other groups recording zero percentages. However, there is a negative association between choice of predominant breastfeeding and household wealth status because as we move to a higher wealth quintile, the practice of predominant breastfeeding reduces. Overall, optimal breastfeeding is highest among the richer (69%) people with the poorer people having the highest percent of suboptimal breastfeeding practices at 49%.

Table 5: Breastfeeding practice by household wealth status (%)

Breastfeeding practice	Household wealth status					Total
	Poorest	Poorer	Middle	Richer	Richest	
Not breastfed	0.00	0.00	0.00	0.85	4.71	0.80
Partial	29.08	38.85	28.28	25.42	27.06	30.10
Predominant	11.35	10.07	8.97	5.08	2.35	8.12
Exclusive	59.57	51.08	62.76	68.64	65.88	60.99
N	*141*	*139*	*145*	*118*	*85*	*628*

x^2-value= 31.60 significant at 1%.

5.2.2.4 Place of residence and breastfeeding practices

Table 6 below depicts that 32.3% women reported to be in the urban, 67.7% from the rural areas which is the reference group. Out of the 425 women in the rural, 60% were breastfeeding their children according to the recommendation guidelines and of the 203 women in the urban, 63% were breastfeeding their children optimally. The results show almost equal percentages of the number of women who breastfed their children according to the recommendations in the two places of residence. With regards to suboptimal breastfeeding practices, women in the urban setting had the highest percent of

breastfeeding partially at about 31% though the percent for women in the rural setting breastfeeding partially is only lower by 1%.

Table 6: Breastfeeding practice by place of residence of the mother (%)

Breastfeeding practice	Place of residence		Total
	Rural	Urban	
Not breastfed	0.47	1.48	0.80
Partial	29.88	30.54	30.10
Predominant	9.65	4.93	8.12
Exclusive	60.00	63.05	60.99
N	*425*	*203*	*628*

x^2-value= 5.96 not significant.

5.2.2.5 Marital status of the mother and breastfeeding practices

Table 7 below shows that the majority of the women are married representing 82% of the sample. An analysis of marital status shows that individuals from all the three marital status categories have a higher percentage of exclusive breastfeeding for at least higher than 50% with the married women leading at 62%. The never married portray the highest tendency to opt for predominant breastfeeding with 10% and the married ones have the lowest at 7.7%. The divorced/separated/widowed women have the highest tendency to opt for partial breastfeeding standing at approximately 35% followed by the never married (31%) and then the married (30%). But overall, the women formerly married have the highest percentage of suboptimal breastfeeding at 44% whilst for the married women; suboptimal breastfeeding is at 38%.

Table 7: Breastfeeding practice by marital status of the mother (%)

Breastfeeding practice	Marital status			Total
	Married	Once married	Never married	
Not breastfed	0.77	0.00	1.49	0.80
Partial	29.54	34.88	31.34	30.10
Predominant	7.72	9.30	10.45	8.12
Exclusive	61.97	55.81	56.72	60.99
N	*518*	*43*	*67*	*628*

x^2-value= 2.48 not significant.

5.2.2.6 Age of the mother and breastfeeding practices

The ages of the mothers are estimated in single years in the study but here explained according to age groups with class width of 5 years. The majority of women who reported to have had a child below six months of age at the time of the survey were in the age group 25-29 (28%) with the lowest being in the age group 45-49 (0.6%) as shown in Table 8 below. For almost all age groups, the breastfeeding practice chosen was mainly exclusive except for the age group 45-49 with the lowest percentage of 25% and the highest of 68% by mothers in the 15-19 age group. On average, suboptimal breastfeeding tends to increase with age. Predominant breastfeeding practice choice is highest for the 40-44 age group at 19% and lowest for the 45-49 age group at 0%. Choice of partial breastfeeding practice is clearly highest for the age group 45-49 at 75% and lowest for the 15-19 age group at 21%. Choice of not breastfeeding clearly reduces with age up to the 25-29 age group after which it becomes nil.

Table 8: Breastfeeding practice by age group of the mother (%)

Breastfeeding practice	Age group of the mother							Total
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
Not breastfed	1.32	1.25	1.12	0.00	0.00	0.00	0.00	0.80
Partial	21.05	30.00	27.53	34.71	35.29	33.33	75.00	30.10
Predominant	9.21	4.38	8.99	11.57	4.41	19.04	0.00	8.12
Exclusive	68.42	64.38	62.36	53.72	60.29	47.62	25.00	60.99
N	*76*	*160*	*178*	*121*	*68*	*21*	*4*	*628*

x^2-value=23.34 not significant.

5.2.2.7 Age of the child in months and breastfeeding practices

The age of the child variable is presented in single months for infants below the age of six months (0-5months). The majority of the infants were 5 months of age at about 19% with the lowest proportion being 0 months at 12%. Table 9 below shows that for all ages, the breastfeeding practice that was predominant is exclusive breastfeeding practice. This means that most infants at all ages were breastfed optimally. Most evidently, optimal breastfeeding tends to reduce with age and thus suboptimal breastfeeding of infants increased with age. Predominant breastfeeding practice is highest for infants of one month (11.3%) though not significantly different from those of 4 months (11.1%) and lowest for those of 0 months at about 4%, but the relationship between age of the child and predominant breastfeeding practice choice does not depict any clear trend. Choice of

partial breastfeeding practice is clearly highest for the infants of 5 months at 68% and lowest for those with 0 months at 3%. From the results, the choice of partial breastfeeding increases with age of the child. Infants between 0-1 months were all at least breastfed with only a small proportion of those in the other ages not breastfed at all.

Table 9: Breastfeeding practice by age of the child in months (%)

Age of the child in months	Age of the child in months						Total
	0 months	1 Month	2 months	3 months	4 months	5 months	
Not breastfed	0.00	0.00	0.94	0.94	1.85	0.85	0.80
Partial	2.63	6.96	16.98	35.85	39.81	68.38	30.10
Predominant	3.95	11.30	7.55	8.49	11.11	5.13	8.12
Exclusive	93.42	81.74	74.53	54.72	47.22	25.64	60.99
N	*76*	*115*	*106*	*106*	*108*	*117*	*628*

x^2-value= 181.62 significant at 1%.

5.2.2.8 Sex of the child and breastfeeding practices

With respect to sex of the child distribution in the sample, the number of male infants (321) is slightly higher than females (307). The breastfeeding practice by the child's sex is shown in Table 10 below. The proportion of female infants who are breastfeed optimally is slightly higher than males with about 40% of the males' exposed to suboptimal breastfeeding as opposed to about 38% for females. However, the percentages in all breastfeeding categories for the sexes are not so different from each other.

Table 10: Breastfeeding practice by sex of the child (%)

Breastfeeding practice	Sex of the child		Total
	Female	Male	
Not breastfed	0.98	0.62	0.80
Partial	29.64	30.53	30.10
Predominant	7.82	8.41	8.12
Exclusive	61.56	60.44	60.99
N	*307*	*321*	*628*

x^2-value= 0.39 not significant.

5.3 Econometric analysis

While section 5.2 focused on statistical analysis of the variables used in the model, this section presents the descriptive statistics, diagnostic tests and interprets the regression results of the model used in the study.

5.3.1 Summary statistics

Table 11 below shows the descriptive statistics of the variables used in the study. It outlines the means, standard deviation, minimum and maximum observations of the variables of the study. The summary statistics indicate that the highest variability in the sample is due to the age of mother with a standard deviation of 6.4875.

Table 11: Summary statistics of the sample

Variable	Obs	Mean	Std. Dev	Min	Max
Breastfeeding practice	628	2.2930	0.9264	0	3
Employment status	628	0.4411	0.4969	0	1
No education	628	0.1417	0.3490	0	1
Primary education	628	0.6067	0.4889	0	1
Secondary education	628	0.2245	0.4176	0	1
Tetiary	628	0.0270	0.1624	0	1
Poor	628	0.4459	0.4975	0	1
Middle	628	0.2309	0.4217	0	1
Rich	628	0.3232	0.4681	0	1
Place of residence	628	0.3232	0.4681	0	1
Married	628	0.8248	0.3804	0	1
Once married	628	0.0684	0.2528	0	1
Never married	628	0.1067	0.3090	0	1
Age of the mother	628	27.1752	6.4875	15	49
Age squared	628	780.5096	374.0120	225	2401
Age of the child	628	2.6465	1.6695	0	5
Sex of the child	628	0.5111	0.5003	0	1

5.3.2 Diagnostic Tests

Examining the robustness of the model results is important in checking for any problems that might render the analysis less credible. With the estimation, the problem of multicollinearity was dealt with in the selection of variables and there was no major correlation amongst any of the variables as there were no cases of high correlation among any of the variables after analyzing the VIFs of all variables, except for the age of the mother and age squared variables which is justified by the fact that the latter is directly

derived from the former and therefore not threatening for all intents and purposes. Therefore, multicollinearity was not found to be a problem in our model. The presence of heteroscedasticity was controlled for by computing robust standard errors[5]. On the basis of the likelihood ratio statistic, the results show that the model passed the test of overall significance. That is to say, the model is well fitted. The significance of the likelihood imply that there is at least one non zero regressor in the model and therefore, the probability of an infant being breastfed by any of the breastfeeding practice choices is explained by at least one of the explanatory variables in the model.

With regards to the significance of the individual regressors, the test was done using the z-statistic to see how different they are, statistically, from zero. On the basis of this statistic, the regressors are subjected to the test of statistical significance. Some of the regressors included in the model passed the test at the defined level of significance and others did not. In addition, for the ordered logit model, a Brant test to test for the proportionality assumption was carried out and a significant test statistic provided evidence that the assumption was violated and thus, failed to accept the null hypothesis of proportionality. Following the Brant test, the final model used in the study for estimation is the partial ordered logit model which is a special case of the generalized ordered logit as a solution to the violation of the proportionality assumption (Williams, 2006)[6]. During the estimation, the category of 'not breastfed at all' was combined with the partial breastfeeding practice category because of it containing extremely few observations.

5.3.3 Econometric results

This section presents results from three empirical models used to estimate the dependent variable; a standard ordered logit model, a generalized ordered model and the partial proportional odds model. The estimation results are shown in Table 12 below. With regards to the standard ordered logit model, the slope coefficients are estimated together with thresholds (cut points) which separate the three categories of breastfeeding practices.

[5] Multicollinearity and heteroscedasticity results shown in appendices
[6] Details given in the later pages of the section

Given the results of the ordered logit model, there are two reasons to think twice about using them. Firstly, in the standard ordered logit model one cannot rely on the coefficient estimates alone to interpret the effect of the independent variables on the dependent variable as well as the economic significance. It is advisable to make use of the marginal effects (Hosmer and Lemshow, 2000). Secondly, the ordered logit model assumes equal slope coefficients across the outcome categories which in practice may be different. For example, it is very possible that changes in education level have different effects on the respective outcomes, in such a case; the proportional odds assumption is violated and results of the model cannot make statistical sense if the assumption is violated.

Table 12: Ordinal outcome models of breastfeeding practices

Variable	Ordered logit	Generalized logit		Partial proportional odds	
	Coefficient	Partial & not breastfed	Predominant	Partial & not breastfed	Predominant
Emplstat	-0.1130 (0.1886)	0.0299 (0.2094)	-0.0531 (0.1968)	-0.0859 (0.1863)	-0.0859 (0.1863)
Prim	-0.1907 (0.2754)	-0.2535 (0.3198)	-0.1089 (0.2835)	-0.1783 (0.2652)	-0.1783 (0.2652)
Sec	-0.0937 (0.3447)	-0.3778 (0.3921)	0.1070 (0.3471)	-0.3055 (0.3477)	0.0407 (0.3385)
Tertiary	-0.1291 (0.6557)	-16.7097*** (0.7306)	15.3329*** (0.71114)	-0.0574 (0.6611)	-0.0574 (0.6611)
Middle	-0.3307 (0.3244)	0.0823 (0.4102)	-0.4931 (0.3446)	0.0250 (0.3417)	-0.4709* (0.3320)
Poor	-0.6777* (0.3508)	-0.3315* (0.4338)	-0.8193** (0.3622)	-0.4174* (0.3520)	-0.8034** (0.3463)
Placeres	-0.4618* (0.3115)	-0.3825 (0.3967)	-0.4635 (0.3331)	-0.4535* (0.3087)	-0.4535* (0.3087)
Married	0.5685* (0.3419)	0.6215* (0.3647)	0.7294** (0.3657)	0.5539 (0.3388)	0.5539 (0.3388)
Oncemarried	0.2865 (0.5081)	-0.0302 (0.5262)	0.5034 (0.5183)	0.1943 (0.4645)	0.1943 (0.4645)
Agemh	-0.1330 (0.1141)	-0.1527 (0.1161)	-0.1577 (0.1171)	-0.1328 (0.1115)	-0.1328 (0.1115)
Agesq	0.0020 (0.0019)	0.0024 (0.0019)	0.0024 (0.0020)	0.0020 (0.0019)	0.0020 (0.0019)
Agech	-0.6869*** (0.0606)	-0.8666*** (0.0820)	-0.6118*** (0.0617)	-0.8344*** (0.0769)	-0.6265*** (0.0630)

Table 12: Ordinal outcome models of breastfeeding practices *(continued)*

Sexch	-0.0049 (0.1820)	-0.0752 (0.2027)	-0.0156 (0.1899)	-0.0187 (0.1810)	-0.0187 (0.1810)
Constant		5.7695*** (1.6502)	4.6748*** (1.6114)	5.4892*** (1.5725)	4.5677*** (1.5610)
Observations	628	628		628	
Wald chi-square	149.5***	219.7***		148.3	
Log Likelihood	-458.8	-435.5		-446.3	
Pseudo R-square	0.1586	0.2014		0.1815	

Notes: Table shows estimation results for the three ordinal outcome models of breastfeeding practices. Robust standard errors are in parentheses. (***) denotes significance at 1% level, (**) at 5% level and (*) at 10% level.

Table 13 below represents the results of the Brant test for the proportional odds assumption as first proposed by Brant (1990). The result testing the assumption for all the variables combined with the hypothesis that the slope coefficients for all independent variables are simultaneously equal; a chi-square of 584.69 suggests that the hypothesis can be rejected at 1% level of significance which means that overall, the assumption is violated. The test for whether the proportional odds assumption holds for the independent variables separately shows that the assumption holds for some variables and not for others. Specifically, the largest violations are for age of the index child and tertiary education. Following the results of the Brant test, the standard ordered logit model is not suitable for modeling breastfeeding practices among women in Zambia because the assumption does not hold. Thus, the suitable model should be one that relaxes the proportional odds assumption and allows the slope coefficients to vary across the breastfeeding categories. The model that is appropriate in this case is the generalized ordered logit model.

Table 13: Brant test for proportional odds assumption

Variable	**All**	**Emplstat**	**Prim**	**Sec**	**Tertiary**	**Middle**	**Poor**
	584.69***	0.02	0.63	2.31	6.24**	0.81	0.67
	(0.000)	(0.893)	(0.427)	(0.129)	(0.013)	(0.368)	(0.412)
	Placeres	**Married**	**Oncemarried**	**Agemh**	**Agesq**	**Agech**	**Sexch**
	0.04	0.91	0.45	0.09	0.04	8.16***	0.04
	(0.833)	(0.339)	(0.502)	(0.760)	(0.837)	(0.004)	(0.850)

P-values in parentheses (p>chi-square), (***) denoted significance at 1% level, (**) at 5% and (*) at 10%. A significant test statistic provides evidence that the proportional odds assumption has been violated.

As shown in Table 12 above, in the generalized ordered logit model, the estimated slope coefficients for the outcome categories are different. The interpretation of the results of

the generalized ordered logit model estimation is similar to results of a series of binary logistic regressions. In this study, three categories were used during estimation; therefore, estimation results for slope coefficients of the 'partial and not breastfed' breastfeeding practice category compare that outcome category with predominant and exclusive breastfeeding categories jointly. In the same way, estimation results for slope coefficients of the predominant category compare the predominant and partial categories with the exclusive category. The signs of each estimated coefficients for the generalized ordered logit model of breastfeeding are the same as those for the standard ordered logit model except for employment status, secondary education, tertiary education and once married variables.

As mentioned earlier, the generalized ordered logit model has the advantage of freeing the ordinal system from the assumption of proportional odds but it has the disadvantage of estimating more parameters than necessary. This is due to the fact that it frees all the independent variables from the proportional odds assumption even when some may be equal. Thus, relaxing the constraint may not be needed for all the variables since some variables may conform to the constraint. A special case to help overcome this limitation is the partial proportional odds model which permits a relaxation of the proportional odds constraint for those variables that violate it.

With the partial proportional odds model, estimation is undertaken using a backwards, stepwise iterative procedure (Williams, 2006). The unconstrained model is estimated first where the Wald tests are estimated for each of the variables which tests whether the coefficients are different across the outcome equations. If the test value is statistically insignificant for one or more variables, the variable with the least significant test statistic is constrained to have equal effects across the equation. A re-estimation of the model is done with constraints imposed and the procedure is done repetitively until there are no more variables that conform to the proportional odds assumption. Ultimately, the final model with constraints is subjected to the overall Wald test against the unconstrained model. An insignificant test statistic of the final model, that is, the model with constraints, indicates that the model does not violate the proportional odds assumption. In our estimation, the overall Wald test statistic was 5.73 with the probability value of

0.7664 showing that the test statistic of the final model is insignificant and thus the assumption is not violated.

Referring to Table 12 once more, with the results for the partial proportional odds model, the overall Wald test allows for four variables to be unconstrained; age of the index child, secondary education, and middle and poor wealth status variables. The rest of the variables are allowed to be constrained and the parameter estimates for those variables are identical or equal for the two outcome categories. For the constrained variables, coefficients of age of the mother, primary education, tertiary education, employment status, place of residence and sex of the index child are negative while those of married, once married and age squared are positive.

Using the standard ordered logit model actually hides important information for the variables that do not conform to the proportional odds assumption. Using the partial proportional odds model however, reveals that information for example, the positive predominant coefficient of 0.0407 for the secondary education. The proportional odds model in a way offers a greater contribution to the estimation of intervention probabilities but in order for us to measure the economic significance of the relationships under analysis, the estimated coefficients that are presented in Table 12 above are not adequate. It is therefore, necessary for us to consider marginal effects.

5.3.4 Marginal probability effects

The results of the partial proportional odds model for the estimation of the ordered outcomes are best interpreted using the marginal effects. The use of marginal effects help in interpreting the parameters and determine the probability of observing both partial and not breastfed or predominant breastfeeding practices (suboptimal breastfeeding practices) if there is a change in the independent variables. The marginal effects for each breastfeeding practice are evaluated at each variable's mean. Table 14 below shows the marginal effect coefficients and the standard errors for the model as well as showing the significance levels.

Table 14: Marginal effects for the partial proportional odds model

Variable	Breastfeeding practices (bfpractice=1,2,3)	Means

	Partial and not breastfed P=0.2356	Predominant P=0.1195	Exclusive P=0.6449	$\bar{x}$
Emplystat	0.0155 (0.0335)	0.0042 (0.0091)	-0.0197 (0.0428)	0.4411
Prim	0.0318 (0.0468)	0.0088 (0.0133)	-0.0406 (0.0500)	0.6067
Sec	0.0574 (0.0678)	-0.0667** (0.0299)	0.0093 (0.0770)	0.2245
Tertiary	0.0105 (0.1225)	0.0028 (0.0312)	-0.0133 (0.1537)	0.0271
Middle	-0.0045 (0.0611)	0.1155*** (0.0380)	-0.1110 (0.0799)	0.2309
Poor	0.0760* (0.0649)	0.1083*** (0.0288)	-0.1843** (0.0786)	0.4459
Placeres	0.0850 (0.0600)	0.0207* (0.0135)	-0.1058* (0.0729)	0.3232
Married	-0.1088 (0.0717)	-0.0231* (0.0120)	0.1319 (0.0827)	0.8248
Oncemarried	-0.0334 (0.0762)	-0.0099* (0.0245)	0.0433 (0.1006)	0.0685
Agemh	0.0239 (0.0201)	0.0065 (0.0056)	-0.0304 (0.0255)	27.1752
Agesq	-0.0004 (0.0003)	-0.0001 (0.0001)	0.0005 (0.0004)	780.5100
Agech	0.1503*** (0.0121)	-0.0068*** (0.0090)	-0.1435*** (0.0141)	2.6465
Sexch	0.0034 (0.0326)	0.0009 (0.0089)	-0.0043 (0.0414)	0.5111

Notes: Marginal effects evaluated at the means, standard errors in parentheses, (***) denotes significance at 1% level, (**) at 5% level and (*) at 10% level.

5.4 Discussion of the econometric results

Breastfeeding practices were categorized into four categories, namely, not breastfeeding, partial, predominant and exclusive. Exclusive breastfeeding category is the reference category and not breastfeeding category was combined with the partial category during the estimation process because of the sample size being too small (0.8%)[7]. From the sample under study, the probabilities of a woman choosing to partially, predominantly or exclusively breastfeed the child are 0.2356, 0.1195, and 0.6449 respectively. The study looks at the effect that the selected socioeconomic variables have on the suboptimal breastfeeding practices which in this case are partial and predominant breastfeeding of

[7] In the discussion of result 'partial breastfeeding' refers to both partial and not breastfed categories.

the infants below the age of six months. Almost all the independent variables used in the present study retained the expected sign.

5.4.1 Employment status of the mother

The marginal effect coefficients for the employment status dummy are not significant for both partial and predominant breastfeeding practices. The effect is also positive for both implying that chances are higher for employed women, compared to those that are not employed, to breastfeed their children partially and predominantly though the effect is lower for predominant breastfeeding.

5.4.2 Education level of the mother

Education level, in this study, was categorized into those who had no education, those who completed primary education, those who completed secondary education and those who have tertiary education and no education was used as a reference category. For all the dummy variables that capture education level of the mother, it is only secondary education that is significant and negative for the predominant category. This implies that differences in the mother's education level has no statistical significance in the choice of suboptimal breastfeeding practices other than a reduction in the probability of a child being predominantly breastfed that reduces by 6.7% if the mother posses secondary level of education. Most studies have actually shown the association between higher education with higher knowledge and practice of positive health behaviour and hence may make women to reduce suboptimal breastfeeding (Kimani-Murage et al, 2011, Mihrshahi et al, 2004).

5.4.3 Household wealth status

Wealth status in this study is categorized into poor, middle and rich and rich wealth status is our reference category. Marginal effects coefficients for being in the middle household wealth status are significant and positive for predominant category choice and not significant but negative in choosing the partial practice. This means being in a middle wealth status household significantly increases the probability of predominant breastfeeding by 11.6% but insignificantly reduces the probability of partially

breastfeeding. The results are significant for being in the poor category in choosing the partial and predominant practices and the effect is positive in both. The positive relationship implies that being poor significantly increases the probability of partially and predominantly breastfeeding by 7.6% and 10.9% respectively relative to being rich. This means that suboptimal breastfeeding practice is higher the lower the level of household wealth status. This is consistent with previous findings reviewed in this study (Sunita, 2000).

5.4.4 Place of residence

Place of residence is, in this study, captured as a dummy reflecting the urban-rural dichotomy. The marginal effect coefficient is significant for the predominant outcome but not significant for the partial outcome. The effect is positive for both categories which imply that chances are higher for the woman in an urban setting to choose partial or predominant breastfeeding compared to the woman in a rural setting. On average, the probability of a woman predominantly breastfeeding a child increases by 2.1% if the woman is in the urban area relative to the woman being in a rural area. The results are consistent with a study by (Aye, 2000) where urban women were found to introduce complementary and supplementary foods to infants within four months of delivery. This association may be because of challenges that the women in urban settings are faced with like returning to work, aggressive advertisements of formula and other baby feeding complements.

Urban areas have also seen an increase in slum settings that also present unique challenges when it comes to breastfeeding practices. Research studies have noted that people in these settings have limited access to services including some basic government services coupled with financial constraints (Fotso et al, 2009). This has lead to the exclusion of people in these settings from government initiatives even those aimed at promoting optimal breastfeeding practices like the BFHI mentioned above which involves giving support to nursing mothers and counseling mothers on infant feeding practices. The slum settings are also characterized by poor standards of living because of limited livelihood opportunities and food insecurity. This has seen most women get

involved in different activities to make a living and as thus create an opportunity for child to be exposed to suboptimal practices.

5.4.5 Marital status

In this study, marital status of the mother is categorized into never married, married and once married and never married is our reference category. Marginal effects coefficients are significant across the divorced/separated/widowed women for predominant breastfeeding (negative) but insignificant for partial breastfeeding (negative). Though not significant, being once married reduces the probability of partially breastfeeding but significantly reduces the probability of predominant breastfeeding relative to having never been married. Thus, being once married reduces the probability of predominantly breastfeeding by 1% relative to never being married. The coefficient is significant for the married when it comes to choosing predominant breastfeeding but insignificant when it comes to partial breastfeeding. For both categories, the sign is negative showing that being married is associated with a reduction in the probability of partially or predominantly breastfeeding relative to never been married. Being married reduces the probability of predominantly breastfeeding by 2.3% relative to never being married.

In this study, as expected the majority of the women are in a marital union (82%) and about 38% practice suboptimal breastfeeding. On the other hand those who are divorced/separated/widowed and those who have never been in a union have 44% and 43% of suboptimal breastfeeding respectively. Econometric results show that being once married and married, relative to never been married, has an influence on predominantly breastfeeding. Particularly, the likelihood of choosing predominant breastfeeding practice is reduced by the women being once married and being married. Many studies (Kimari-Marage, 2011, Dubois et al, 2003) have suggested that this association between marital status and suboptimal breastfeeding may be due to the presence of social, emotional and economic support of a partner and/or other family members. Never married woman would be likely to practice suboptimal breastfeeding due to their engagement in some sort of income generating activities that hinder exclusive breastfeeding practice.

5.4.6 Age of the mother

Age of the mother as well as its square is not significant for both categories. In the model, it is found that an increase in mothers' age increases the probability of partially and predominantly breastfeeding. This implies that higher levels of age of the mother though not significant, increases the probability of the mother partially or predominantly breastfeeding the child.

5.4.7 Age of the child

Though age of the index child tends to increase the probability of the mother partially breastfeeding the child but reduces the probability of the mother predominantly breastfeeding the infant, the variable is significant for both categories implying that evaluated at the mean; an increase in the age of the child by one month increases the probability of the mother partially breastfeeding the infant by 15% and reduces the probability of predominant breastfeeding by 0.7%. The results show that the effect is higher with partial breastfeeding practice than predominant breastfeeding. This is in conformity with other studies including those that have found that optimal breastfeeding reduces with increase in age (Tewodros et al, 2009; Shirima et al, 2000).

Basically, this can be as a result of social, cultural and economic factors at play. It's easy for a mother to give post -partum care to the child in the first few months when she is confined at home but after some time especially if the mother has to go back to work or school, an opportunity is created for the child to be exposed to suboptimal breastfeeding particularly early introduction to complementary foods. Some qualitative studies have revealed that infants are introduced to foods early because mothers think breast milk is insufficient for the child's food needs. Therefore, lack of better knowledge of the breastfeeding and infant feeding recommendations is also a factor increasing the rate of partial breastfeeding before the child is six months of age.

5.4.8 Sex of the child

The sex of the child, in our regression, is captured by the male dummy. The marginal effect coefficients for this dummy are not significant for both the partial and predominant

breastfeeding practice categories and positive for both. Though insignificant, being male increases the probability of being partially or predominantly breastfed relative to being female. This shows that male infants are more likely to be introduced to complementary feeding early compared to female infants. Some studies have shown that boys are introduced to complementary foods early because breast milk alone does not meet their feeding demands.

5.5 Concluding remarks

Overall, the marginal effects reveal that for the data set used in this study and the sample size, age of the child and being in the poor household wealth status seem to be the major determinants of partial breastfeeding practice while secondary education, place of residence, being divorced/separated/widowed, being married, age of the child and being in the middle and poor wealth status are major factors that have an effect on predominant breastfeeding practice. This chapter has presented the study findings and interpretations in form of variables statistics and marginal effects of the partial proportional odds model. The next chapter concludes the study by presenting summary results, policy implications, limitations of the study and areas for further research.

CHAPTER SIX
CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Summary of the findings

The major objective of the present study was to empirically investigate the socioeconomic factors that have an effect on suboptimal breastfeeding practices among women. This choice was made because suboptimal breastfeeding has a negative impact on infant illness and death and also affects adulthood life. The specific objectives in this study were to investigate whether education level, household wealth status, and employment status have an effect on the suboptimal breastfeeding practices. Since the choice of breastfeeding practices is also influenced by other factors other than the selected socioeconomic factors, age of the child, age of the mother, sex of the child, place of residence and marital status were included in the study as control variables.

The study has somewhat come up with similar results as previous studies and has brought out some important issues that can help in understanding the underlying reasons for women to choose suboptimal breastfeeding practices for infants below six months. Exclusive breastfeeding has been recommended as the infant breastfeeding method during the first six months of life given its health benefits and protective effect against morbidity and mortality but suboptimal breastfeeding practices which includes partial and predominant breastfeeding are still relatively high putting infants at high risk of mortality and morbidity and different factors have been associated globally including, among others, socioeconomic factors, cultural factors, demographic factors, practice in health care facilities, advertising and promotion of breast milk complement and supplement infant feeding products.

From the study, breastfeeding for infants below six months among women in Zambia is a common practice but exclusive breastfeeding practice especially for infants above three months has remained low which means that suboptimal breastfeeding is still highly practiced. The early introduction of water, liquids and/or food to infants has also been documented in Zambia in a study by Fjeld et al (2008) where it was postulated that mixed feeding was the conventional way to feed infants. The presence of suboptimal breastfeeding for infants as well as the lack of significant improvement in infant and child mortality rates prompted this study's investigation into the impact of socioeconomic

factors on suboptimal breastfeeding practices so as to inform intervention strategies and future research studies.

The study hypothesized that education level; employment status and wealth status have no effect on the suboptimal breastfeeding practices. The results have however revealed that wealth status (middle and poor) and education level (secondary education) significantly influence the choice of suboptimal breastfeeding practices. In addition, based on the marginal effects, control variables; age of the child, place of residence and marital status also seem to have significant influence on the choice of suboptimal breastfeeding practices based on the partial proportional odds regression model. For this dataset and selected sample, the study failed to reject the hypothesis of mother's employment status not having an effect on the choice suboptimal breastfeeding practices since it showed no significant effect. Other control variables such as sex of the child and age of the mother also do not seem to be significant factors in influencing the suboptimal breastfeeding practices.

6.2 Policy recommendations

Based on the summary of the findings, a number of policy recommendations can be drawn given that two of the hypothesized variables; wealth status (middle, poor) and education (secondary education) have emerged to significantly influence the choice of suboptimal breastfeeding practices. Other control variables; age of the child, place of residence and marital status (married, once married) are also shown to significantly have an effect on the choice of suboptimal breastfeeding practices. The significant association shows that other than the hypothesized factors, other factors also have an influence on the choice of breastfeeding practices.

Different factors could be at play for the associations revealed in the study but there is need for promotion of exclusive breastfeeding for infants below the age of six months as suggested by WHO for the benefits of the child.

- There is need to come up with policies that will encourage improved education attainment for girls and women as it will increase chances of women making right choices and decisions not only about their life in general but also including child health through optimal breastfeeding. Education will also make it possible for women to have wide access to a range of relevant information to help them better understand the importance of optimal breastfeeding as well as dangers of suboptimal breastfeeding.

- Potential interventions that address economic limitations of the women in the country can also help promote optimal breastfeeding practices especially policies aimed at ensuring food security through appropriate income generating activities.

- It is highly possible that the opportunity to reduce suboptimal breastfeeding lies in the health facilities especially through intensifying the Baby Friendly Hospital Initiative as a way of disseminating information to the mothers and influencing their choices towards optimal breastfeeding. This is because the BFHI includes necessary steps that are needed to help promote and offer support to nursing mothers which encourages optimal breastfeeding[8].

- For women who are not able to access health services, community based activities which may involve groups from within the community can be used to encourage woman to breastfeed optimally. Support from skilled birth attendants should be strengthened and increased to help disseminate information regarding the importance of optimal breastfeeding.

- There is need for a supportive policy environment to help invest highly in the promotion of optimal breastfeeding such as nutrition support services and wage compensation for mother's especially those in the informal sector. This is only possible if policy makers and programme managers understand the social, human and economic costs of suboptimal breastfeeding practices.

[8] Ten steps for the BFHI outlined in the appendix

- Most mothers need much practical and emotional support especially that most unmarried mothers are first time mothers and adolescent girls, there is need for them to be supported to initiate and maintain optimal breastfeeding practices.

Clearly, the health benefits and protective effects of breastfeeding are most important in populations with high infant mortality, high illiteracy, poor sanitation facilities, poor nutritional status and generally low economic status, which fulfil the Zambian situation. Therefore, if optimal breastfeeding is going to be practiced, considerable changes could be achieved in the infant morbidity and mortality.

6.3 Study limitations and area for further research

The study used secondary data which was not particularly designed for this study therefore; the researcher relied on the sample size as well as variables captured in the main data set. The questionnaire used in the survey basically targeted women and so other important interest groups such as health care workers, employers were not represented which impacted the understanding and ability to explain the issues in relation to interventions. HIV and AIDs status of the mother, mother's knowledge of recommendations and attitude towards the breastfeeding practices were not included because they were not captured in the main dataset. It is necessary therefore to search the gap in knowledge and real practice of breastfeeding for necessary interventions by either re-interviewing the same sample or having a new sample that will include all necessary factors.

In view of the above shortcomings, future research should also find out the woman's social status in the family regarding decision making and cultural aspects in relation to breastfeeding. This can be done through qualitative research which will help to identify the reasons why suboptimal breastfeeding practices occur and help guide in developing strategies to accelerate improvements in child survival.

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APPENDICES

Appendix A: Test for Heteroscedasticity

Breusch-Pagan test

H_0: Homoscedastic variances

H_1: Heteroscedastic variances

x^2-value = 42.95

p-value = 0.0000

Appendix B: Test for Mulicollinearity

Collinearity diagnostics

VARIABLE	VIF	TOLERANCE	R-SQUARED
Employment status	1.08	0.9259	0.0741
Primary education	2.16	0.4638	0.5362
Secondary education	2.37	0.4223	0.5777
Tetiary education	1.30	0.7663	0.2337
Middle wealth status	1.28	0.7841	0.2159
Poor wealth status	2.08	0.3470	0.6530
Place of residence	2.41	0.4152	0.5848
Married	2.08	0.4814	0.5186
Once married	1.76	0.5678	0.4322
Age of the mother	17.41	0.0151	0.9849
Age squared	16.73	0.0158	0.9842
Age of the child	1.03	0.9682	0.0318
Sex of the child	1.00	0.9953	0.0047

A high VIF is not a problem and can be ignored if:

- The variables with high VIFs are control variables, and the variables of interest do not have high VIFs.
- The high VIFs are caused by the inclusion of powers or products of other variables.
- The variables high VIFs are indicator (dummy) variables that represnet a categorical variable with three or more categories.

Appendix C: Baby Friendly Hospital Initiative

Ten Steps for successful breastfeeding:

1. Have a written breastfeeding policy that is routinely communicated to all health care staff.
2. Train all health care staff in skills necessary to implement this policy.
3. Inform all pregnant women about the benefits and management of breastfeeding.
4. Help mothers initiate breastfeeding within one half-hour of birth.
5. Show mothers how to breastfeed and maintain lactation, even if they should be separated from their infants.
6. Give newborn infants no food or drink other than breast milk, unless medically indicated.
7. Practice rooming in – that is, allow mothers and infants to remain together 24 hours a day.
8. Encourage breastfeeding on demand.
9. Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants.
10. Foster the establishment of breastfeeding support groups, and refer mothers to them on discharge from the hospital or clinic.