UNIVERSITY OF CAPE COAST

BREASTFEEDING PRACTICES AND RISKS OF CHILDHOOD MORBIDITY IN GHANA

ANTHONY MWINILANAA TAMPAH-NAAH

2019

UNIVERSITY OF CAPE COAST

BREASTFEEDING PRACTICES AND RISKS OF CHILDHOOD MORBIDITY IN GHANA

BY

ANTHONY MWINILANAA TAMPAH-NAAH

Thesis submitted to the Department of Population and Health of the Faculty of Social Sciences, College of Humanities and Legal Studies, University of Cape Coast in partial fulfilment of the requirements for the award of Doctor of Philosophy in Population and Health

JANUARY 2019

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: ………………………… Date: …………………..

Name: Anthony Mwinilanaa Tampah-Naah

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: …………………… Date: ……………...

Name: Prof. Akwasi Kumi-Kyereme

Co-Supervisor's Signature: ………………………… Date: ………………

Name: Dr. Joshua Amo-Adjei

ABSTRACT

In Ghana, child nutrition and health are major public health and developmental challenges. In this study, interpretivist and positivist paradigms were applied to assess breastfeeding practices and risk of childhood morbidity. The GDHS 2014 data and in-depth interviews with mothers were used. Multivariate, geospatial, and inductive analyses were employed to manage the data. The study extracted 2202 respondents and engaged 20 participants. The multivariate logistic regression analyses revealed that protective effects of breastfeeding practices against childhood morbidity disappear in the midst of other risk factors. Risk factors accounting for this operated at the individual, community, health, and environmental levels. Major hot spot districts for breastfeeding practices were: Accra Metro (not breastfeeding); Daffiama-Bussie-Issa, Wa Municipality, Wa West, and Bolgatanga (exclusive); Gushiegu (predominant); and Bawku West (partial). Hot spot districts for childhood morbidity were: Savelugu-Nanton (diarrhoea); Accra Metro (ARI); Zabzugu (anaemia); and Lawra, Jirapa, and East Mamprusi (fever). Key challenges of breastfeeding practices were related to: household chores; formal and informal work schedules; family influences; low breast milk production; and swollen breasts or sore nipples. Childhood morbidity was commonly attributed to primary teeth development and eating of cold foods. To manage morbidity cases, most mothers preferred present their children at hospitals or clinics. The Ministry of Health and Ghana Health Service could use channels such as radio and television to carry out more educative programmes on breastfeeding practices, (noting potential risk factors) to reduce episodes of childhood morbidity in the country.

KEY WORDS

Breastfeeding

Childhood

Diarrhoea

Acute respiratory infection

Anaemia

Fever

ACKNOWLEDGEMENTS

First and foremost, I offer my sincerest gratitude to my principal supervisor, Prof. Akwasi Kumi-Kyereme, and my co-supervisor, Dr. Joshua Amo-Adjei, for their guidance in producing this thesis. Their comments, critical reviews, and suggestions were helpful. Also, I am appreciative to MEASURE DHS for making available freely the Ghana Demographic and Health Survey data set used for this study. I duly acknowledge the mothers at Upper West and Western regions who expressed their views on breastfeeding practices and childhood morbidity.

I would also like to acknowledge the support of all staff and post-graduate students of the Department of Population and Health, Department of Geography and Regional Planning, and Department of Tourism and Hospitality, all of the University of Cape Coast, who in diverse ways assisted me in successfully completing this thesis.

DEDICATION

To all mothers and children in Ghana

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AAFP	American Academy of Family Physicians
AIDS	Acquired Immune Deficiency Syndrome
ALRI	Acute Lower Respiratory Infection
AOR	Adjusted Odds Ratio
ARI	Acute Respiratory Infection
ANC	Antenatal Care
AURI	Acute Upper Respiratory Infection
BFHI	Baby Friendly Hospital Initiative
BP	Breastfeeding Practices
CDC	Centers for Disease Control and Prevention
CHPS	Community-based Health Planning and Services
CI	Confidence Interval
CM	Childhood Morbidity
DHS	Demographic and Health Survey
ESRI	Environmental Systems Research Institute
GDHS	Ghana Demographic and Health Survey
GHS	Ghana Health Service
GIS	Geographic Information System
GPS	Global Positioning System
GSIYF	Global Strategy for Infant and Young Child Feeding
GSS	Ghana Statistical Service
HBM	Health Belief Model
HIV	Human Immunodeficiency Virus
H-L	Hosmer-Lemeshow
IBFAN	International Baby Food Action Network
ICF	Inner City Fund

IFRRI	International Food Policy Research Institute
IRB	Institutional Review Board
MDG	Millennium Development Goals
MFMER	Mayo Foundation for Medical Education and Research
MICS	Multiple Indicator Cluster Survey
MOH	Ministry of Health
MS	Microsoft
NICE	National Institute for Health and Care Excellence
NMIMR	Noguchi Memorial Institute for Medical Research
ENN	Emergency Network Nutrition
OR	Odds Ratio
ORT	Oral Rehydration Therapy
PHC	Population and Housing Census
SDG	Sustainable Development Goals
SSA	sub-Saharan Africa
STATA	Statistics and Data
TRA	Theory of Reseasoned Action
UN	United Nations
UNICEF	United Nations Children's Fund
UTM	Universal Transverse Mercator
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

Background to the Study

World Health Organization (WHO) has published a number of documents on breastfeeding and nutritional issues of children. In 1991, a document on the indicators for assessing breastfeeding practices was developed to spell out indicators for assessing infant feeding within and across countries particularly on promoting breastfeeding efforts (WHO, 1991). The initial recommendation to exclusively breastfeed infants for the period of four to six months before the introduction of complementary foods was adjusted to a new recommendation of exclusively breastfeeding up to six months before complementary foods could be introduced to a child (WHO 2001). Again in 2002, another document was provided to assess indicators of complementary feeding (Ruel, Brown & Caulfield, 2003).

Inspite of all these measures, a set of indicators for assessing feeding practices of infants and young children had not been well developed. Based on this, a number of activities were again initiated by a working group of WHO and this led to the development of a set of indicators for assessing feeding practices of infants and young children for population-based surveys (WHO, 2008). The core indicators put forward by WHO include: early initiation of breastfeeding; exclusive breastfeeding for six months; continued breastfeeding for one year; introduction of solid; semi-solid or soft foods; minimum dietary diversity; minimum meal frequency; minimum acceptable diet; and consumption of iron or iron-fortified foods. Among these core indicators, the breastfeeding practices are considered the foundation for boosting the immune systems of infants and young children. The short and long-term impacts of such feeding practices could reduce childhood morbidities and mortalities, particularly those arising from infectious diseases.

Also, infectious diseases among children are accorded much public health attention due to their adverse impact on their growth and development. These diseases, especially diarrhoea and acute respiratory infection (ARI) account for the death of millions of children (under five years) every year worldwide (WHO, 2015). Global reports indicate that diarrhoea, ARI, anaemia, and fever are among the leading causes of childhood morbidity and mortality worldwide (WHO, 2015).

On diarrhoea, projections show that it contributed to about nine per cent of all deaths among children under age five; thus being the second highest cause of childhood mortality (United Nations Children's Fund [UNICEF], 2017). This translates into around 1,400 young children dying each day and 526,000 children per year. Predictably, 80 per cent of these deaths occur in developing countries where living conditions are mostly unfavourable for the growth and development of children (Boschi-Pinto, Velebit & Shibuya, 2008).

Specifically, ARI contribute to the largest number of childhood mortality and morbidity worldwide (UNICEF, 2017). Recent estimates suggest that children below five years of age suffer about five episodes of ARI per child per year, thus accounting for about 238 million attacks (Pinzón-Rondón, Aguilera-Otalvaro, Zarate-Ardila & Hoyos-Martinez, 2016). Also, data suggest that 30-40 per cent of out-patient-department attendance and 20-40 per cent of hospital admissions in developing countries may be attributed to ARI and pneumonia among children (Walke, Das, Acharya & Pemde, 2014).

Ninety-seven per cent of ARI cases occur in developing countries with about seventy per cent of the cases occurring in South Asia and sub-Saharan Africa [SSA] (Troeger, Forouzanfar, Rao, Khalil, Brown, Swartz, et al., 2017).

Another morbid condition that constantly confronts infants and young children in many developing countries is anaemia. Childhood anaemia was estimated to be 68 per cent, deciphering to 84 million cases among pre-school children in Africa (WHO, 2008). In SSA, the prevalence of anaemia among children under five years varies from 42 per cent in Swaziland (now Kingdom of eSwatini) to 91 per cent in Burkina Faso (Magalhães & Clements, 2011). High prevalence of anaemia in most developing countries is linked to poor nutrition that results in iron deficiency and consequently, insufficient red blood cells production among children (Knowledge for Health, 2017).

Fever is also common among children under five years in SSA countries (WHO, 2013). However, the exact figures on prevalence of fever are difficult to ascertain in the region given that it is usually a symptom of infectious diseases such as malaria, dengue, pneumonia, diarrhoea and typhoid (Murray, Rosenfeld, Lim, Andrews, Foreman, Haring, et al., 2012). Therefore, several causes of fever are problematic to differentiate clinically. In this study, fever is referred to without localizing features.

Breastfeeding as a natural intervention has been identified as a major means of reducing the high prevalence of life threating early childhood morbidity (Walker, Rudan, Liu, Nair, & Theodoratou, 2013). Breast milk contains antibodies and nutrients essential for protecting infants and young children from diseases, ensures their cognitive development (Richards, Hardy & Wadsworth, 2002) and has the potential of reducing gastrointestinal and respiratory infections throughout a child's life time (Arifeen, Black & Antelman, 2001). For instance, it has been estimated that an increase in breastfeeding worldwide by 40 per cent would reduce respiratory infection morbidity by 50 per cent in children less than 18 months of age (Oddy, Sly, de Klerk, Landau, Kendall, Holt, et al., 2003). In a cohort study consisting of 18,819 infants, optimal breastfeeding was associated with 53 per cent decrease in hospital admissions for diarrhoea (Quigley, Kelly & Sacker, 2007).

However, breastfeeding practices may be interrupted by some specific risk factors leading to childhood morbidity (diarrhoea, ARI, anaemia, and fever). These factors include maternal education, source of drinking water and size of child are related variables that may predispose infants and young children to morbidity. There have been empirical studies conducted to suggest that mother and child characteristics and other related factors play important roles in childhood anaemia (Chandyo, Henjum, Ulak, Thorne-Lyman, Ulvik, Shrestha, et al., 2016; Kuziga, Adoke & Wanyenze, 2017; Simbauranga, Kamugisha, Hokororo, Kidenya & Makani, 2015). Other studies have indicated associations between potential maternal and childhood risk factors and childhood fever (Netzer-Tomkins, Rubin & Ephros, 2016; Pisacane, Continisio, Palma, Cataldo, Michele & Vairo, 2010). Others include association between specific risk factors and diarrhoea (Gebru, Taha & Kassahun, 2014; Thiam, Diene, Fuhrimann, Winkler, Sy, Ndione, et al., 2017); and acute respiratory infection (Amugsi, Aborigo, Oduro, Asoala, Awine & Amenga-Etego, 2015; Kwofie, Anane, Nkrumah, Annan, Nguah & Owusu, 2012).

Breastfeeding practices, therefore, may provide fundamental indication for developing effective programmes to ensure the survival and health of infants and young children especially in developing countries. This defines the basis, essence, and need for the present study. The study sought to assess breastfeeding practices and risks of childhood morbidity in Ghana using dataset from the Ghana Demographic and Health Survey 2014 and exploring views from mothers.

To guide the study, the concept of proximate determinants – as embedded in the Analytical Child Survival Framework (Mosley & Chen, 2003), and UNICEF Framework for Child Malnutrition (UNICEF, 2013) – was used to develop a conceptual framework. In addition, Breastfeeding Self-Efficacy Theory, Theory of Planned Behaviour, Social Theory and Health Belief Model supported other aspects of the study that explored views of mothers on breastfeeding practices and childhood morbidity.

Statement of the Problem

Breastfeeding (practices) plays an integral role in sustaining healthy growth and development of children worldwide. However, in situations where mothers and caregivers do not adhere to best practices of feeding infants and young children through optimum breast milk and appropriate complementary foods or fluids, the prevalence of diarrhoea, ARI, anaemia and fever may be high. Evidence suggests that breastfeeding practices, undoubtedly, correlate with infants and young children's health outcomes (Marques, Taddei, Lopez & Braga, 2014).

In Ghana, child health is a major public health and development issue. (Ministry of Health [MOH], 2007). To address challenges associated with child health, a strategy (2007 – 2015) was formulated and implemented with the aim of achieving the past Millennium Development Goal (MDG) 4 – to reduce by two thirds the under-five mortality rate. Most countries including Ghana, however, did not meet this target. Consequently, this has been re-packaged into Sustainable Development Goal (SDG) 3 (target 2) - to reduce "under-5 mortality to at least as low as 25 per 1000 live births" (United Nations [UN], 2016; p.1).

An assessment of survey reports of Ghana indicates that the prevalence of diarrhoea in 2008 was 19.8 per cent and dropped to 12 per cent in 2014. Likewise, ARI prevalence in 2008 was 5.5 per cent and reduced to 3.6 per cent in 2014. Also, the prevalence of anaemia in 2003 was 77.9 per cent and reduced to 65.7 per cent in 2014. Furthermore, the prevalence of fever in 2008 was 20 per cent and this reduced to 14 per cent in 2014 (Ghana Statistical Service, Ministry of Health & Inner City Fund Macro [GSS, GHS & ICF International], 2009; 2015). While the aforementioned evidence suggests some modest improvement, a drastic reduction of the prevalence of diarrhoea, ARI, anaemia, and fever among children under two years of age in Ghana would be needed to meet the related targets of SDG 3.

In relation to breastfeeding, exclusive breastfeeding (0-5 months) rate was 63 per cent in 2009 and this reduced to 54 per cent in 2015 (GSS, GHS & ICF International, 2009; 2015). Again, 68 per cent of breastfeeding children received solid or semi-solid foods in 2009 and this increased to 88 per cent breastfed children (6-23 months) in 2014 (GSS, GHS & ICF International, 2009; 2015).

The implication of the decline is that, more infants are being introduced to complementary foods early. In situations where these foods are contaminated or not nutritionally balanced, infants and young children are most likely to be exposed to infectious ailments such as diarrhoea, ARI, anaemia and fever. Notwithstanding the contributions made by studies (Ewusie, Ahiadeke, Beyene & Hamid, 2014; Nonvignon, Aikins, Chinbuah, Abbey, Gyapong, Garshong, et al., 2010) to the child health and nutrition literature, less attention has been paid to breastfeeding practices of mothers, which is a key variable in early childhood infections pathways. At best, where breastfeeding is considered, it is presented as a confounding variable to others. Yet, breastfeeding practices of children are pre-requisites to their positive growth and development, health, and survival (WHO/UNICEF, 2003). Furthermore, studies that rigorously explored district spatial patterns and hot spots of breastfeeding practices and related morbidities in Ghana are inadequate.

Also, there has been paucity of studies that incorporate qualitative narratives of mothers to further explain the perceived impacts of breastfeeding practices and childhood morbidity. The above is suggestive, therefore, of the need for more studies in the field to address the identified lapses in the literature. This study addresses the following questions; (a) how do breastfeeding practices of women shape prevalence of childhood diarrhoea, ARI, anaemia and fever?; (b) where are the hot spots of breastfeeding practices and childhood morbidity in the country?; and, in addition, (c) what are the views of mothers on breastfeeding practices and childhood morbidity?

To answer the above-mentioned questions, the present study assessed breastfeeding practices and risks of childhood morbidity, specifically; diarrhoea, ARI, anaemia and fever using a large population-based survey data. The study considered a pool of risk factors (at the individual-level, community-level, health-level and environmental-level) to accomplish its purpose. Also, district based spatial data were used to examine hot spots of breastfeeding practices and childhood morbidity. To further unearth social meanings, the study sought views of mothers on breastfeeding practices and childhood morbidity from selected locations within the country.

Objectives of the Study

The main objective of the study was to assess breastfeeding practices (no breastfeeding, exclusive breastfeeding, predominant breastfeeding and partial breastfeeding) and risks of childhood morbidity (diarrhoea, ARI, anaemia and fever) in Ghana.

The specific objectives were to:

1. Examine breastfeeding practices and childhood morbidity (diarrhoea, ARI, anaemia and fever) among children (0-23 months);
2. Analyse spatial patterns and hotspots of breastfeeding practices, and childhood morbidity among children (0-23 months);
3. Explore views of mothers on breastfeeding practices and childhood morbidity (0-23 months).

Hypotheses of the Study

Review of related literature has revealed arguments on the similar effect of exclusive breastfeeding and predominant feeding on childhood morbidity. The equal effects of these two breastfeeding practices are much pronounced in developed countries compared to developing countries (UNICEF, 2015). However, a recent study conducted in some SSA countries showed a narrowing gap of these breastfeeding practices on childhood morbidity (Ogbo, Eastwood, Page, Arora, McKenzie, Jalaludin, et al., 2017). Based on these, four research hypotheses were formulated. These are that there was no significant difference in the occurrence of:

(i) Diarrhoea between exclusively and predominantly breastfed children;

(ii) ARI between exclusively and predominantly breastfed children;

(iii) Anaemia between exclusively and predominantly breastfed children;

(iv) Fever between exclusively and predominantly breastfed children.

Significance of the Study

Child health continues to attract enormous attention in public health and development discourses. Not surprisingly, child health featured prominently in the past MDG and, now in the current SDG. The issue of breastfeeding practices and its effect on health outcomes of children has, also, gained much attention as evidenced by the number of research papers in the last few years and action plans by WHO and UNICEF.

Also, findings from this study would be useful to other non-governmental organizations that are interested in child nutrition and health. The findings of this present study may aid them in targeting populations at risks in their areas of operations. This would enable them to judiciously use their limited resources to meeting their objectives in beneficiary communities in Ghana.

Towards knowledge generation, this study, to the best of my knowledge, may be the first to investigate association between breastfeeding practices and childhood morbidity, taking into consideration potential risk factors, through the usage of a large population-based survey data in the country. Also, findings from the present study would add up to existing body of knowledge on child health and nutrition globally.

Delimitations of the Study

The data used for the analysis in this study were collected based on aims different from the 2014 GDHS. This has compelled the study to reduce the original dataset to a desired sample size (N = 2202) of children less than 24 months. This was to comply with the tentative age group of infants and young children technically required to assess their breastfeeding practices. WHO (2001) recommends that mothers should practice exclusive breastfeeding and thereafter they should introduce complementary foods and continue to breastfeed, on demand, till their children are aged two years. Some variable responses were operationalized and this resulted in findings of the present study being different from descriptive figures in the 2014 GDHS report.

Review of related literature is only on research articles on breastfeeding practices and childhood morbidity (diarrhoea, ARI, anaemia, and fever). Articles were reviewed for pertinent and current literature on the issues under study. For the spatial analysis, only breastfeeding practices and childhood morbidity variables were considered and these were overlaid on the district map of the country. The qualitative analysis only considered mothers in Upper West and Western regions, using the urban and rural divide to explore views of mothers on breastfeeding practices and childhood practices.

Limitations of the Study

Notwithstanding the aforementioned contributions of this study to empirical knowledge, it has some limitations. Statistically, the study can only establish associations between the study variables. Hence, causalities cannot be examined since the data is cross-sectional. Also, the data used has no explicit parameters indicated on the inclusion and exclusion criteria used to collect the breastfeeding data among children (0-23 months). These criteria are necessary to ensure that only healthy mothers and children are included in the data collected. Hence, this study assumes that all mothers and children included in the study were healthy.

Data on childhood morbidity were collected based on verbal reports given by the mothers. The mothers could under-report or over-report the occurrence of childhood morbidity (diarrhoea, ARI, anaemia, and fever) within the 24 hours recall period.

For the spatial analysis, identifying hot spots in a single year's data puts a limitation on the findings. Multiple year data could have increased the analytical power. The hot spot districts ascertained are assumed to be homogeneous. Identification of specific target localities within districts can better dictate implementation of interventions.

Limitations of the qualitative aspect of this study are: findings cannot be generalized. The data was purposively collected from small sample of mothers within two regions; and views expressed the by mothers are unique to their own observations and knowledge and may not represent those of other mothers in the same community.

Organization of the Study

This study is organized in eleven chapters. Chapter One covers the background of the study, statement of the problem, objectives, hypotheses, significance, delimitations and limitations of the study. Chapter Two reviews related literature on breastfeeding practices and childhood morbidity. Chapter Three focuses on related theoretical issues and conceptual framework of the study. Chapter Four presents philosophical paradigms, and methodologies used to analyze the quantitative and qualitative data.

Chapter Five covers results and discussion on breastfeeding practices and risks of childhood diarrhoea. Chapter Six focuses on results and discussion on breastfeeding practices and risks of acute respiratory infection. Also, Chapter Seven focuses on results and discussion of breastfeeding practices and risks of anaemia. Chapter Eight provides results and discussion on breastfeeding practices and risks of fever.

Chapter Nine contains results and discussions on spatial patterns and hot spots of breastfeeding practices and childhood morbidity. Chapter Ten presents views of mothers and discussions on breastfeeding practices and childhood morbidity management. Chapter Eleven presents the summary, conclusions, recommendation for policy, recommendation for further research, and contribution to knowledge.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

Issues on breastfeeding and child health internationally and nationally, were briefly reviewed. Also, a review of related extant literature on breastfeeding practices, risk factors and childhood morbidity (diarrhoea, ARI, anaemia, and fever) was conducted. The key words used to search for literature were exclusive breastfeeding, predominant breastfeeding, partial breastfeeding, diarrhoea, ARI, anaemia, risk, explanatory or confounding factors. These key words were also paired to get information on the link between breastfeeding practices and childhood morbidity. Electronic platforms such as PubMed and Google Scholar were used to search for the related information. Other national and international reports were accessed for relevant information.

International Breastfeeding and Child Feeding Policies

WHO and UNICEF have formulated breastfeeding and child feeding policies to improve upon the health and nutrition of infants and children in the world. Some of these prominent policies include: International Code of Marketing Breast Milk Substitutes; Baby Friendly Hospital Initiative; and Global Strategy for Infant and Young Child Feeding.

The World Health Assembly adopted the International Code of Marketing of Breast Milk Substitutes in 1981 as an international health policy framework for the promotion of breastfeeding across member countries (WHO, 1981). As a public health strategy, the code was to be given legal support in countries that adopted it to put restrictions on the marketing of breast milk substitutes that may be equated to breastfeeding. The breast milk substitutes consist of: infant formula; vegetable mixes; cereal for infants; baby teas and juices; follow-up milk; and other milk products. Also, it contains outlined ethical guidelines and regulations for the marketing of feeding bottles and teats (UNICEF, 2005).

This policy was to further support overall maternal and child health programmes that are fundamental elements of primary health care in all spheres of society (National Institute for Health and Care Excellence [NICE], 2017). Since the adoption of the Code, 84 countries have enacted legislations to ensure that stakeholders abide by the resolutions embedded in it. About 14 countries have formulated laws to smoothly implement the Code (International Baby Food Action Network [IBFAN], 2017). Apart from these countries that have developed tremendous strategies to ensure that families, health facilities and related companies comply with the Code are Iran, India, and Papua New Guinea (UNICEF, 2005).

In addition, hospitals and maternity units have reinforcing environments for new mothers to learn and adapt better and sustainable breastfeeding practices. One such initiative is the Baby Friendly Hospital Initiative (BFHI). The BFHI, launched in 1991, was an effort by UNICEF and WHO to ensure that all maternity units whether free standing or in a hospital, become centers of breastfeeding support.

A maternity care facility can be designated 'baby-friendly ' when it does not accept free or low-cost breast milk substitutes, feeding bottles or teats, and has implemented the ten specific steps to support successful breastfeeding (WHO, 2009). UNICEF/WHO (1991) had earlier suggested that every facility providing maternity services and care for newborn infants should: (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; and (4) help mothers initiate breastfeeding within half an hour of birth.

Other BFHI steps include that facilities should: show mothers how to breastfeed, and how to maintain lactation even if they should be separated from their infants; give newborn infants no food or drink other than breast milk, unless medically indicated; practice rooming-in, that is, allow mothers and infants to remain together - 24 hours a day; encourage breastfeeding on demand; give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants; and foster the establishment of breastfeeding support groups and refer mothers to them upon discharge from the hospital or clinic.

The Global Strategy for Infant and Young Child Feeding (GSIYF) is another policy intended to promote healthy growth and development of children. WHO and UNICEF jointly developed the GSIYF with the aim of improving - through optimal feeding - the nutritional status, growth and development, health, and survival of infants and young children (WHO, 2017).

Approved in 2002, GSIYF sets the standards for global action in support of optimal breastfeeding, complementary feeding, and related maternal nutrition and health. Specifically, the strategy includes the following: six months of exclusive breastfeeding; continued breastfeeding for two years or beyond; timely adequate, safe and appropriate complementary foods and feeding starting after six months; and related support for maternal health, nutrition and birth spacing (WHO/UNICEF, 2003).

As indicated by WHO and UNICEF (2003), the GSIYF further aimed to create: awareness of the main problems affecting infant and young child feeding, identify approaches to their solution, and provide a framework of essential interventions; increase the commitment of governments, international organizations and other concerned parties for optimal feeding practices for infants and young children; and create an environment that will enable mothers, families and other caregivers in all circumstances to make - and implement - informed choices about optimal feeding practices for infants and young children.

National Child Health Policy

The National Child Health Policy (2007-2015) instituted by the Ministry of Health, Ghana, sought to provide a framework for planning and implementing a continuum of programmes in the areas of neonates, infants and children under five years to promote their survival, growth and development. This policy was formulated based on a previous working document in 1999 and complements the Health Sector Programme (2007-2011) (GHS, 2016).

At the stage of infants and children (aged 1-59 months) health on the continuum, a number of preventive and treatment interventions were spelt out. These include, but not limited to: exclusive breastfeeding to six months; continued breastfeeding to two years and beyond; appropriate complementary feeding from six months; access to clean water, sanitation and promotion of hygiene; anti-malarial for malaria; ORT and zinc for diarrhea; anti-biotic for pneumonia; and management of malnutrition (GHS, 2016).

The adoption of related international infant and child health policies has enabled the country to achieve notable improvements on issues on maternal and child health. For instance, the Baby-Friendly Hospital Initiative implemented in qualified health facilities in the country has effectively promoted breastfeeding initiation and improvements of exclusive breastfeeding among neonates and infants less than six months respectively.

In the next sections, a discussion of the etiological characteristics of the childhood morbidity investigated and their interconnections with breastfeeding practices are done.

Diarrhoea

WHO defines diarrhoea as the passage of three or more loose or liquid stools per day, or more frequently than is normal for the individual (WHO, 2017). Passing of loose stools by infants who are breastfeeding or frequent passing of formed stools is not classified as diarrhoea. However, when an adult passes loose stools three or more times in a day or a breastfeeding infant passes loose watery stools twelve or more times, it can be described as diarrhoea.

There are three clinical types of diarrhoea. These are acute watery diarrhoea, acute bloody diarrhoea, and persistent diarrhoea. Acute watery diarrhoea starts abruptly and can last several hours or days. This is the commonest diarrhoea. Acute bloody diarrhoea, also known as dysentery, occurs when a person passes loose or watery stools containing visible blood

(WHO, 2017). Persistent diarrhoea lasts more than two weeks and mostly leads to substantial weight loss and subsequent nutritional problems (Health Direct, 2017). This type of diarrhoea can signify the onset of other health problems in a person.

Diarrhoea is commonly caused by infectious pathogens although in some instances it can be triggered by errors of metabolism, chemical irritation or organic disturbances. These pathogens include bacteria, viruses, and parasites. Bacterial infections are caused by *E. coli*, *Salmonella*, *Shigella, Campylobacter, Yersinia, vibrios,* and *Clostridium difficile* (Rathaur, Pathania, Jayara & Yadav, 2014). Viral infections consist of *Norwalk virus*, *Norwalk-like viruses*, *enteric adenoviruses*, *caliciviruses*, and *astroviruses* (Al-Ruwaili, Khalil & Selim, 2012).

In addition, parasites that cause diarrhoea include *Giardia lamblia, Entamoeba histolytica, Cyclospora cayetanensis* and *Cryptosporidium* (Shah, Kongre, Kumar & Bharadwaj, 2016). Among all these causes of diarrhoea, rotavirus, enterotoxigenic *Escherichia coli*, *Shigella*, *Salmonella*, *Campylobacter jejuni* and *Cryptosporidium spp*. are the most commonly known causes of diarrhea in developing nations such as Ghana (Binka, Vermund & Armah, 2012).

Diarrhoea is transmitted either directly or indirectly. Direct transmission of diarrhoea occurs between hands contaminated with faeces gets in contact with a person's mouth (Centers for Disease Control and Prevention [CDC], 2012). Also, diarrhoea is transmitted indirectly through ingestion of contaminated food or water, and oral contact with infected soil, cooking utensils, drinking cups, spoons and the like. Besides, flies that have traces of faeces on them are potential transmitters of diarrhoea.

Breastfeeding Practices and Diarrhoea

Breastfeeding can offer protection against childhood diarrhoea. Human milk glycans, contains oligosaccharides in their natural and conjugated forms, constitute a natural immunological mechanism that accounts for the manner in which human milk offer protective effect for breastfed infants against diarrhoea (Morrow, Ruiz-Palacios, Jiang & Newburg, 2001). These glycans found in human milk function as soluble receptors against pathogens from adhering to their target receptors on the mucosal surface of the children's gastrointestinal tracts (Chaturvedi, Warren, Altaye, Morrow, Ruiz-Palacios, Pickering, et al., 2001). Also, optimum breastfeeding tend to prevent infants from consuming other fluids and foods that may be unwholesome. By so doing, infants' immune systems are fortified adequately to counteract any infections that may lead to diarrhoea (Lamberti, Walker, Noiman, Victoria & Black, 2011).

Studies have been conducted to reveal how various breastfeeding practices tend to protect or predispose children to the occurrence of diarrhoea. These studies have enormously acclaimed the protective effect that exclusive breastfeeding bestows on the immune system of children to drastically minimize childhood diarrhoea (Gedefaw & Berhe, 2015; Pinzon-Rondon, Zarate-Ardila, Hoyos-Martinez, Ruiz-Sternberg & Velez-van-Meerbeke, 2015). Other studies have equally applied cross-sectional and case control study approaches to further argue for the importance of breastfeeding in preventing diarrhoea among children (Gedefaw & Barhe, 2015; Hanieh, Ha, Simpson, Thuy, Khuong, Thoang, et al., 2015). Likewise, Maponga, Chirundu, Gombe, Tshimanga, Shambira & Takundwa (2013) found strong independent associations between children who were not exclusively breastfed and diarrhoea.

Also, Yarnoff, Allaire and Detzel (2013) indicated that although all other feeding practices were associated with worse health outcomes than exclusive breastfeeding, breastfeeding supplemented with liquids had a lower burden on infant health than solid foods. In a comparable study, Mihrshahi, Oddy, Peat and Kabir (2008) investigated the association between the prevalence of exclusive breastfeeding and diarrhoeal diseases and showed that the prevalence of diarrhoea was significantly associated with lack of exclusive breastfeeding.

In some instances, other studies have demonstrated that exclusive and predominant breastfeeding equally have positive effects on diarrhoea among children (Mihrshahi, Ichikawa, Shuaib, Oddy, Ampon, Dibley, et al., 2007). However, a late initiation of breastfeeding and an early introduction of prelacteal feeds to children expose them to higher prevalence of diarrhoea (Hanieh et al., 2015). This suggests that partially breastfed infants had a higher prevalence of diarrhoea than the others.

In contrast, Raheem, Binns and Chih (2017) indicated that the risk of getting diarrhoea was significantly reduced even when the babies were partially breastfed for six months. This finding suggests that irrespective of breastfeeding status of children, the prevalence among them is similar.

The following paragraphs discuss reviews of some risk factors of childhood diarrhoea. These include age of child, maternal education, maternal occupation, place of residence, preceding birth interval, source of drinking water, type of toilet facility, and type of floor material.

Age of Child and Diarrhoea

Age of a child has been associated with an ascending occurrence of diarrhoea cases. In an inter-country study, child's age was found to be a main risk factor of under-five diarrhoeal morbidity (Bado, Susuman & Nebie, 2016). Further, various studies – after adjusting for other variables – show positive associations between age of child and risk of diarrhoea (Messelu & Trueha, 2016; Pinzon-Rondon et al., 2015).

Children between 0 and 5 months are linked to less episodes of diarrhoea compared to those who are older (Stanly, Sathiyasekaran & Palani, 2009). Older children (6 months and higher) are likely to consume contaminated solid foods that may result in episodes of diarrhoea compared with children aged less than six months who benefit directly from their mother's immune system through breastfeeding (Bado et al., 2016; Siziya, Muula & Rudatsikira, 2009). Studies have, therefore, identified older children (6-24 months) to have higher risk of diarrhoea (Gedefaw & Berhe, 2015; Kumi-Kyereme & Amo-Adjei, 2016). In India, slightly different findings were obtained in a study in which children aged 7-12 months had the highest prevalence of diarrhoea followed by children aged 13-24 months and 0-6 months (Gedefaw & Berhe, 2015; Stanly et al., 2009).

Maternal Education and Diarrhoea

Maternal educational level has been reported by some studies to be significantly associated with childhood diarrhoea (Bado et al., 2016; Hashi, Kumie & Gasana, 2016). For instance, in Ethiopia, Gebru et al. (2014) found that mothers who could not read or write as an independent predictor of childhood diarrhoea. In Ghana, children whose mothers had secondary and higher education were found to have lower odds of experiencing diarrhoea (Kumi-Kyereme & Amo-Adjei, 2016). Similarly, studies elsewhere have found low maternal education as a risk factor for childhood diarrhoea (Alelign, Asegidew & Abera, 2016; Pinzon-Rondon et al., 2015). It is generally interpreted that a mother's literacy influences hygiene, child feeding, weaning and sanitation practices which in turn are important factors for childhood diarrhoea.

Maternal Occupation and Diarrhoea

The direction of association between maternal occupation and childhood diarrhoea is unclear although studies have demonstrated maternal occupation to be a significant determinant of childhood diarrhoea (Bado et al., 2016; Messelu & Trueha, 2016). It has been suggested that children of mothers whose occupation was non-agriculture had a higher risk of diarrhoea compared with children whose mothers were not working (Mihrete, Alemie & Teferra, 2014).

On the contrary, children whose mothers were not working or were farmers or manual labourers had a significantly higher frequency of diarrhoea (El-Gilany & Hammad, 2005). In another study, housewives were associated with higher risk of diarrhoea compared to those working in the private or public sector (Thaim, Diene, Fuhrimann, Winkler, Sy, Ndione, et al., 2017). Different occupational environments in various settings might be accounting for the contradicting findings.

Place of Residence and Diarrhoea

Mothers residing in different environmental and geographical locations can have differences in reported cases of childhood diarrhoea. Studies have identified place of residence of children as a risk for diarrhoea (Bado et al., 2016; Kumi-Kyereme & Amo-Adjei, 2016). Between urban and rural areas, children in the latter are commonly found to be exposed to higher prevalences of diarrhoea compared to those in the former (Mengistie, Berhane & Worku, 2013).

A study conducted in Gaza Governorates rather found that children in urban residence were more prone to diarrhoea than those in rural areas (Alnawajha, Bakry & Aljeeh, 2015). An explanation for this outcome may be that children with higher family income in urban areas tend to eat more sweets that results in bowel changes compared to those in rural children. However, there is also evidence to show that the urban advantage is not uniform; children in urban slums, couple with deplorable sanitation and water conditions, may fare worse than rural children (Kimani-Murage, Fotso, Egondi, Abuya, Elungata, Ziraba, et al., 2014).

Preceding Birth Interval and Diarrhoea

The birth spaces between children has also been linked to childhood risk of diarrhoea (Islam, Hossain, Khan & Ali, 2015; Rasooly et al., 2013). Data from cross-sectional studies suggest that shorter birth intervals (less than

24 months) are associated with a higher occurrence of diarrhoea (Kandala, Stallard, Stranges & Cappuccio, 2007; Rutstein, 2008). This may be so since mothers with short preceding birth intervals may not have enough time to adequately cater for their children and may therefore be prone to diarrhoea due to poor feeding practices.

Source of Drinking Water and Diarrhoea

Source of drinking water is one environmental factor found to significantly influence childhood diarrhoea (Hashi et al., 2016). Literature has shown that the usage of improved sources of drinking water lessens the burden of diarrhoea among children (Kalakheti, Panthee & Jain, 2016). Other studies, however, have indicated that the manner in which water is stored or treated could be a risk factor for diarrhoea in children (Danquah, Mensah, Agyemang & Awuah, 2015). For instance, studies have showed that the main risk factor for diarrhoea is the unhygienic manner in which mothers and caregivers in households store drinking water (Alelign et al., 2016; Hashi et al., 2016).

Storing of water in wide-open pots is deemed to contribute to poor physical quality of drinking water that might lead to higher occurrence of childhood diarrhoea (Rohmawati, Panza & Lertmaharit, 2012). In that light, the usage of narrow-mouth containers or closed containers for storage of drinking water in households lessens episodes of childhood diarrhoea (Maponga et al., 2013; Tambe, Nzefa & Nicoline, 2015).

Type of Toilet Facility and Diarrhoea

Studies have indicated that the availability of toilet facilities in households is significantly associated with childhood diarrhoea (Bado et al., 2016; Hashi et al., 2016). Also, written works have shown that children whose mothers had access to (improved) toilet facilities are less prone to diarrhoea (Kalakheti et al., 2016). It has, therefore, been explained that the absence of toilet facilities in houses at times undermines hygienic practices of care-givers and how stools of children are disposed and this exposes children to diarrhoeal illness (Mihrete et al., 2014; Wilunda & Panza, 2009). By contrast, Tambe et al. (2015) found that children using the main toilet and other types of toilet facilities such as bushes, and diaper are less likely to suffer from diarrhoea.

Type of Floor Material and Diarrhoea

Type of floor material within households has been established as a significant factor with childhood diarrhoea (Bado et al., 2016; Hashi et al., 2016). Studies that found floor material as a risk factor for diarrhoea morbidity commonly indicated that children who are exposed to poor quality floor materials are more likely to get diarrhoea (Exum, 2016). Poor quality floor materials frequently harbour diarrhoea causing agents and these are introduced orally to children as they pick dirt or other contaminated objects for playing or eating. Another study conducted by Mihrete et al. (2014), however, found no significant association between childhood diarrhoea and floor material.

Acute Respiratory Infection (ARI)

Acute respiratory infection (ARI) occurs when a person coughs, gets sore throat, runny nose, and ear problem or finds it difficult to breathe or swallow. ARI can be grouped into two types; upper respiratory tract infections or lower respiratory tract infections. Airways from the nostrils to the vocal cords in the larynx including the paranasal sinuses and the middle ear constitute the upper respiratory tract (Simons, Cherian, Chow, Shahid,-Salles, Laxminarayan & John, 2006). Upper respiratory infections include acute pharyngitis, common cold, and acute ear infection.

In addition, the lower respiratory tract consists of the continuation of the airways from the trachea and bronchi to the bronchioles and the alveoli. Bronchitis, pneumonia, and bronchiolitis are some types of lower respiratory infections. Pathogenic infection of any of these tract sectors can result in acute respiratory infection.

Both bacteria and viruses can cause ARI. These causes include rhinovirus, adenovirus, Coxsackie virus, parainfluenza virus, respiratory syncytial virus, and human metapneumovirus. Others are adenoviruses, pneumococcus, and rhinoviruses (Monto, 2002). Among the causes of respiratory infections, rhinoviruses are the sources of common cold. Poor management of cold may aggravate into ARI especially among children and aged persons including persons with weak immune system.

Generally, inhaling droplets from the sneeze and cough of an infected person can spread ARI. Viral pathogens vary in their ability to transmit respiratory infections. Coronaviruses are commonly transmitted by large droplet spread, whereas influenza viruses are spread by airborne methods, including both aerosol and droplet spread (Mandell, 2005). However, the exact mode of transmission of rhinoviruses is not explicit. It is still being argued whether rhinovirus is transmitted primarily by direct contact or by indirect contact (Goldmann, 2001). For instance, it has been revealed that these viruses can survive on surfaces and could spread by inoculation of nose or eyes with one's fingers, and others have shown that spread by droplet transmission can take place as well (Rosa, Fratini, Libera, Iaconelli & Muscillo, 2013).

A number of mechanisms have been postulated of a likely protection effect of breastfeeding against respiratory infections. One has been that breast milk contains substances consisting of antimicrobial or immunological elements that generally improve nutritional status of breastfed infants (Horta & Victora, 2013). This protects children against respiratory infections. It has been cited that secretory antibodies may transfer immunity from previously exposed mother to their children (Tamura, Funato, Hirabayashi, Suzuki, Nagamine, Aizawa, et al., 1991). Consequently, cytokines and growth factors may be transferred through human milk and stimulate immune systems of children. Oligosaccharides in human milk may also prevent attachment of infectious agents to mucosa of infants thereby preventing respiratory infections (Hanson, Korotkova, Haversen, Mattsby-Baltzer, Hahn-Zoric, Silfverdal, et al., 2002).

Breastfeeding Practices and Acute Respiratory Infection

Breastfeeding bestows nutritional properties in children that help to protect them from respiratory infections. Enough evidence show that there are significant associations between breastfeeding and ARI exist (Taksande & Yeole, 2015). Most related studies have asserted to the protective effect of exclusive breastfeeding against ARI in infancy (Dagvadorj, Ota, Shahrook, Olkhanud, Takehara, Hikita, et al., 2016; Hanieh et al., 2015).

Some studies have even shown that prolonged periods of breastfeeding – up to 24 months – still fortifies the immune systems of children against ARI

(Fisk, Crozier, Inskip, Godfrey, Cooper, Roberts, et al., 2011; Tromp, Kiefte-de, Raat, Jaddoe, Franco, Hofman, et al., 2017). Prelateal feeding, partially breastfed and those who are weaned before six months tend to be more susceptible to ARI (Hajeebhoy, Nguyen, Mannava, Nguyen & Mai, 2014; Prietsch, Fisher, Cesar, Lempek, Barbosa, Zogbi, et al., 2008; Taksande & Yeole, 2015). Also, it has been observed that prelacteal and complementary feeds given to children who are not breastfeeding sometimes contain less micro nutrients to help minimize the occurrence of ARI (Oddy et at., 2003).

Aside the link between breastfeeding practices and ARI, other potential risk factors were reviewed. These are age of child, maternal age, maternal occupation, place of residence, antenatal visits, and cooking fuel.

Age of Child and ARI

Children within the age group of 0-24 months might be vulnerable to respiratory infections since their immune systems are yet to adjust to various exposures. Empirical studies have revealed age of a child to be a risk factor for ARI (Chen, Williams & Kirk, 2014; Harerimana, Nyirazinyoye, Thomson & Ntaganira, 2016). Studies have equally documented that as children grow older, the risk of acquiring ARI decreases (Hatakka, Piirainen, Pohjavuori, Poussa, Savilahti & Korpela, 2010; Mathew, Singhi, Ray, Hagel, Saghafian-Hedengren, Bansal, et al., 2015). Also, longitudinal cohort studies have declared that as children grow older, they are protected from respiratory infections due to the enhancement of some antibody mechanisms within their immune systems (Boccolini, de Carvalho, de Oliveira & Boccolini, 2011; Liu, Ai, Xiong, Li, Wen, Liu, et al., 2015).

Conflicting findings have detailed high risk of ARI among children aged between 6 to 18 months and even beyond (Kaware, Kamble & Mangulikar, 2017; Shivaprakash & Kutty, 2017). A general interpretation for this age group being vulnerable to respiratory infection is that maternal antibodies embedded in children tend to degrade as they grow older, therefore, resulting in less immunity (Kock et al., 2003). Other studies, however, have not found associations between age of child and ARI (Cox, Rose, Kalua, Wildt, Bailey & Hart, 2017; Jabeen, Khan & Qureshi, 2017).

Maternal Age and ARI

An association between maternal age and ARI status of children has been shown in some studies (Lakshmi, 2010). Commonly, advancement in maternal age reduces the risk of childhood ARI (Pinzon-Rondon, Aguilera-Otalvaro, Zarate-Ardila & Hoyos-Martinez, 2016). This category of mothers are purported to have better child health prowess compared to younger mothers who are generally naïve in caring for children to avert childhood morbidity such as respiratory infections. Other scholarly works found a non-significant association between age of mother and ARI among children (Jabeen, Khan & Qureshi, 2017; Prietsch et al., 2008).

Maternal Occupation and ARI

Hazards related to maternal occupations expose children to respiratory infections (Pinzon-Rondon et al., 2016). Empirical substantiations have suggested a positive linkage between maternal occupation and ARI (Jabeen et al., 2017; Prajapati, Talsania & Sonaliya, 2011). Further, there are indications that children whose mothers engage in occupations that produce smoke and yield low socio-economic status are more likely to show episodes of ARI (Alemayehu, Alemu, Sharma, Gizaw & Shibru, 2014; Geberetsadik, Worku & Berhane, 2015). It has consistently been argued that mothers in less professional occupations might have inadequate funds to basically cater for their children, therefore, exposing their children to infections such as ARI.

Place of Residence and ARI

Conditions that prevail within places of residence of children can potentially influence their exposure to respiratory illness (Kumar, Majumbar, Kumar, Naik, Selvaraj & Balajee, 2015). Documented cross-sectional records indicate that children in rural areas are more positively associated with ARI (Harerimana et al., 2016; Sharma, Kuppusamy & Bhoorasamy, 2013). Studies generally interpret higher prevalence of ARI among rural children than those in urban areas in relation to exposure to higher levels of particulate matter and less nourishment.

Contradictory findings have also suggested that children in urban settings are more exposed to ARI than their rural counterparts due to air pollution (Arbex, Santiago, Moyses, Pereira, Saldiva & Braga, 2011; Brugha & Grigg, 2014). For instance, Ujunwa and Ezeonu (2014) found that living in an urban area was a risk factor for ARI among children in Nigeria. This study was conducted in an urban teaching hospital and the outcome is more likely to be associated with selection effect.

Antenatal Visits and ARI

Children whose mothers seek for regular antenatal care most often have healthier health outcomes including prevention or reduction in the occurrence of infections such as ARI (Halim, Bohara & Ruan, 2011). Koch, Molbak, Homoe, Sorensen, Hjuler, Olesen, et al., (2003) and Ramani et al., (2016) observed that antenatal care or child-care center is a risk factor for respiratory tract infection among children. At antenatal care centers, children are inoculated against infections. So children whose mothers do not patronize such centers are more likely to be exposed to ARI.

Cooking Fuel and ARI

Existing evidence point out that positive associations exist between type of cooking fuel used by mothers and the occurrence of childhood ARI (Asghar, Srivastava, Srivastava, Gupta & Zaidi 2017; Tazinya, Halle-Ekane, Mabuagbaw, Abanda, Atashili & Obama, 2018). Further, both cross-sectional and case-control studies have found the usage of wood fuel (Dorle, Mannapur & Naik, 2017; Ramani et al., 2016; Ujunwa & Ezeonu, 2014) and charcoal (Bautista et al., 2009) as risk factors that expose children to ARI. In other controlled studies, similar effects of biomass fuels and charcoal or kerosene on childhood ARI have been identified (Kilabuko & Nakai, 2007; Sanbata, Asfaw & Kumie, 2014).

Also, the usage of wood fuels has been found to be the highest risk factor among all the cooking fuels examined in most studies (Taylor & Nakai, 2012). It has been suggested that children within settings that regularly use cooking fuels such as biomass, charcoal and wood fuel (that have high levels of pollutants) are prone to ARI (Langbein, 2017).

Anaemia

Anaemia is defined as a condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet physiologic needs, which vary by age, sex, altitude, smoking, and pregnancy status (WHO, 2017). WHO technically define anaemia as haemoglobin level of less than 11 grams per deciliter (g/dl). Symptoms of anaemia include feeling tired, weakness, shortness of breath, or inability to exercise, feeling like one is going to pass out, and loss of consciousness or increased thirst (Janz, Johnson & Rubenstein, 2013).

There are three conditions that can lead to anaemia and these are anaemia due to blood loss, decreased red blood cell production, and increased red blood cell breakdown (American Academy of Family Physicians [AAFP], 2000). The types of anaemia include: iron deficiency anaemia (shortage of iron in a person's body); vitamin deficiency anaemia (lack of folate and vitamin B-12); anaemia of chronic disease (such as cancer, rheumatoid arthritis, kidney disease, and Crohn's disease and other inflammatory diseases) (MFMER, 2017).

Other types and causes of anaemia are: aplastic anaemia (insufficient production of red blood cells); anaemia associated with bone marrow disease (such as leukemia and myelofibrosis); hemolytic anaemia (destruction of red blood cells than bone marrow can replace); and sickle cell anaemia (deformation
of red blood cells).

Breast milk contains enough iron to prevent childhood anaemia for the first four to six months (Kids Health, 2018). After this age of exclusive breastfeeding, mothers are recommended to feed their children with iron-fortified foods such as iron-fortified formula or iron-fortified infant cereal. The absorption of iron is primarily regulated within intestines of children. So far as iron has been absorbed, there is no mechanism of excretion from the kidneys or liver (Andrews, 2008). The iron is then transported across all membranes to maintain adequate levels which can prevent anaemia inasmuch as the used iron are being replaced continuously through appropriate breastfeeding practices.

Breastfeeding Practices and Anaemia

Breastfeeding contributes to the reduction of anaemia among children (Chandyo et al., 2016; Meinzen-Derr, Guerrero, Altaye, Ortega-Gallegos, Ruiz-Palacios & Morrow, 2006). To that effect, prospective studies have indicated significant association between various breastfeeding practices (predominant, partial, full breastfeeding) and childhood haemoglobin levels (Monterrosa, Frongillo, Vasquez-Garibay, Romero-Velarde, Casey & Willows, 2008). Most studies have identified children who are exclusively breastfed as less likely to be anaemic (Chandyo et al., 2016). The low prevalence of anaemia among exclusively breastfed children is attributable to the immunological properties of breast milk (Qasem & Friel, 2015). But there are studies that indicate that children who breastfeed exclusively for more than six months may be anaemic especially among children whose mothers were iron deficient (Marques, Taddei, Lopez & Braga, 2014; Torres, Braga, Taddei & Nobrega, 2006). Other cross-sectional studies found that children who were put on complementary feeds had low haemoglobin levels (Kikafunda, Lukwago & Turyashemerwa, 2009).

Age of Child and Anaemia

The increased iron requirements during the growth and development process of children make them susceptible to anaemia (Silva, Atukorala, Weerasinghe & Ahluwalia, 2003). Monterrosa et al. (2008) and Chandyo et al. (2016) in their respective studies found age of child to be positively associated with anaemia. In both cross-sectional and longitudinal analyses, children who are less than two years were found to be at a higher risk of being anaemic (Ewusie et al., 2014; Khan, Awan & Misu, 2016; Zuffo, Osorio, Taconeli, Schmidt, da Silva, Almeida, 2016). Among children in their younger ages (less than two years), the prevalence of anaemia is high as breast milk is mostly substituted with less nutritious foods that have poor iron content including other essential vitamins and folic acid (Adair, Fall, Osmond, Stein, Martorell, Ramirez-Zea, et al., 2013).

Sex of Child and Anaemia

Conflicting findings have been documented on the association between sex of child and anaemia. Some studies have verified that sex of child has an association with childhood anaemia (Fosu, Frimpong & Arthur, 2014; Chandyo et al., 2016; Leal et al., 2011) while other studies found no significant associations (Ewusie et al., 2014; Santos, Gonzalez, de Albuquerque, de Arruda, Diniz, Figueroa, et al., 2011). It is further indicated that male children have higher risk of being anaemic (with low haemoglobin concentrations) compared to females (VanBuskirk, Ofosu, Kennedy & Denno, 2014). Genetically, iron requirement in boys during the second half of infancy and young childhood are higher than those of girls (Domellof, Dewey, Lonnerdal, Cohen & Hernell, 2002) and therefore any shortfalls in the amount of iron they obtain can expose them to aneamia.

Maternal Education and Anaemia

Several independent associations between maternal education and childhood anaemia have been observed (Fosu et al., 2014; Kikafunda et al., 2009). In various studies, the likelihood of anaemia has been shown to be less among children whose mothers are formally educated (Goswmai & Das, 2015; Woldie, Kebede & Tariku, 2015). Educated mothers are deemed to be more enlightened on better eating habits and this translates to healthier foods they might give to their children to prevent anaemia (Lamerz, Kuepper-Nybelem, Wehle, Bruning, Trost-Brinkhues, Brenner, et al., 2005). Contrary to the above findings, Mesfin, Berhane and Worku (2015) revealed maternal education not to be a protective factor against childhood anaemia.

Wealth Quintile and Anaemia

Many studies have demonstrated that wealth quintile or household wealth status has a significant association with childhood anaemia (Fosu et al., 2014; Khan et al., 2016). For instance, mothers falling within the lowest wealth quintile or low wealth status had been identified as a risk factor for anaemia among children (Balarajan, Fawzi & Subramanian, 2013; Woldie et al., 2015). A high wealth status of mothers could influence their purchasing power for healthier diets for their children thereby preventing dietary illnesses such as anaemia.

Place of Residence and Anaemia

Place of residence may influence how children are fed appropriately which functionally determine their anaemia status. Epidemiological researches have linked children in poor resourced places to aneamia (Zhao, Zhang, Peng, Li, Yang, Liu, et al., 2012). The argument on anaemia prevalence is not mainly on the rural poor (Jalil, Zakar & Zakar, 2015; Momeni, Danaei, Kermani, Bakhshandeh, Foroodnia, Mahmoudabadi, et al., 2017) but including those in urban slums (thus the urban poor) (Ghosh & Shah, 2004; Konstantyner, Oliveira & Taddei, 2012) who are not able to feed their children with nutritious foods with required iron quantities.

Studies have equally identified geographical location to be significantly associated with childhood anaemia (Fosu et al., 2014; Khan et al., 2016). For instance, in Ghana, Ewusie et al. (2014) found that children who were in Upper East and Upper West regions were more likely to be anaemic than those in the other regions. These regions are considered to have the lowest standard of living in Ghana and this may mean that mothers in these locations might be economically disadvantaged in providing their children with satisfactory nutritious foods to avert anaemia.

Size of Child and Anaemia

Cross-sectional studies have shown that there is a negative association between low birth weight and iron deficiency anaemia in infants (Teixeira, Lira, Couinho, Eickmann & Lima, 2010; Zhao, Xu, Zhou, Jiang, Richards, Clark, et al., 2015). The weight of a child at birth is determined by a number of factors (age of mother, multiple births, and mother's health). Despite the causal factor that may influence a child's weight, the child is confronted with some nutritional deficiencies. Iron deficiency anaemia is the commonest type of anaemia affecting most infants due to the poor nutritional status of mothers during pregnancy (Rahmati, Delpishe, Azami, Hafezi-Ahmadi & Sayehmiri, 2017; Ramakrishnan, 2004).

Place of Delivery and Anaemia

Empirical evidences have shown that children who were delivered at home were more likely to be anaemic than those delivered at health facilities (Kikafunda et al., 2009; Saaka & Galaa, 2017). This is so because most mothers who deliver at home have poor records of antenatal visits (Pervin, Moran, Rahman, Razzaque, Sibley, Streatfield, et al., 2012). It is during these antenatal visits that expectant mothers are given essential iron supplements to boost their haemoglobin levels and to promote healthy fetuses' growth and development (Tran, Fisher, Hanieh, Tran, Simpson, Tran, et al., 2015).

Children in Household and Anaemia

The number of children in a household influences food quality and their eating patterns (Leal, Filho, de Lira, Figueiroa & Osorio, 2011). The number of children in a household is another significant determinant of severity levels of childhood anemia (Legason, Atiku, Ssenyonga, Olupot-Olupot & Barugahare, 2017; Muchie, 2016). This may be more pronounced in poor households where food security is a recurrent struggle. Coupled with availability, mothers may have very limited time to feed children adequately, particularly when they are closely birth spaced (Conde-Agudelo, Rosas-Bermudez, Castano & Norton, 2012; Kuziga et al., 2017).

Fever

Fever is an immune response capable of protecting the body from the effects of microbial infections (Schaffner, 2006). In children, temperatures above 38°C (measured rectally) or 37.2°C (under the arm) are indicative of fever which is frequently associated with infections (Barone, 2009). It is a temporary increase in body temperature signaling an onset of illness, and in relation to infants and young children, a slight increase in body temperature could mean a serious infection (Mayo, 2017). Symptoms of fever include, but are not limited to, sweating, chills and shivering, headache, loss of appetite, dehydration and general weakness (Cho, Lai, Lee, Hsu, Chen, Chang, et al., 2015).

Typical infections that may cause a fever include infections of the ear, throat, lung, bladder, and kidney. In children, immunizations (such as vaccine shots) or teething may cause short-term low-grade fever. Auto-immune disorders (including rheumatoid arthritis, lupus, and inflammatory bowel disease), medication side effects, seizures, blood clots, hormone disorders, cancers, and illicit drug use may also cause fevers (Cunha, Apostolopoulou & Gian, 2017). In addition, micro-organisms, including bacteria and parasites, can produce chemical poisons. Both the micro-organism and the poisons cause the white blood cells (called *monocytes*) to produce substances called *pyrogens*. It is the pyrogens that actually cause the fever (MedBroadcast, 2017).

Breast milk contains a unique balance of nutrients that strengthens a child's weak immune system and can minimize the severity of childhood fever. Breastfed children benefit from several anti-inflammatory and immunomodulatory factors that are present in breast milk (Pisacane et al., 2010). However, the actual mechanisms through which breast milk properties reduce fever are unclear (Mann, 2010). Notwithstanding this, studies have generally attributed the reduction in infectious ailments such as fever to the anti-inflammatory and immunomodulating elements of breast milk (Lepage & de Perre, 2012; Palmeira & Carneiro-Sampaio, 2016).

Breastfeeding Practices and Fever

Different feeding types (exclusive breastfeeding, non-exclusive breastfeeding, infant formula, milk liquids, non-milk liquids, and solid foods) can protect children against infectious symptoms such as fever (Netzer-Tomkins et al., 2016; Pisacane et al., 2010). These studies used survey and prospective cohort data to arrive at their conclusions. The rise of body temperature of children in the literature is commonly attributed to viral infections (O'Meara, Mott, Laktabai, Wamburu, Fields, Armstrong, et al., 2015).

Fever is a sign of malaria and other infections (GSS, GHS & ICF Macro, 2015). In Ghana, malaria and ARI are the main causes of childhood fever (Nonvignon et al., 2010). Therefore, the following review of risk factors is on fever (not localized) - fever due to malaria or fever due to acute respiratory infections - among children.

Age of Child and Fever

A positive association has been established between age of child and fever (Ayele, Zewotir & Mwambi, 2012; Hamooya, Chongwe, Sitali &

Halwindi 2015). It has been found that older children (more than one year) are more prone to experiencing higher body temperatures or easily infected with malaria than younger children (Krefis, Schwarz, Nkrumah, Acquah, Loag, Sarpong, et al., 2010; Roberts & Matthews, 2016). This may be because older children have larger body surface, thereby, they are more susceptible to mosquito bites that generally cause fever. Another interpretation is that, older children easily get infections due to their eating of contaminated foods from different sources that in some instances could result in fever.

Sex of Child and Fever

Scientific indication shows that in equal environmental exposure, both sexes (male and female) are similarly exposed to episodes of fever or malaria (Hammoya et al., 2015). The relationship between sex of child and the occurrence of fever is not explicit in cross-sectional studies. Some studies have suggested significant association between sex of child and fever (Ayele et al., 2012) while others have not (Deressa, 2017; Roberts & Matthews, 2016).

Maternal Education and Fever

Maternal education is a requisite factor in appropriate child care (Roberts & Matthews, 2016). Less exposure of mothers to formal education therefore is reported as a risk factor for childhood feverishness and other viral infections (Gahutu, Steininger, Shyirambere, Zeile, Cwinya, Danquah, et al., 2011; Snyman, Mwangwa, Bigira, Kapisi, Clark, et al., 2015). In hospital-based studies, Bertille, Fournier-Charriere, Pons and Chalumeau (2013), and Talebi, Shahrabadi, Sabzevar, Talebi and Siyavoshi (2016) identified high level of parental education as a significant factor to preventing fever among children. Again, in a household-based study, Elizabeth and Raj (2012) indexed similar findings. It could be construed that mothers with high educational levels are equipped with adequate knowledge for controlling children's body temperature below recommended threshold.

Maternal Occupation and Fever

The link between maternal occupation and fever morbidity among children is not explicit. Maternal occupation has been identified in a number of cross-sectional studies to be significantly associated with the occurrence of childhood fever (Elizabeth & Raj, 2012) and the risk of malaria is found to be significantly higher among children whose mothers had lower economic status (Baragatti, Fournet, Henry, Assi, Ouedraogo, Rogier, et al., 2009). Mothers' occupational schedules could through other means such as kind of childhood feeding practices result in how frequent children experience fever.

Place of Residence and Fever

Place of residence influences child health (Hamooya et al., 2015; Liu et al. 2015). Existing envidence reveal that children in rural settings are associated with higher prevalence of fever cases than those in urban settings (Snyman et al., 2015). Rural settings are so much engulfed with higher rates of bacterial and viral infections so that children are most often subjected to experiencing higher body temperatures (38ºC or more) (Wong & Abubakar, 2013). Also, children in urban slums characterized with poverty are found to be much associated with fever caused by other infections (Ramani, Pattanker & Puttahonnappa, 2016). This category of children might be susceptible to fever related infections due to poor sanitary conditions and, at times, polluted environments.

Antenatal Visits and Fever

Evidence has indicated that antenatal care increases the odds for appropriate care for children with fever (McGlynn, Wilk, Luginaah, Ryan & Thind, 2015). At antenatal care centers, mothers are appropriately educated on ways to take care of children to prevent the onset of fever. It has also been shown that immunization of children during and after antenatal visits increases their chance of experiencing fever (Kohl, Marcy, Blum, Jones, Dagan, Hansen, et al., 2004; Navar-Boggan, Halsey, Golden, Escobar, Massolo & Klein, 2010).

Source of Drinking Water and Fever

Studies have documented that source of drinking water can significantly expose children to fever diagnosis (Ayele et al., 2012). Even the distance to fetching source of drinking by mothers was found to decrease with a 4.5 percentage reduction in the occurrence of fever among children (Pickering & Davis, 2012). Also, Novignon and Novignon (2012) found that available of improved water source was not statistically associated with fever in chidern under five in Ghana and Sierra Leone. Source of drinking water appears to be linked with child health since it could expose children to bacterial infections that may trigger fever.

Spatial Issues of Breastfeeding Practices and Childhood Morbidity

There is paucity of literature on spatial analysis of breastfeeding practices and childhood morbidity. The few available literature are largely on childhood diarrhoea and the others are localized to fit climatic and environmental features of countries where they were conducted.

Kandala, Magadi and Madise (2006), in their paper, investigated the spatial distribution of observed diarrhoea prevalence in Malawi. Their findings suggest that children living in the capital city are more affected by diarrhoea. The spatial patterns emphasize the role of remoteness as well as climatic, environmental, and geographic factors on morbidity. Nyadanu, Osei, Nawumbeni, Adampah and Polishuk (2016) also assessed the global and local occurrence of the prevalence rates of diarrhoea at district levels in Ghana. To them, evaluating the observed non-random spatial patterns, the global Moran's *I* confirmed significant geographical epidemiological patterns with significant spatial clustering.

In another spatial analysis of childhood diarrhoea in Ghana, Osei and Stein (2017) observed substantial variation in the spatial distribution of the relative risk. They further documented that there was evidence of significant spatial clusters with most of the excess incidents being long-term with only a few being emerging clusters. Thus, space-time clustering was found to be more likely to occur in peri-urban districts than in rural and urban districts. Also, Wangdi and Clements (2017) in their study which sort to describe spatiotemporal patterns of diarrhoea in and quantify the association between climatic factors and the distribution and dynamics of the disease observed the presence of significant residual spatial clustering after accounting for climate and demographic variables.

Views of Mothers on Breastfeeding Practices and Childhood Morbidity

Literature was reviewed on views of mothers in relation to breastfeeding practices and childhood morbidity. This was done specifically on their (mothers) knowledge and practice of breastfeeding, challenges of breastfeeding, knowledge and practice of complementary feeding, challenges of complementary feeding, childhood morbidity and their management.

Knowledge and Practice of Breastfeeding

In the area of breastfeeding, researches have been conducted on knowledge of breastfeeding among mothers (Mbada, Olowookere, Faronbi, Oyinlola-Aromolaran, Faremi, Ogundele, Awotidebe, et al., 2013; Mohammed, Ghazawy & Hassan, 2014). Others have further examined how mothers practice breastfeeding at various settings (Mogre, Dery & Gaa, 2016). In a study conducted by Mohammed et al. (2014) in Egypt, they observed that mothers knew breastfeeding was the best nutritional source for the baby. And also, majority of the mothers had good knowledge of the advantages of breastfeeding for their children. It was further revealed in their study that, most mothers agreed that breastfeeding protects children from infection, and they further agreed that it is the healthiest for infant.

In another related study, Mbada et al. (2013), based on cumulative breastfeeding knowledge and attitude scores, demonstrated that most mothers had good knowledge on breastfeeding practices. Also, studies have revealed that mothers had good knowledge and positive perception of exclusive breastfeeding (Alamirew, Bayu, Tebeje, & Kassa, 2017; Marzuki, Yohmi, Nainggolan, Hegar, Oswari & Partiwi, 2014). Mothers showed positive attitudes towards breastfeeding and acknowledged its importance (Cinar, Alvur, Kose & Nemut, 2013). Studies have also demonstrated that mothers usually get information on breastfeeding practices from the media, family and friends, and health professionals (Hoddinott, Craig, Britten & McInnes, 2012; Singh, Chouhan, Trivedi, Patel & Sethia, 2016).

Challenges of Breastfeeding

Mothers encounter challenges in the practice of breastfeeding. Some of these are physiological (Lee & Kelleher, 2016) and others are anatomical (Robert, Coppieters, Swennen & Dramaix, 2014). Aside these challenges, research indicates that mothers are sometimes negatively influenced by significant others as to how to practice breastfeeding (Wood & Qureshi, 2017).

In a study by Diji, Bam, Asante, Lomotey, Yeboah and Owusu (2017), three breastfeeding challenges among mothers; belief that breast milk alone was not sufficient in meeting their babies' nutritional needs; short maternity leave period; and socio-cultural pressure to introduce water and artificial feeds. Also, Kent, Ashton, Hardwick, Rowan, Chia, Fairclough, et al. (2015) documented that nipple pain was one of the reasons for consultation on breastfeeding cases. They further found that the most common attributed cause of nipple pain was incorrect positioning and attachment, followed by tongue tie, infection, palatal anomaly, flat or inverted nipples, mastitis, and vasospasm.

In addition, Giugliani (2004) documented several common problems that may arise during the breastfeeding period. Such problems include breast engorgement, plugged milk duct, and insufficient milk supply. In a related study, Gatti (2008) found that a lot of mothers discontinue breastfeeding during the first few weeks of the post-partum period because of perceived insufficient breast milk leading to early weaning.

The environments in which mothers live have influence on their practice of breastfeeding. Desmond and Meaney (2016) noted that cultural attitudes in Ireland coupled with inadequate or inconsistent advice from health professionals posed the biggest challenge mothers had to overcome in order to achieve six months exclusive breastfeeding. Key challenges included experiences of cultural conflict or social change, lack of support from their local community, family and health-care staff, as well as limited self-knowledge about how to manage common breastfeeding problems (Wood & Qureshi, 2017).

Still on societal challenges, Valizadeh, Hosseinzadeh, Mohammadi, Hassankhani, Fooladi and Schmied (2017) found that breastfeeding mothers who return to work often feel exhausted – since they feed-on-demand and attend to family and employment responsibilities – leading to concerns for their personal health. These activities limit their practice of breastfeeding. Again, Agunbiade and Ogunleye (2012) in a survey showed that the major constraints to exclusive breastfeeding were the perception that babies continued to be hungry after breastfeeding, maternal health problems, fear of babies becoming addicted to breast milk, pressure from mother-in-law, pains in the breast, and the need to return to work. In addition, they documented that poor feeding, inadequate support from partners and conflicting positions from the significant others were dominant constraints.

Knowledge and Practice of Complementary Feeding

Complementary feeding is essential to maintain healthy growth and development of children after the recommended six months of exclusive breastfeeding (Saleh, Ara, Hoque & Alam, 2014). The ability of mothers to know how to start complementary feeding and the choice of nutritious foods are indispensable (Olatona, Adenihun, Aderibigbe & Adeniyi, 2017).

Rao, Swathi, Unnikrishnan and Hegde (2011) observed that the practice of complementary feeding among mothers in India was high. They observed that the practice of giving an adequate quantity of complementary feeds was significantly associated only with the place of delivery. However, Saleh et al. (2014) showed that complementary feeding practices among mothers of children aged less than two years were very poor in slums of Dhaka city. These findings indicate that there is a considerable gap between the recommendations of the WHO and the energy intake among this group of children.

Olatona et al. (2017), in Nigeria, also found that knowledge of complementary feeding, timely initiation of complementary feeding, dietary diversity and minimum acceptable diet for children between six and nine months were low among mothers. Contrary to the findings by Olantona et al. (2017), Udoh and Amodu (2016) earlier found that timely introduction of complementary feeding was high among mothers in Nigeria. However, they indicated that minimum dietary diversity, minimum meal frequency and minimum acceptable diet rates were low among the mothers.

Challenges of Complementary Feeding

Although mothers may be aware of when and how to start complementary feeding, it has been shown that some of these mothers encounter challenges (Lindsay, Machodo, Sussner, Hardwick & Peterson, 2008). Also, according to Abeshu, Lelisa and Geleta (2016) the gaps are mostly attributed to either poor dietary quality or poor feeding practices, if not both. Abeshu et al. further indicated that commercial fortified foods are often beyond the reach of the poor; therefore homemade complementary foods remain commonly used. These home foods are mostly unfortified plant-based complementary foods hence providing insufficient key micronutrients (especially, iron, zinc, and calcium) during the age of 6–23 months. Besides, Mitchodigni, Hounkpatin, Ntandou-Bouzitou, Termote, Kennedy and Hounhouigan (2017) observed in Benin that complementary foods consumed by children were characterized by un-enriched porridges; mashed family diets and less consumption of fruits and eggs.

Societal agents pose challenges that may discourage mothers to adequately feed their children. Nankumbi and Muliira (2015) observed that challenges in relation to appropriate infant and young child-feeding practices are mothers' knowledge about complimentary feeding, influence of culture custodians on mothers, and patterns and burden of other responsibilities the mothers have in the household. Family support was also identified as an important challenge to complementary feeding in Bangladesh (Paul, Roy, Islam, Isam, Akteruzzaman, Rouf, et al., 2015). Moreover, Lindsay et al. (2008) noted that cultural factors and specifically taboos have influence on mothers' infant feeding practices and eating patterns of their children. To them, for instance, a taboo that describes the feeding of infants with banana and mango at night as ‘inappropriate’.

Consumption of foods containing insufficient nutrients and vitamins could have effect on the growth of infants and young children. Zahiruddin, Gaidhane, Kogade, Kawalkar, Khatib and Gaidhane (2016) identified that initiation of inadequate complementary feeding adversely affects the growth and development of children in rural areas, which may have undesired long-term implication on the cognitive development.

Childhood Morbidity and their Management

Infants and young children in resource poor environments are prone to life threatening morbidity (Kamal, Hasa & Devey, 2015). Based on how mothers and caregivers perceive these morbidities, various management strategies are applied to cure childhood morbidity (Lee, Huy & Choi, 2016).

En-Obong, Iroegbu and Uwaegbute (2000), in Nigeria, observed that management strategies applied were prescribed by medical personnel, patent medicine dealers, or mothers themselves. Mothers treated watery and teething diarrhoea with drugs only. The drugs used were mainly antimicrobials and some local herbal preparations. In another study by Yalew (2014) in Ethiopia, majority of the caregivers perceived inadequate personal hygiene and poor environmental sanitation as the main causes of childhood diarrhoea. However, few of them related its occurrence with sucking hot breast milk. Some mothers preferred traditional medications for their children with diarrhoea. Similarly, Othero, Orago, Groenewegen, Kaseje and Otengah (2008) documented that perceived causes of diarrhoea were unclean water, contaminated food, bad eye, false teeth and breast milk. They further indicated that to manage diarrhoea, mothers decreased fluid intake during diarrhoea episodes, and also withheld milk including breast milk with the notion that it enhanced diarrhoea.

Furthermore, mothers were equally able to identify respiratory infections. In a study conducted in South Africa by Kauchali, Rollins, Bland and den Broeck (2004) maternal recognition of respiratory diseases was a good practice. Also they documented that mothers described respiratory illness in various ways – such as supernatural, natural, tuberculosis, cold weather and unknown – indicating that perceptions of causation differed greatly from biomedical concepts. In managing respiratory infections, mothers preferred traditional remedies.

Different observations were made by Bham, Saeed and Shah (2016) in Pakistan. They indicated that the most common symptom perceived was cough, mostly worsening during winter season, and the commonest aggravating factor was dust. They rather detected that most mothers opted for medical practitioners' services for the treatment of respiratory infections in children, and self-medication was practiced and paracetamol was the frequently used medication.

In relation to childhood fever, Alex-Hart and Frank-Briggs (2011) in Nigeria, identified the commonest cause of fever to be malaria. In their study, they observed that mothers measured their children's body temperature by touching their forehead, while others used thermometer. The commonest action taken by mothers when they notice a child had fever was to administer paracetamol. In Nigeria, Salako, Brieger, Afolabi, Umeh, Agomo, Asa, et al. (2001) noted that the most common form of first-line treatment for childhood fever was drugs from a patent medicine vendor or drug hawker.

Similarly, Oshikoya and Senbanjo (2008) documented that most mothers perceived fever as the hotness of the whole body of the patient. Their findings also showed that most mothers managed the fever at home, and home treatments included exposing children to air, tepid sponging, and giving children paracetamol. Related to the study by Kareem et al. is that of Zyoud, Al-Jabi, Sweileh, Nabulsi, Tubaila, Awang, et al., (2013). They revealed physician's instruction, the degree of elevated temperature and instructions on a medication leaflet as part of the common factors influencing frequency of medication administration.

Conclusion

Most of the literature reviewed were conducted in developing countries including those in sub-Saharan. There studies are mainly conducted to examine associations between single factors and childhood morbidity such as diarrhoea, ARI, anaemia, and fever. This method lacks the critical examination of how outcome variables and explanatory variables interact to result in the occurrence of childhood morbidity. A few were conducted to assess the occurrence of childhood morbidity among children within the recommened ages of breastfeeding (0-23 months).

CHAPTER THREE

THEORETICAL AND CONCEPTUAL FRAMEWORKS

Introduction

This chapter focuses on reviewed theoretical frameworks on child nutrition and morbidity. These frameworks are the UNICEF Framework for Malnutrition (UNICEF, 2013), and the Analytical Child Survival Framework for studying child survival in developing countries (Mosley & Chen, 2003). Also, Breastfeeding Self-efficacy (Dennis, 1999), Theory of Planned Behaviour (Ajzen, 2002), Health Belief Model (Rosenstock, 1974) and Social Theory (Bourdieu, 1984) guided the component of the study that explored the views of mothers on breastfeeding practices and childhood morbidity.

UNICEF Framework for Child Malnutrition

In 1990, UNICEF developed a framework to guide interventions on nutrition from a multi-sectorial and multi-dimensional perspective, thus shifting attention from macro to micro-levels. This framework captures the multifactorial causality of undernutrition among children (UNICEF, 2003). The framework consists of three main components which are: the basic; underlying; and immediate cause of malnutrition (survival, growth and development) (Figure 1). It is the interplay or interaction of these factors that account for the nutritional status of a child. However, this framework has been modified in recent times by Black, Victoria, Walker, Bhutta, Christian, de Onis, et al. (2013), Levitt, Pelletier & Pell (2009) and UNICEF, (2013). The 2013 modified version of the framework, by UNICEF, further added short-term consequences (mortality, morbidity and disability), and long-term consequences (adult height, cognitive ability, economic productivity, reproductive performance, overweight and obesity, metabolic and cardiovascular diseases). The long-term consequences in the framework suggest future intergenerational consequences.

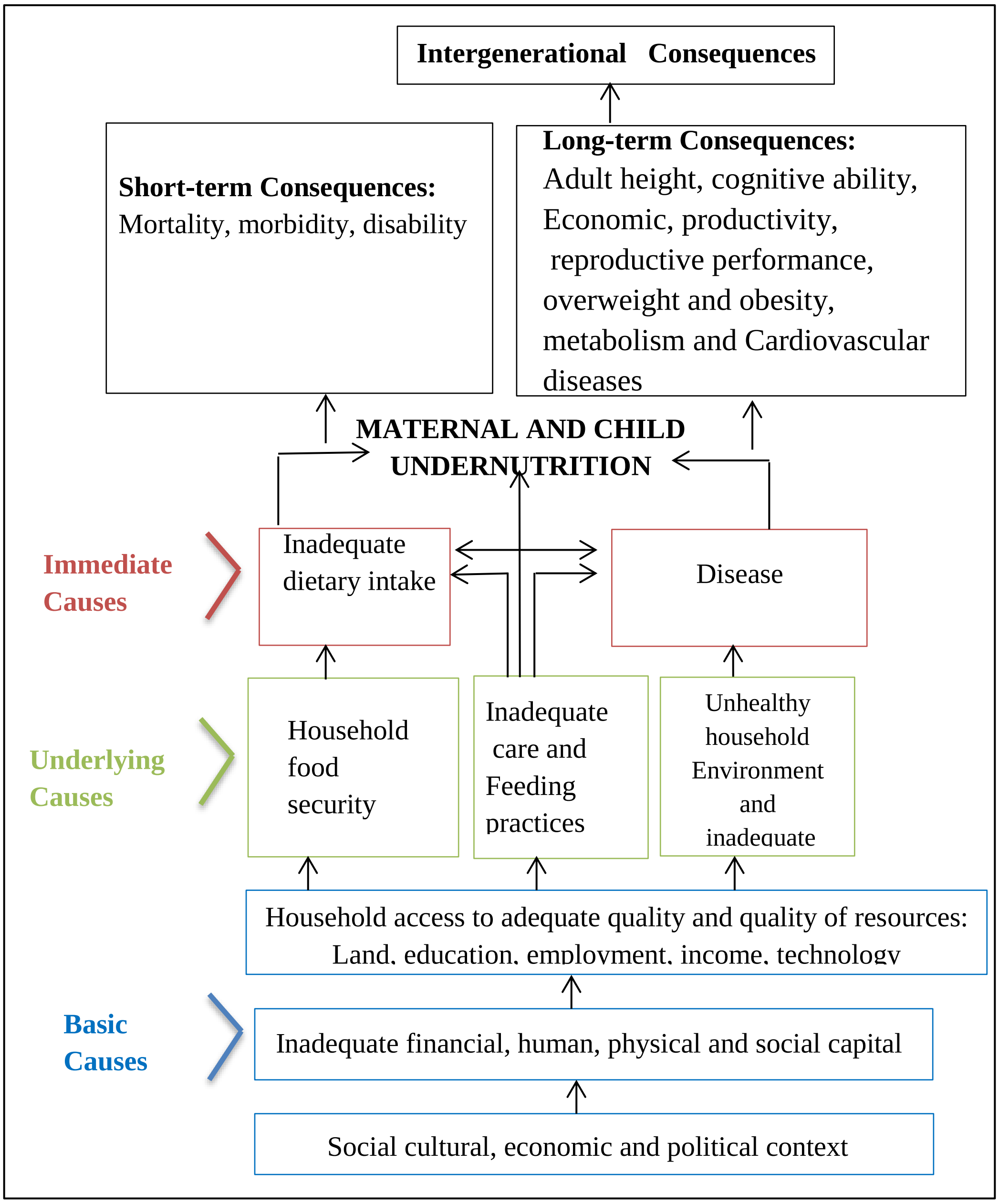


Figure 1: UNICEF Framework for Malnutrition

Source: UNICEF (2013)

The basic causes focus on systemic-level challenges leading to structural and political processes in each society. These processes comprise social, economic, environmental, and political issues that result in the lack of or unequal distribution of capital. Capital in this context includes financial, human, physical, social and natural resources. The underlying causes consist of household food insecurity, inadequate care and feeding practices, inadequate health services, and residing in unhealthy household environment.

Furthermore, the immediate causes focus on the impact of the basic and underlying causes at the individual level through inadequate food intake, and diseases such as diarrhoea and acute respiratory conditions. The framework further provides an interface between these broader systemic level issues and the community, household, and individual levels (Reinhardt & Fanzo, 2014).

The UNICEF Framework for Malnutrition can be applied in a number of situations (The Sphere Project, 2011). It can be used to create a checklist to identify and prioritise the short and long term needs of vulnerable groups and the general population during an emergency. Also, organisations can use it to form consensus on priority needs (International Food Policy Research Institute [IFPRI], 2000). And it provides a structure for survey data collection and gives an analytical plan for data processing. The framework can be used in longitudinal cohort studies to show causations of malnutrition. It can also be applied during anthropometric cross-sectional data collection to identify factors that influence the nutritional status of a population (Emergency Network Nutrition [ENN], 2016).

Analytical Child Survival Framework

The framework consists of both social and biological variables to measure mortality and morbidity. It is based on the premise that all social and economic determinants of child mortality necessarily operate through a common set of biological mechanisms, or proximate determinants to exert an impact on mortality (Mosley & Chen, 2003). The framework was designed to bridge a gap identified between social and medical science researchers. Social scientists mostly try to account for a health outcome by examining individual or societal level variables. In constrast, medical scientists conduct their research to investigate disease-causing agents (bacteria or virus) contributing to a particular health outcome.

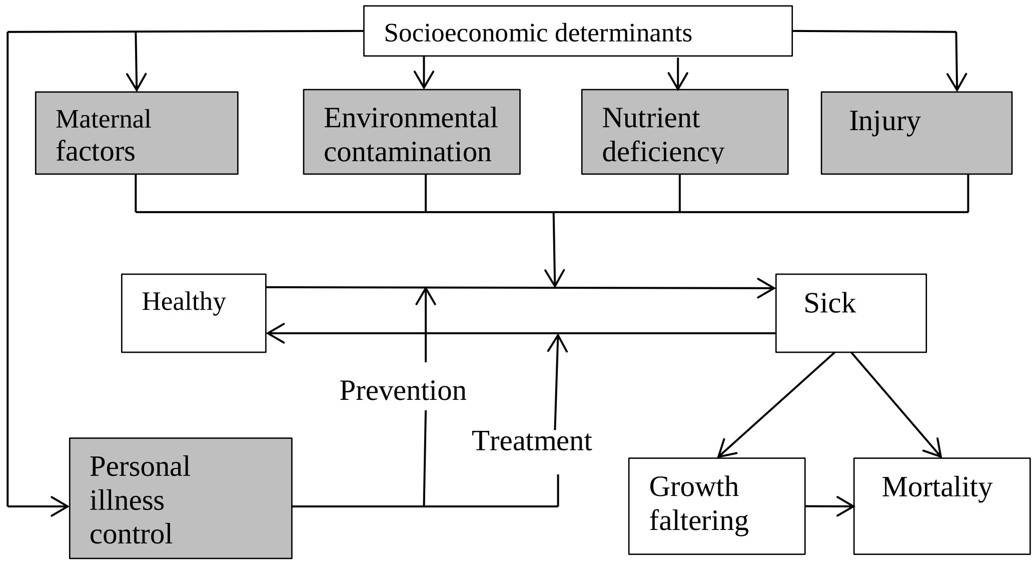


Figure 2: Analytical Child Survival Framework

Source: Mosley & Chen (2003)

What makes the framework essentially useful is that it fuses both approaches by social and medical scientists by considering three components to assess a single health outcome (mortality or morbidity). These components are independent, proximate, and dependent variables. The independent variables consist of socioeconomic determinants (thus at the individual-level, household-level, and community-level).

The individual variables include maternal and paternal characteristics and their beliefs (tradition, norms or attitudes). Household-level variables include wealth composition of individuals' income and wealth. With community-level variables, the framework incorporates ecological setting, political economy and health systems. The horizontal interactions of the independent variables, as mostly used by social scientists to determine mortality, are important but do not independently contribute to a health outcome. These variables require a mechanism or an intermediary to operate in order to determine child survival; and proximate determinants are the mechanisms.

As depicted in the framework (Figure 2), proximate determinant measures are environmental conditions, health care practices, feeding practices, and disease states that act mutually to determine the survival of a child. The vertical interaction of the independent variables and the proximate determinants would define the health status of a child as either healthy or sick. And the rate of recovery or the progression of illness is attributed to personal illness control variables. The personal illness control measures for a child are pre-determined by the independent variables.

The dependent variable (state of health) measures a single outcome (sickness) and further describes either the growth faltering (dietary deficiency) or mortality rates in a cohort of children. To adequately assess health outcomes of a child, the framework proposes a combination of the two states of sickness (growth faltering and mortality). This enables both the strengths and weaknesses of social and medical science researches to mutually complement one another.

The framework could inform social scientists or epidemiologists on conceptualization of models (Hill, 2003). Again, scientists can also use the framework to generalise approaches that aid in statistical modeling of proximate determinants on background factors. These analytical models provide insights for professionals, for instance, in health sectors on how to improve upon health systems.

Breastfeeding Self-Efficacy Framework

Self-efficacy is embedded in cognitive psychology and has been widely used in health-care research (Lenz & Shortridge-Baggett, 2002). The concept of self–efficacy is based on social learning theory that a person believes that he or she is capable of making things happen (Keemer, 2011). Bandura (1977) defines self-efficacy as “people’s beliefs about their capabilities to produce effects” (p. 71). Bandura (1977) expanded this concept by exploring how thoughts, feelings, and actions affect behaviour and how vital these factors are in achieving goals. In addition, motivation, incentive, and perseverance, including foundations of self-efficacy such as perception, consciousness, cognition, learning, memory, and emotion all play significant parts in self-efficacy (Seema, Patwari, & Satyanarayana, 1997). Bandura’s basic principle is that people are likely to engage in activities to the extent that they perceive themselves to be competent at those activities.

There are four main sources of self-efficacy: enactive mastery experiences; vicarious experience; social and verbal persuasion; and physiological and affective (somatic) reactions (Bandura, 1977). Enactive mastery experience refers to experiences learned through personal experience. Sucesses and failures tend to interplay to affect a person’s mastery of experiences. Vicarious or indirect experience is gotten through observation of others undertaking a task. Social and verbal persuasion consists of the support or unsupportive verbal persuasion from significant others including health professionals. And physiological and affective reactions entail situations which are interpreted by individuals as demanding and can weaken performance thereby producing fear in a person.

Dennis (1999) incorporated the social learning theory by Bandura (1977) to formulate the breastfeeding self-efficacy framework (Figure 3). Breastfeeding self-efficacy refers to a mother's perceived ability to breastfeed her new infant and it is a salient variable in breastfeeding duration as it predicts: (1) whether a mother chooses to breastfeed; (2) how much effort she will expend; (3) whether she will have self-enhancing or self-defeating thought patterns; and (4) how she will emotionally respond to breastfeeding difficulties. In particular, efficacious (confident) mothers are more likely to choose breastfeeding, persist even when confronted with difficulties, employ self-encouraging thoughts, and react positively to perceived difficulties (Dennis, 1999).

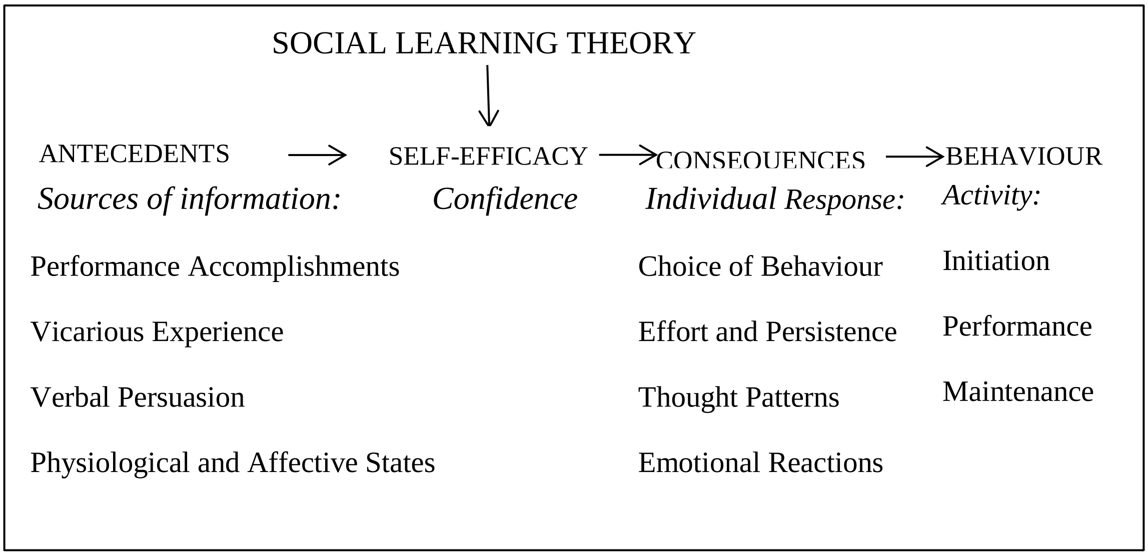


Figure 3: Breastfeeding Self-Efficacy Framework

Source: Dennis (1999)

In relation to breastfeeding, with enactive mastery experiences, a mother needs to undertake the task to practice breastfeeding. The efforts she put into breastfeeding will determine her level of commitment and her pre-existing knowledge of the activity. Also, with vicarious experience, a mother who observes other mothers with similar attributes succeed at breastfeeding is motivated to start breastfeeding. Regarding social and verbal persuasion, a mother who sees another mother breastfeeding or visual media showing a mother breastfeeding may be motivated to start breastfeeding her child. In respect to physiological and affective reactions, a mother facing challenges at breastfeeding may have some fear to subsequently breastfeed another infant.

The breastfeeding self-efficacy framework has been identified as a principal part of health research literature accessible to enlighten the work of health professionals in catering for breastfeeding mothers (Hauck, Hall, & Jones, 2007; O'Brien & Fallon, 2005).

Theory of Planned Behaviour

Ajzen and Fishbein (1980) formulated the theory of reasoned action (TRA) and later on, Ajzen (1985) modified it into the theory of planned behaviour. Simply, the theory of reasoned action holds that if people examine the suggested behaviour as positive (attitude), then the likelihood of them performing an intention (motivation) is higher if significant others want them to perform the behaviour (subjective norm) (Figure 4).

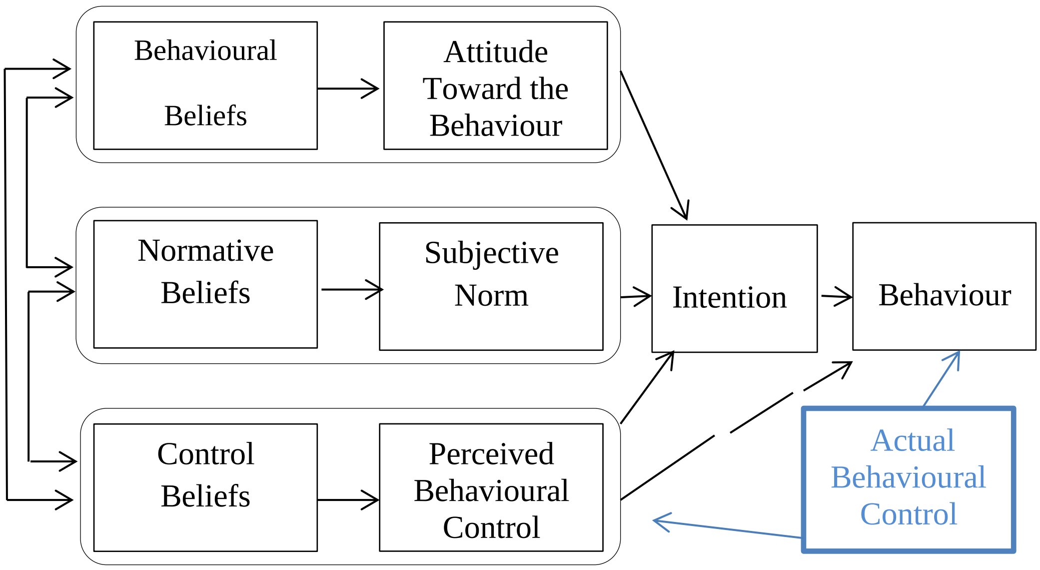


Figure 4: Theory of Planned Behaviour
Source: Ajzen (2002)

In addition, a person's behaviour is not automatically voluntary and in most instances is under control. This account for people's perceived behavioural control. The discovery of perceptions that are embedded in people's intentions led to the postulation of the theory of planned behaviour.

The theory of planned behavior, as put forward by Ajzen (1985), claims that people's rational reflections govern their choices and behaviours. It states that behavioural achievement depends on both motivation (intention) and ability (behavioural control). It distinguishes between three types of beliefs - behavioural, normative, and control. In the theory, six constructs that were identified as collectively representing a person's actual control over behaviour are: behavioural intention, attitude, normative norms, subjective norms, control beliefs and perceived behavioural control.

Behavioural intentions denote the motivational factors that influence a given behaviour. The stronger the intention to perform a behaviour, the more the likelihood of performing the behaviour. Attitude refers to the extent to which a person has a favourable or unfavourable assessment of the behaviour of interest. It involves a consideration of the outcomes of performing the behavior. Moreover, to measure attitudes toward the behaviour, there need to be a measure of a person's subjective norms.

Subjective norms pertain to the belief about whether others approve or disapprove of a behaviour. That is, whether important people in one's life think he or she will perform the behaviour. It relates to peoples' perception of the social environment surrounding the behaviour. Also, it relates to a person's beliefs about whether peers and people of importance (to the person) think he or she should engage in the behaviour. Social norm is about the customary codes of behaviour in a group or people or a larger cultural context. Social norms are considered normative or standard in a group of people.

Perceived power is the fifth construct. This refers to the perceived presence of factors that may facilitate or impede performance of a behaviour. Perceived power contributes to a person's perceived behavioural control over each of those factors. Also, perceived behavioural control refers to a person's perception of the ease or difficulty involved in performing the behaviour of interest (Ajzen, 2002). Perceived behavioural control varies across situations and actions, which results in a person having varying perceptions of behavioural control depending on the situation. In other words, it increases when individuals perceive they have more resources and confidence. This construct of the theory was added later, and that created the shift from the 'Theory of Reasoned Action' to the 'Theory of Planned Behaviour'.

The theory has been used successfully to predict and explain a wide range of health behaviours and intentions including smoking (Karimy, Zareban, Araban & Montazeri, 2015), drinking (Cooke, Dahdah, Norman & French, 2014), health services utilization (Mak & Davis, 2014), and breastfeeding (Guo, Wang, Liao & Huang, 2016).

In relating the theory to the present study, when mothers examine their behaviour as positive they would be motivated to have the intention to initiate and continue breastfeeding. In addition, if people such as partners, grandmothers, aunties, and siblings around them would like to see them breastfeed, then mothers would be more likely to act accordingly. This explanation could also be related to how mothers practice complementary feeding.

Notwithstanding the usefulness of the theory in predicting a person's behaviour, it has some shortcomings. It assumes that a person has attained the opportunities and resources to be successful in performing the desired behaviour, regardless of the intention. Also, it assumes that a person's behaviour is the outcome of a linear decision-making procedure. Hence, behaviour is not expected to change over time (Miller, 2017).

Health Belief Model

The development of this model was inspired by the theory of change by Lewin (1947). This theory generally states that the environment of a person influences their perception and, hence, defines their actions and inactions.

The model was developed by a group of social psychologists who were working on tuberculosis screening programme in the United States of America in the early 1950s (Rosenstock, 1974). Their main focus was to systematically understand why some people utilized free health activities while some people do not.

As assumed in the model (Figure 5), for a person to accept to avoid a disease, the person would need to believe: "(i) that he was personally susceptible to it; (ii) that the occurrence of the disease would have at least moderate severity on some component of his life; and (iii) that taking a particular action would in fact be beneficial by reducing his susceptibility to the condition, or if the disease occurred, by reducing its severity; and (iv) that it would not entail overcoming important psychological barriers such as cost, convenience, pain, and embarrassment" (Rosenstock et al., 1988; p. 3). Added to this, the person must have the trust that a disease can be prevented by boosting ones immune system with the requisite health interventions without the manifestation of symptoms (Figure 5).

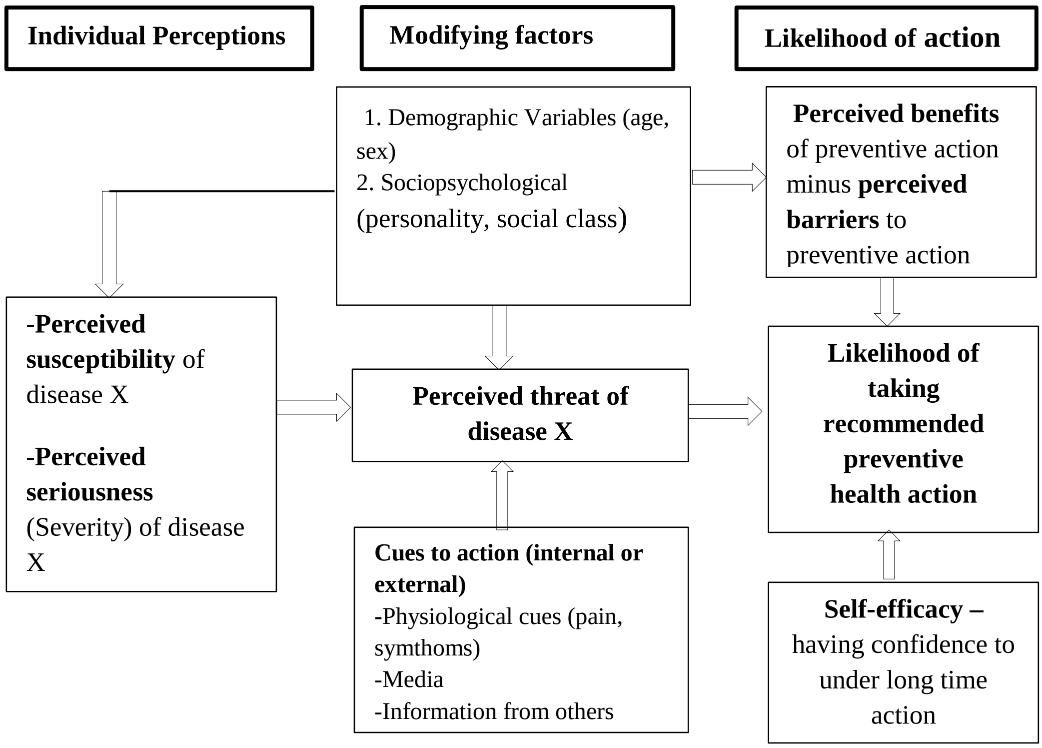


Figure 5: Health Belief Model

Source: Rosenstock, Strecher & Becker (1988)

In relation to the aforementioned assumptions, four concepts were formulated. They are: perceived susceptibility; perceived severity; perceived benefits; and perceived barriers (Rosenstock, 1974). 'Perceive susceptibility' denotes a person's belief in the probability of having a disease or condition.

Also, for the concept of 'perceived severity', a person acknowledges that having a disease is detrimental and, therefore, the person desires not to be ill. Further, 'perceived benefits' refer to a person's approval that a disease exist and, hence, accepts and makes use of the available health interventions.

The combination of the perceived severity and perceived benefits of a disease enables a person to establish a level of threat (perceived threat). The perceived threat may then lead to a desirable health action. 'Perceived barriers' refer to likely adverse effects of a health activity that may deter a person from accepting recommended behaviour. Hence, there are obstacles that may prevent a mother from practicing optimum breastfeeding. Some of these obstacles include individual, societal or cultural beliefs, and access to health facilities.

Furthermore, a person needs to be stimulated to take an informed action after acknowledging the levels of susceptibility and seriousness. Then, appreciating the benefits of a health condition propels the person to take action. The direction of action may be gotten from advice from others, reminders from primary care, articles, television, or radio. These path-ways of action are captured in the model as ‘cue to action’. Therefore, ‘cue to action’ is important for a person to seek health care or to avoid the condition that exposes the person to a ‘at-risk’ role (Rosenstock, 1974).

In addition to the four constructs in the initial HBM, another construct was added. The fifth construct added to the model was ‘self-efficacy’ (Rosenstock et al., 1988). Generally, ‘self-efficacy’ denotes an intent which brings about behaviours that maintain or improve health. An individual needs confidence to sustain certain prescribed set of behavioural change actions and not just to make a one-time health related behaviour. The modification was also to further differentiate illness and sick-role behaviour from health behaviour as was depicted in the original model.

In the health discourse, the model has been applied to investigate a number of health behaviors – condom use, medical compliance, and health screening – among different populations. Other areas the model has been applied include health education (Naghashpour, Shakerinejad, Lourizadeh, Hajinajaf & Jarvandi, 2014), health promotion (Oyekale & Oyekale, 2010), and breastfeeding (Emmanuel, 2015). Most health promoting and disease prevention activities are formulated in line with the model.

The environment in which mothers live would have an influence on them as to how to seek for health care for their children when they are ill. Therefore, the usage of either orthodox medicines or herbal medicines to treat childhood morbidity would be informed by mothers' perceptions or beliefs.

Social Theory

Social Theory by Bourdieu (1984) argues that "food and eating is much more than a process of bodily nourishment: it is an elaborate performance of gender, social class and identity" (Amir, 2011; p.1). The concepts of *habitus* and *dispositions* are put forward by Bourdieu to explain societal living styles. The concept of *habitus* denotes social structures and history of individuals that interrelate to define perceptions and actions in relation to their social environment (Power, 1999). Also, the concept of *dispositions* depicts preferences. That is, the behavioural tendencies that a person exhibits due to cultural beliefs passed on to the next generation through unconscious memories of attitudes and practices (Fagerli & Wandel, 1999).

Conceptually, the concepts of *habitus* and *dispositions* were used to study challenges mothers encounter in relation to breastfeeding practices (exclusive breastfeeding and complementary feeding). Perceptions and actions avowed by social structures may pose challenges to mothers in their attempt to comply by breastfeeding practices. The roles played by mothers at home in the Ghanaian context are mostly stressful and sometimes time consuming (Diji et al., 2016). In such situations, appropriately adopting exclusive breastfeeding and complementary feeding regiments may be difficult practices to observe, hence influence their perceptions and actions or inactions.

For instance, the choice of complementary food a mother gives to her child may be informed by how she perceives 'food'; whether food is for nourishment or to satisfy her child's hunger. How society defines food may challenge her intention of complementarily feeding her child. Again, the inability of a mother to provide adequate and appropriate foods for her child is partly determined, probably, by what a mother can afford and what foods society expects her to feed her child. The definition of food by a mother is therefore being dictated by social structures (*habitus*) and by preferences (*dispositions*).

Conceptual Framework of the Study

"Linked to the problem statement, the conceptual framework sets the stage for presentation of the specific research questions that drives the investigation being reported" (McGaghie, Bordage & Shea, 2001; p. 923). The conceptual framework of this study was guided by the proximate deteminant models' structure as depicted in the Analytical Child Survival Framework (Mosley & Chen, 2003) and UNICEF Framework for Malnutrition (UNICEF, 2003) (Figure 6).

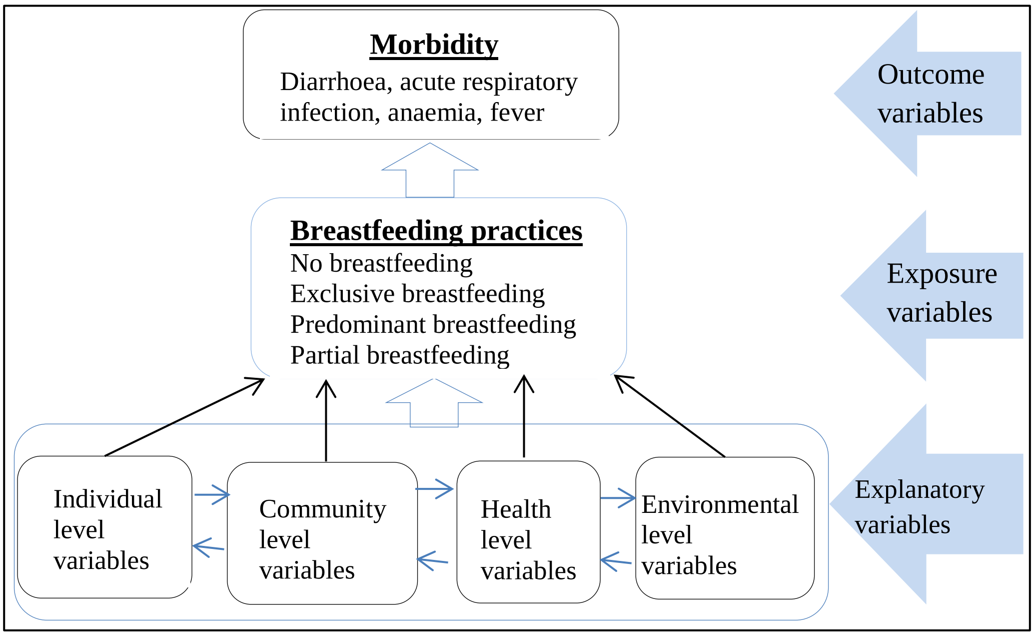


Figure 6: Conceptual Framework

In the conceptual framework of this study, three main groups of variables were considered. These are: explanatory variables; exposure variable; and outcome variables. The pivotal argument of the conceptual framework is that breastfeeding practices may influence a child's health status. Primarily, the framework assumes a bottom-up vertical linkage of the three sets of variables.

Simply, the explanatory variables (at the individual-level, community-level, health-level, and environmental-level) may operate through the exposure variable and this could lead to the occurrence of childhood morbidity.

The explanatory variables include: individual level variables (age of child, sex of child, maternal age, maternal marital status, maternal education, and maternal occupation); community level variables (residence, and region); health level variables (preceding birth interval, size of child, place of delivery, mode of delivery, and antenatal care visits); and environmental level variables (source of drinking water, type of toilet, floor material, cooking fuel, and number of children).

In this study, the exposure is breastfeeding practice(s). It consists of *no breastfeeding*, *exclusive breastfeeding*, *predominant breastfeeding*, and *partial breastfeeding*. These categories are further explained in Chapter Four. Any of these breastfeeding practices could result in a particular morbidity when a mother does not comply with standard breastfeeding recommendations. For instance, a mother who does not comply with the recommended period of exclusive breastfeeding may expose her child to a variety of childhood morbidities. These morbidities constitute the outcome variable in the conceptual framework. The outcome variable (morbidity) consist of four health conditions namely: diarrhoea; ARI; anaemia; and fever.

The interplay of the exposure and explanatory variables could lead to a child being morbid (Al-Sharbatti & Aljumaa, 2012). For example, where a mother adheres to recommended breastfeeding practices, the immune system of her infant would be fortified enough to lessen the occurrence of diarrhoea (Bener, Ehlayel & Abdulrahman, 2011); ARI (Yarnoff et al., 2013); anaemia (Agho, Dibley, D'Éste & Gibberd, 2008); and fever (Netzer-Tomkins et al., 2016).

Nonetheless, breastfeeding practices do not act directly, in the social context, to result in childhood morbidity. They are moderated by other set of variables such as the individual, community, health, and environmental level variables to explain whether a child who breastfeeds may or may not have diarrhoea, ARI, anaemia, or fever especially within the first two years of his or her life. Theoretically, explanatory variables were chosen for each selected outcome variable; this was informed by the review of related literature.

The conceptual framework also facilitated in the review of related literature on breastfeeding practices, childhood morbidity and other pontetial risk factors. In addition, the conceptual framework informed the structure of the data analysis and guided the discussion of the findings.

Chapter Summary

In this chapter, five theoretical frameworks were reviewed. UNICEF Framework for Child Malnutrition identifies three factor groups (basic, underlying and immediate) that interplay to cause child malnutrition or undernutrition. Analytical Child Survival Framework combines both social and biological variables and integrates research procedures applied by social and medical scientists. These two frameworks inspired the development of the study's conceptual framework. Also, Breastfeeding Self-efficacy Theory deals with mothers perceived ability to breastfeed their infants and how personal and external forces would encourage or discourage the act of breastfeeding. Theory of Planned Behaviour claims that individuals' rational reflections govern their choices and behaviours. Health Belief Model generally indicates that environment of a person influences their perception and therefore defines their actions and inactions. Finally, Social Theory argues that a person's social structure influences how he or she would be influenced in terms of choosing foods and eating habits.

CHAPTER FOUR

RESEARCH METHODS

Introduction

This chapter presents information under the following sub-headings: study setting; philosophical paradigms; research designs; data sources; data management; sampling of respondents and selection of participants; data collection; and data analyses.

Study Setting

The study setting consists of all the ten regions of Ghana (Figure 7). The population of the country, as recorded in the 2010 Population and Housing Census Report, was 24,658,823 million people with an average annual growth rate of about 2.5 per cent. Ashanti Region had the highest population of 4,780,280 inhabitants and Upper West Region had the least population size of 702,110. However, Greater Accra was the most densely populated region with about 1,236 persons per square kilometer (GSS, 2012). In general, the southern part (forest area) of the country had the higher population density compared to the northern part (savanna zone).

The population comprises of 12,633,978 (51.2%) females and 12,024,845 (48.8%) males. This translated to a sex ratio of 95 males to 100 females (GSS, 2012). In all the regions, females were more than males except for Western Region where there was an equal number of males to females. Children (0-4 years) number up to 3,550,870 and most of these children were males compared to females both in urban (15% versus 12%) and rural (17% versus 14%) areas of the country (GSS, 2012).

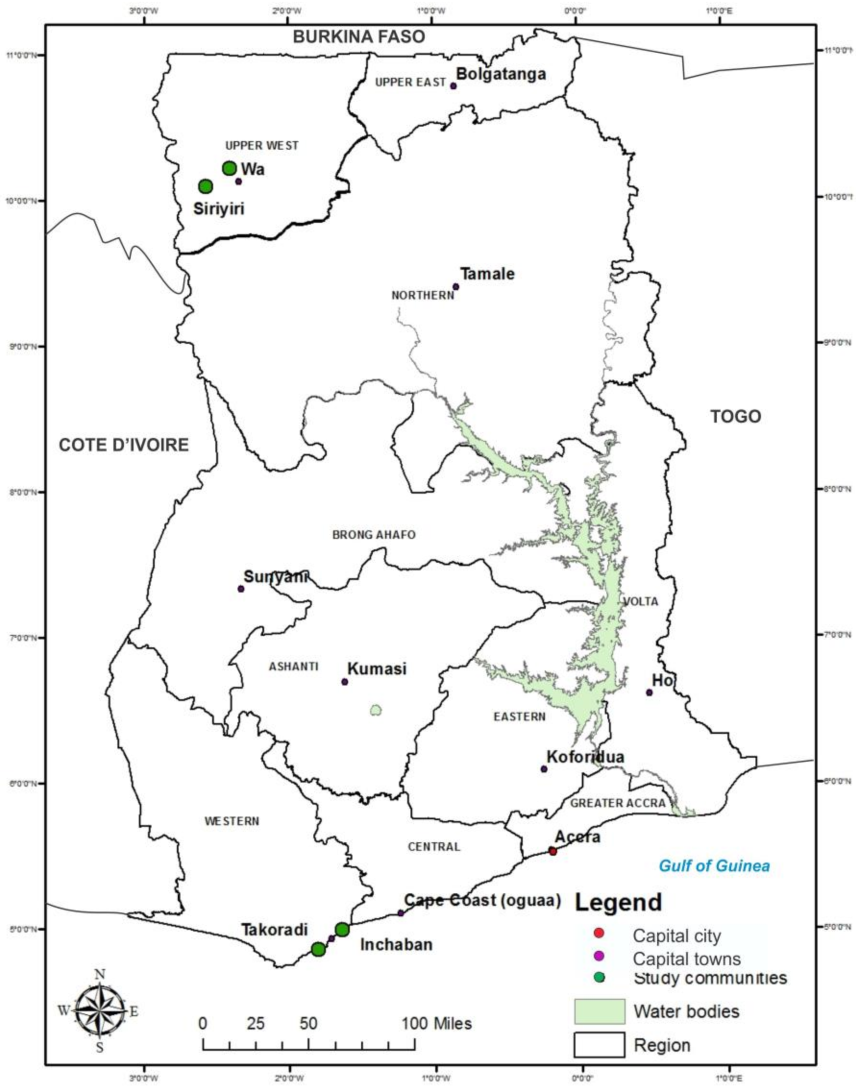


Figure 7: Map of Study Areas

Source: Department of Geography and Regional Planning, University of Cape Coast (2018)

Also, the total fertility rate in the country in 2014 was 4.2 children per woman. In terms of rural and urban fertility rates, total fertility rate in urban areas was 3.4 children per woman while in rural areas it was 5.1 children per woman. Among the regions, Northern Region has the highest total fertility rate of 6.6 (GSS, GHS, & ICF Micro, 2015). Approximately 76.1 per cent of pregnant women had at least four antenatal care (ANC) visits in 2014 (GHS, 2015). The median birth interval in 2014 was 39 months (GSS, 2016). Ten per cent of newborns had low birth weight (less than 2.5 kilograms). In urban areas, nine in ten women delivered in health facilities compared to five in ten women in rural areas. Nationally, 13 per cent of deliveries were by caesarean section, and 14 per cent of children under age two were bottle fed (GSS, GHS & ICF Macro, 2015).

For marital status, almost equal number of females in rural areas (38%) and those in urban areas (37%) were married. A greater proportion of rural women (53%) never attended school compared to urban women (29%) . More females in rural areas were self-employed than those in urban areas (85% versus 70%) (GSS, 2013). A higher percentage of urban dwellers had household possessions (household effects, means of transport, land and animals). However, rural household possessed more animals and lands than those in urban households (59% versus 22% for land, and 55% and 20% for animals) (GSS, GHS & ICF Macro, 2015).

In addition, infant mortality in 2014 was 41 per 1000 live births and under-five mortality rate in 2014 was 60 per 1000 live births. With child nutrition, a proportion of 19 per cent of children were stunted, 5 per cent wasted, and 11 per cent underweight (GSS, GHS, & ICF Micro, 2015). Also, 79.3 per cent of the population had improved access to water. Twenty-three per cent of the population practiced open defeacation or have no toilet facilities (GSS, 2011). This scenario is prevalent in both urban and rural areas of Ghana. In urban areas, a higher proportion of households (42%) used charcoal while in rural areas, most of them used wood (66%) (GSS, GHS & ICF Macro, 2015).

Upper West and Western regions were selected as study settings to collect qualitative data (Figure 7). Upper West Region is located in the north-western part of the country. It is predominantly inhibited by the *Dagaaba* and *Sissala* peoples. It lies in the Guinea Savannah vegetation belt commonly populated with shea (*Vitellaria paradoxa*), baobab (*Adansonia*), dawadawa (*Parkia biglobosa*), and neem (*Azadirachta indica*) trees. Main economic activities are agricultural related and key crops grown are maize, millet, peanuts, okra, and rice. Animal husbandry (e.g. sheep, goats, and pigs, cattle) is also common in the region. *Tuo-zafi'* (made from maize or millet) accompanied with soups made of green vegetable leaves is the commonest food among households in the region. In the region, there are 176 CHPS compounds, 15 clinics, three district hospitals, 68 health centers, six hospitals, five maternity centers, and five polyclinics (GHS, 2015). In the Upper West Region the study areas were Wa (urban) and Siriyiri (rural).

The second region of interest, Western Region, is located in the south-western part of the country with the *Fante* people being the largest group of inhabitants. The region has about 75 per cent of dense forest vegetation. The key economic activities include cocoa, rubber, oil palm and coffee farming. Food crops that are mostly cultivated in this region are plantain, cassava, and cocoyam. *Fufu* with soup prepared from palm nut is a very much preferred meal in the region. Also, in relation to the availability of health facilities, the region has 267 CHPS compounds, 144 clinics, 18 district hospitals, 59 health centers, 20 hospitals, 36 maternity homes, and one polyclinic (GHS, 2015). Kojokrom (urban) and Inchaban Nkwanta (rural) were selected as study areas in the Western Region.

Philosophical Paradigms

In this study, both the positivist and interpretivist paradigms were employed in order to cater for lapses in each strand. The choice of the two paradigms also assisted the study in providing better understanding of the issues under investigation. For instance, the value-free doctrine of positivists tends to singularize reality. This may be necessary when studying large samples, however, the true voices of the group members being studied are muted. To cater for this gap, applying interpretivist canons enabled the study to uncover how each study participant viewed reality from their own perspective.

The positivist and interpretivist perspectives dictate: what set of beliefs and ideas are held about the nature of reality (ontology); what the knower knows about reality (epistemology); and what approaches are applied to establish reality (methodology) (Lincoln, Lynham & Guba, 2011).

The positivist research paradigm holds the view that reality is fixed and can be observed and described from an objective viewpoint (Levin, 1988). In other words, the positivist paradigm adheres to the opinion that only "factual" knowledge gained through observation (the senses), including measurement, is trustworthy. In positivist studies, the role of the researcher is limited to data collection and interpretation through objective approach and the research findings are usually observable and quantifiable (Dudovskiy, 2016). Research conducted by positivists tends to assess the causes that influence outcomes by following a rigorous scientific method: getting a theory; collecting data; and then supporting or refuting theory (Creswell, 2006). The set of data and analytical procedures used in this study were dominantly guided by the positivist research paradigm.

In contrast to the positivist research paradigm is the interpretivist research paradigm. Interpretivists argue that people could subjectively be studied using different empirical procedures in terms of ontological, epistemological, and methodological approaches. The interpretivists believe that a researcher does not have a direct access to the real world and, hence, no single external reality can be objectively established (Black, 2006). They defend that the relationship between reality and research can be understood through 'perceived' knowledge narrated by people (Neuman, 2000). Also, they want to experience issues, understudy and, hence, allow feelings and reasons to direct their actions. The usage of pre-existing comprehension of experience is relevant as well as limitedly accepting scientific research procedures (Edirisingha, 2013). The arguments putfoward by the interpretivists were used to explore views of mothers on breastfeeding practices and childhood morbidity management in selected localities in Ghana.

Research Design

The present study applied a cross-sectional mixed method design as a way of collecting, analyzing, and synchronizing both quantitative and qualitative approaches to better answer the set of research questions (Creswell & Clark, 2011). Specifically, the study applied an explanatory sequential mixed methods approach. This approach was used because it offers flexibility in adequately collecting quantitative and qualitative data in sequential phases and conduct analyses thereto.

Specifically, the quantitative data was used for two purposes. One was to run bivariate and multivariate logistic regression analyses using explanatory, exposure, and outcome variables. Second, GPS coordinates were used to analyze spatial pattern and hot spots of breastfeeding practices and childhood morbidity. This was followed with a qualitative data analysis to get deeper understanding and add social meanings on breastfeeding practices and childhood morbidity among mothers.

Despite this advantage of mixed method, some difficulties may arise as to which part or parts of the quantitative outcomes to follow up on qualitatively. The uncertain follow-ups may be on the kind of participants to sample, and the set of questions to ask in the follow up phase. In addition, the process can be time consuming, and requires both skills in areas of quantitative and qualitative data management (Creswell, 2012).

Furthermore, an interpretive case study research design was applied to explore the views of mothers on breastfeeding practices and related childhood morbidity in selected regions in the country. The application of interpretive case study research design enabled me to get deeper and social meanings attached to breastfeeding practices and childhood morbidity by mothers. Hence, interpretivist philosophical assumptions guided me to incorporate: appropriate strategies of inquiry; methods of data collection, analysis; and interpretation of findings. The qualitative aspect of this study is epistemologically grounded within the realm of social constructivist paradigm.

"In social constructivism, individuals seek understanding of the world in which they live and work; thus, they develop subjective meanings of their experiences – meanings directed toward certain objects or things" (Creswell, 2013; p.24). Therefore, an individual acquires knowledge through interactions with his or her culture and society. Knowledge is accumulated over time and hence influences how they undertake or perceive occurrences in their daily lives. Views on breastfeeding practices and causes of childhood morbidity or health outcomes by mothers or caregivers are culturally constructed and at times influence how they adhere to recommendations put forward by different sources or probably how they seek for options to manage childhood morbidity.

Data Sources

Quantitative data were obtained from GDHS 2014. Although the data is free online, the custodians of the data (Measure DHS) demanded a research proposal before the required data could be made available for download. A research proposal was sent to them and subsequently an approval was given to download the data. The specific data used in this study was the GDHS 2014 individual dataset. This dataset contains details on, but not limited to, mothers characteristics, breastfeeding practices and childhood morbidity (diarrhoea, ARI, and fever).

In addition, Geographical Positioning System (GPS) coordinates were downloaded. Demographic and Health Surveys (DHS) have regularly chronicled the geographical location of each cluster of surveyed households with handheld GPS units. Data are captured at an aggregated level to protect actual identity and location of respondents. However, these data at the cluster level permits linkages between GDHS data on infant and child morbidity and information from other data sets.

The GDHSs are national-level population and health surveys conducted in Ghana as part of the Global Demographic and Health Survey programme. The surveys are designed to provide information to monitor the population and health situation in most developing countries including Ghana. These surveys are conducted every five years in the country and the first survey was conducted in 1988. The surveys are implemented by the Ghana Statistical Service and other national organisations such as Ghana Health Service and the Noguchi Memorial Institute for Medical Research (NMIMR) with technical support from Inner City Fund (ICF) Macro.

The surveys are designed to obtain detailed data on areas such as fertility, marriage, sexual activity, fertility preferences, awareness and use of family planning methods. Other areas include breastfeeding practices, nutritional status of women and young children, childhood mortality, maternal and child health, awareness and behaviour regarding HIV/AIDS, and other sexually transmitted infections (GSS, MOH & ICF Macro, 2015).

The 2014 GDHS used a two-stage sample technique to produce separate estimates for key indicators in both rural and urban areas for each of the 10 regions in Ghana. The first stage was based on selecting clusters in relation to the enumeration areas defined by the 2010 Population and Housing Census (PHC). Systematic sampling procedures were applied in the second stage. From each cluster, 30 households were selected and this equated to a sample size of 12, 831 households. In each household selected for the 2014 GDHS, females (between 15-49 years) were eligible for the interviews.

Data for the qualitative aspect of the study was gotten through in-depth interviews conducted with mothers. These mothers were situated in Upper West and Western regions of Ghana.

Data Management

To validate the data, breastfeeding status of children (0-23 months) were recalculated. The recalculation reflected figures in Table 11.3 in the GDHS 2014 report (on page 161 – *https://dhsprogram.com/publications/ publication-FR307-DHS-Final-Reports.cfm*). Issues captured under this section are: no breastfeeding; exclusive breastfeeding; breastfeeding and consuming plain water only; breastfeeding and consuming non-milk liquids; breastfeeding and consuming other milk; and breastfeeding and consuming complementary foods. These categories are hierarchical and mutually exclusively.

The study considered four outcome variables. These are diarrhoea, ARI, anaemia, and fever. These are among the top ranged as contributing to childhood morbidity in the country (GSS, GHS, ICF Macro, 2015).

In the GDHS 2014, data on 'all diarrhoea' and 'diarrhoea with blood' were collected. Mothers were asked "Whether any of their children under five years of age had diarrhea during the two weeks preceding the survey". The responses to this question were: *No=0*; *Yes, last two weeks=1*; *Don't know=8*.

Similarly, prevalence of ARI was estimated by "Asking mothers whether their children under age five had been ill with a cough accompanied by short rapid breathing in the two weeks preceding the survey. 'Cough' was used as a proxy to determine ARI among children". The ARI categories were: *No=0*; *Yes=1*; *Don't know=8*.

For anaemia, "children who stayed in the household on the night before the interview" were tested for anaemia based on their haemoglobin levels. The categories for this variable were: *Severe=1; Moderate=2; Mild=3;*

Not anemic=4. The various types of anaemia were charactised by haemoglobin levels as follows; severe (less than 7.0 g/dl); moderate (7.0-9.9 g/dl) and mild (10.0-10.9 g/dl). These were recoded as: *Anaemic (severe, moderate, mild) =1; and Not anaemic=2.*

Likewise, mothers were asked “Has (NAME) been ill with a fever at any time in the last 2 weeks?” with responses *Yes=1*, *No=2*, and *don't know=8*. Only the *Yes=1* and *No=2* responses were considered for the analysis. All the “*Don't Know*” responses on the dependent variables were excluded from the analysis. This was done because the study was only interested in responses that were captured on either a child was morbid or not morbid.

The exposure variable is breastfeeding practices. This variable has six categories as captured in the GDHS 2014 report consisting of: no breastfeeding; exclusive breastfeeding; breastfeeding plus water only; breastfeeding plus non-milk liquids; breastfeeding plus other milk; and breastfeeding plus complementary foods. These were determined by asking mothers about breastfeeding status of a child (0-23 months) within a recall period of 24 hours (yesterday and last night). For the sake of comparison, the exposure variable was recoded to conform to most related literature.

The exposure variable was recoded into four categories as follows: no breastfeeding; exclusive breastfeeding; predominant breastfeeding; and partial breastfeeding. No breastfeeding denotes that an infant or child was not fed with breast milk but with other foods. Exclusive breastfeeding defines an infant or child breastfed with only breast milk. Predominant breastfeeding means an infant or child who was breastfed, and given water and non-milk liquids. Partial breastfeeding refers to an infant or child being fed breast milk along with other milk, and complementary foods. The aforementioned categorizations are in accordance with WHO (2002) standard definitions.

The explanatory variables selected for this study were informed by the review of related literature; and these variables can be found in the GDHS. Some of the selected variables were recoded while others were adopted as reported in the GDHS 2014 report. Also, the selected variables were put into four levels; individual, community, health, and environmental.

The individual level variables were: age of child [in months] (0-5, 6-11, 12-23); sex of child (male, female); and maternal age [in years] (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49); marital status of mothers (never married, currently married, living with partner, ever married); education (no education, primary, secondary, higher), wealth quintile (lowest, second, middle, fourth, highest); and occupation of mothers (not working, professional, sales/services, agriculture, manual). Community level variables were: residence (urban, rural); and region (Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East, Upper West).

For health level, the variables included: preceding birth interval (less than 24 months, 24 months or more); size of child (small, average, large); place of delivery (public facility, private facility, home); mode of delivery (non-caesarean, caesarean section); and antenatal visits (0, 1-3, 4 or more).

Further, environmental level variables consisted of: source of drinking water (improved, unimproved); type of toilet (improved, unimproved); floor material (improved, unimproved); and cooking fuel (gas/electricity;

coal/charcoal; wood/straw/grass); and number of children in household (1, 2-3, 4 or more).

At each stage of the analysis, variables from the individual, community, health and environmental levels were chosen based on the possible association with an outcome variable (diarrhoea, ARI, anaemia or fever). The review of related literature equally informed the choice of the explanatory variables.

In relation to geospatial data, cartographic display of 216 districts' polygons were generated by extracting the coordinates of digitized boundary map into a National Grid, Ghana Metre-Grid Universal Transverse Mercator (UTM) coordinates system using ArcGIS version 10.3. The prevalence of breastfeeding practices (no breastfeeding, exclusive breastfeeding, predominant breastfeeding, partial breastfeeding) and childhood morbidity (diarrhoea, ARI, anaemia, fever) were estimated using reported frequencies in each survey cluster in the GDHS 2014. The breastfeeding practices and childhood morbidity frequencies were geo-coded to the district polygon layers to create geo-relational database for the spatial analysis.

Initially, data on the prevalence of breastfeeding practices and childhood morbidity were extracted from GDHS using Stata version 12. These were exported to Microsoft (MS) Excel sheets for further sorting. The MS Excel sheets containing the data were then loaded onto ArcGIS 10.1 to join them with the GPS cluster coordinates obtained during GDHS 2014.

Sampling of Respondents and Selection of Participants

The criteria for sampling respondents was that mothers (15-49 years) should have been living with their youngest child under two years of age (0-23 months) at the time of the survey. Appropriate STATA commands were used to obtain a weighted sample size of 2022 mother-child pairs (Appendix Z).

The purposive sampling technique was used to select mothers. For the participants, only mothers from the age group of 15-49 years were purposely sampled the for interviews. These mothers were deemed to have adequate knowledge on breastfeeding practices and in the position to express their views on breastfeeding practices and childhood health outcomes. The inclusion criterion for selecting mothers was that they should be aged 15-49 years old and with an infant or a child of age 0-23 months. Also, the mother was to be identified as a resident and a native of the town where the qualitative data were collected.

The initial purposive sampling involved two procedures. First the region with the highest and then the region with the lowest prevalence rate of exclusive breastfeeding were selected. The reason for using exclusive breastfeeding rates as the basis for purposively selecting regions was the reported protective effect it has on reducing the prevalence of childhood morbidity (diarrhea, ARI, anaemia, and fever). Based on the secondary data analysis Upper West Region had the highest prevalence rate (33.08%) and Western Region had the lowest prevalence rate (9.60%) of exclusive breastfeeding.

The convenience sampling method was subsequently used to select urban and rural settings within each of the regions. The essence of selecting these settings was to get the views of mothers with different social, economic and environmental exposures since related breastfeeding literature suggests variations in breastfeeding practices and childhood morbidity in urban and rural areas in Ghana.

Data Collection

Qualitative data were collected through unstructured in-depth interviews using an interview guide (Appendix A). The questions focused on knowledge and sources, challenges of breastfeeding practices, childhood morbidity and management of childhood morbidity. The interview guide was designed in the English Language. The interview guide was subsequently translated to *Fante* (for participants in Western Region) and *Dagaare/Waale* (for participants in Upper West Region) and then translated back into English Language to ensure reliability of the data collection instrument. This was pre-tested among mothers with children less than two years in a community (Amamoma) – close to the University of Cape Coast. This afforded me the opportunity to review and revise the tool for clarity. Interviews were conducted using any of the languages (English, *Fante*, *or Dagaare/Waale*) that a mother was conversant with, understood and spoke fluently.

Interviews were conducted according to the date, time and place agreed upon with each mother. Some mothers allowed me to interview them only after I had introduced myself and requested for their consent (Appendix B). Those who were willing but could not afford the time for a prompt interview, a time and place were agreed upon. Interviews took place at either their homes or work places. In both instances, interviews were conducted without the presence of a third-party. This was done to avoid split of attention on the side of mothers during the interviews, to create an atmosphere of confidentialilty, and also to have clear audio recordings of the discussions.

No initial sample size was set for the study. Twenty-two participants were contacted but two mothers in Western Region declined to be interviewed because they were busy and not ready. In all, 20 participants (10 each from Upper West and Western regions) participated in the study. I then canvassed through the selected communities to recruit participants until data saturation was attained in each location. Due to my inability to communicate fluently in Fante and Twi, a qualified interviewer (with a master's degree in a related discpline) was recruited and trained appropriatly to conduct interviews in the Western Region.

All interviews were conducted face-to-face between August 19, 2017 and September 17, 2017; and each interview lasted about 35–45 minutes. Prior to the data collection, no relationship was established with the participants. Informed consent was obtained from each participant and confidentiality of discussions was assured before the commencement of each interview. Unique numbers were then assigned to each participant to ensure anonymity.

Also, participants were informed of their rights to respond or not to respond to any question they might deem sensitive and could withdraw from the interview at any time. The interviews were audio recorded and field notes were written in a hand book. Using the field notes and transcribed data from each interview, where necessary, interview questions were modified accordingly. To ethically conduct these interviews, I obtained clearance (with reference number UCCIRB/CHLS/2016/22) from the Institutional Review Board (IRB) of the University of Cape Coast (Appendix C).

Data Analyses

Analysis on the quantitative GDHS 2014 data was restricted to the youngest children and all children under age two living with their mothers. This formed the parameter of analyses in the study. All the outcome variables (diarrhoea, ARI, anaemia, and fever) were dichotomized, with *No = 0* and *Yes = 1* formats. The exposure variable, breastfeeding practice(s) (hierarchically and mutually exclusive), was coded as: *no breastfeeding = 0; exclusive breastfeeding = 1; predominant breastfeeding = 2;* and *partial breastfeeding = 3.* The explanatory variables were arbitrarily assigned numeric codes starting with either *'0' or '1'*.

At each stage of the data analyses, a STATA survey set statement (*svyset command*) was used to produce unbiased means and accurate variance estimates to enhance representativeness of the results. A survey design weight of v005, primary sampling unit of v021 and strata of v023 were used in the survey set statement. Thus, in all the analytical procedures, appropriate sample weights were applied to ensure generalization of the findings. Further, a $p < 0.05$ was used to examine associations of the independent and dependent variables.

The quantitative analytical plan consisted of two stages. The first stage comprised descriptive analysis (univariate, bivariate and multivariate procedures). Frequencies and proportions were used to summarize the raw data, and, where applicable, means and standard deviations of the variables were calculated. Pearson chi-square test (χ^2) of independence was used to examine the associations between independent variables and dependent variables. The assumptions underpinning the usage of chi-square test for analysis were adhered to in this study. Thus, the measure of the variables was either in ordinal or nominal levels and, also, the study variables consisted of two or more categorical mutually exclusive groups. Importantly, the chi-square test was deemed applicable since none of the expected frequencies, of the variable categories, ware less than five and the second stage of analyses comprised inferential statistics. Before running the analysis, multicolinearity of variables was examined by estimating for Variance Inflation Factor to avoid redundancy of variables. Logistic regression models were generated using hierarchical approach, controlling for individual, community, health, and environmental fixed effects. Generations of models were based on the assumption that effects of explanatory and exposure variables on outcome variables differ. The hierarchical generation of the binary logistic regression models followed the pattern shown in Table 1.

Table 1: Procedure for Generation of Hierarchical Binary Models

Model	**Loading of variables**
Model I	*morbidity* + breastfeeding practices
Model II	*morbidity* + breastfeeding practices + individual variables
Model III	*morbidity* + breastfeeding practices + individual variables + community variables
Model IV	*morbidity* + breastfeeding practices + individual variables + community variables + health variables
Model V	*morbidity* + breastfeeding practices + individual variables + community variables + health variables + environmental variables

Morbidity represents each of the dependent variables of this study (diarrhea, ARI, anaemia, and fever): +; plus

Hosmer-Lemeshow (H-L) Test, as a goodness-of-fit statistic, was used to evaluate the fit of the models. With this statistic, an H-L p-value more than 0.5 indicates a good fit of a model. A pseudo measure of prediction (Pseudo R^2) and a measure to test significance of interactions (Wald chi-square) of explanatory variables within models were indicated.

Using multilevel modeling approach, logistic regression analyses were performed to assess the effect of explanatory variables that were considers as pontential confounders on the association between breastfeeding practices and childhood morbidity. The various explanatory variables were nested in the exposure variable to estimate their effect on the each of the outcome variables (diarrhoea, ARI, anaemia, and fever). This was done to achieve the arguments embedded in the conceptual framework of the study. Probability values (*p*-values) of 0.01, 0.05 and 0.10 were used to ascertain siginificant associations. In generating these models, clustering effects were accounted by prefixing each STATA command with *svy:* in order to estimate robust standard errors.

On the spatial data, three statistical tools were applied to analyze the data on breastfeeding practices and childhood morbidity. These tools were: spatial autocorrelation (Global Moran's *I*); cluster and outlier analysis (Anselin's local Moran's *I*); and hot spot analysis (Getis-Ord G).

Spatial autocorrelation (spatial association) measures clustering or dispersion based on feature geographical locations and attribute values of a single variable. It is used to calculate correlation among neighbouring observations and to ascertain patterns and levels of spatial clustering in neighbouring districts (Boots & Getis, 1998; Tsai, 2012). It computes a single summary value, a *z*-score, describing the degree of spatial concentration or dispersion for a measured variable (Scott & Janikas, 2009).

Also, the spatial autocorrelation was used to examine whether breastfeeding practices (no breastfeeding, exclusive, predominant, and partial) or childhood morbidity (diarrhoea, ARI, anaemia, and fever) had a clustering or dispersion pattern in the country using districts as features. The study hypothesized that the prevalence of the study phenomena (breastfeeding practices or childhood morbidity) are randomly distributed (no spatial dependency) across various districts in the country. The null hypothesis is rejected if a calculated *p*-value is very small (95% confidence interval); which implies an unlikely situation that observed spatial pattern is as a result of random processes. Hence, a district with a high *z*-score and a small *p*-value indicates a spatial clustering of high values.

To locate where breastfeeding practices or childhood morbidity were clustered, the ArcGIS clusters and outlier analysis tool was applied. Cluster and outlier tool measures spatial autocorrelation based on both area locations and area values simultaneously. Given a set of areas and an associated attribute, it evaluates whether the pattern expressed is clustered, dispersed, or randomized (ESRI, 2017).

Cluster and outlier analysis (Anselin Local Moran's *I*) was used to ascertain geographic composition of breastfeeding practices and childhood morbidity clusters and outliers. This statistic calculates a *z*-score, a *p*-value, and a code representing each cluster type. The Moran's *I* identifies clusters of features with values similar in magnitude. Moran's *I* values range from -1 (disperse) to +1 (clustered). A calculated Moran's *I* value of 0 indicates complete spatial randomness. This study used $p < 0.05$ to interpret statistical significance of the computed index values.

With breastfeeding practices, the following categorization were applied: (i) High-high cluster (districts showing high levels of breastfeeding practices surrounded by districts with similar high levels); (ii) Low-low cluster (districts showing low levels of breastfeeding practices surrounded by districts with similar low levels): (iii) Low-high cluster (districts showing low levels of breastfeeding practices surrounded by district with similar higher values): (iv) High-low cluster (districts showing comparatively high levels of breastfeeding practices surrounded by districts with similar lower values).

Also, with childhood morbidity, the following groupings were used: (i) High-high cluster (districts showing high levels of morbidity surrounded by districts with similar high levels); (ii) Low-low cluster (districts showing low levels of morbidity surrounded by districts with similar low levels): (iii) Low-high cluster (districts showing low levels of morbidity surrounded by district with similar higher values): (iv) High-low cluster (districts showing comparatively high levels of morbidity surrounded by districts with similar lower values).

The second part of the geospatial analysis was to examine hot spots. Hot spot analysis (Getis-Ord G) measures each area in a dataset within the context of neighbouring areas in the same dataset. It uses vectors to identify areas of statistically significant hot spots and cold spots in data. Hot spot analysis assumes that there is the presence of clustering within the data (Mitchell, 2005). Therefore, before conducting the hot spot analysis, it was deemed necessary to run cluster and outlier analysis to test for the presence of clustering in the data.

Hot spot analysis then was used to identify statistically significant spatial clusters of high values (hot spots) and low values (cold spots). That is, hot spot analysis was used to define districts with high prevalence versus districts of low prevalence of the phenomena under study (breastfeeding practices and childhood morbodity). For instance, to identify districts that had high or low rate of no breastfeeding children, and to identify which districts have high or low prevalence of diarrhoea. The description of a district as being a hot spot of a phenomenon was expressed in terms of statistical confidence. In the hot spot analysis, areas were indicated using a 95 per cent confidence level.

In relation to the qualitative data, thematic content analysis was applied using the analytical inductive approach to analyze the data. Preliminary data analysis started immediately with the first two interviews. During each interview, field notes were taken and continuous process of transcription of interviews were done. Using the field notes and transcribed data from each interview, where necessary, interview questions were modified accordingly. As interviews were being transcribed, each transcript was critically read over and over again. This was done to achieve ample immersion. Further, my supervisors verified these transcripts. Subsequently, initial themes and sub-themes were identified from the transcribed data.

On the transcripts, themes were marked with letters. For instance, 'A' for exclusive breastfeeding challenges at home; 'B' for complementary feeding challenges at home; 'C' for perceived causes of diarrhoea; and 'D' for send children to hospital. Similarly, numerals were used to specifically identify sub-themes. For example, ‘1’ for household chores; ‘2’ for formal and informal work schedules; and ‘3’ for self-medication. Further, to enable easy identification of individual transcripts, unique codes (consisting of a number, place of residence, and region) were assigned to selected quotations.

Generally, questions were asked on the knowledge and sources of breastfeeding practices and issues were categories as such. Sixteen sub-themes emerged from the challenges of exclusive breastfeeding, and five sub-themes from challenges of complementary feeding. To ensure mutual exclusivity of the sub-themes, some sub-themes were merged. This reduced the number of sub-themes to eight themes. Due to the merger of sub-themes, newly constructed typologies that were not indicated by the participants were used to label them where necessary.

For instance, ‘formal and informal schedules’ was used to represent both ‘running office errands’, ‘working in office’ and ‘farm works’. The themes identified were used as main headings in the results sections. The themes presented at the results section are: household chores; formal and informal work schedules; family influence; low breast milk production; swollen breast or sores on nipples; access food items; and preparing and giving foods to children (Table 2).

Table 2: Description of Coding Tree of Challenges

Main topics	Categories	Themes
Exclusive breastfeeding challenges	Cooking Fetching water	Household chores
	Running office errands Working in office Much work at farm	Formal and informal work schedules
	Grandmothers Cousins Aunties	Family influence
	Insufficient breast milk	Low breast milk production
	Swollen breasts Sores on nipples	Swollen breast or sores on nipples
Complementary feeding challenges	Lack of food items Lack of money Getting quality foods	Access to food items
	Preparing foods Feeding children	Preparing and giving foods

For views of mothers on childhood morbidity and management 10 sub-themes emerged from the data (Table 3). To ensure mutual exclusivity of the sub-themes, related ones merged into themes. This reduced the number of sub-themes to three main themes (manifestation of morbidity, causes of morbidity, and remedy for morbidity).

Table 3: Description of Coding Tree of Morbidity

- Manifestation of morbidity
  - Diarrhoea
  - Fever
  - Cough
- Cause of morbidity
  - Weather condition
  - Mosquito bites
  - Frequent bathing
  - Primary teeth development
- Remedy for morbidity
  - Health facility
  - Orthodox medicine
  - Herbal medicine

To ensure validity of the results, grouping of themes was done at different times. Inconsistencies, where identified, were reconciled. Also, quotations used to support views expressed by mothers were carefully chosen. Interpretations of views were done to reflect salient and subtle meanings as expressed by participants. Also, as the analysis of views continued, each identified theme was interpreted coherently to show the meanings participants attached to, for instance, challenges of breastfeeding practices; noting their spatial and societal characteristics.

Chapter Summary

Research methods for both quantitative and qualitative data collection and analysis were presented in this chapter. Philosophically, positivist and interpretivist paradigms were used to guide the study. Based on this, a mixed method design was adapted to facilitate data collection and subsequent data analysis. GDHS 2014 data were used for the quantitative aspect of the study. This aspect consisted of logistic regressions and geospatial data analyses. For the qualitative aspect, views of mothers were collected on breastfeeding practices and childhood morbidity in two selected regions within the country. Inductive analytical procedures were used to organize the qualitative data.

CHAPTER FIVE

BREASTFEEDING PRACTICES AND RISKS OF CHILDHOOD DIARRHOEA

Introduction

This chapter presents results and discussion on breastfeeding practices and risks of diarrhoea among children (0-23 months) in Ghana. Breastfeeding practices include: no breastfeeding, exclusive breastfeeding, predominant breastfeeding, and partial breastfeeding. Diarrhoea was reported based on the number of diarrhoeal episodes in the past two weeks preceding the GDHS 2014. Frequencies, proportions, chi-square test, and logistic regression are used to present the results. Discussions of findings are presented with empirical evidence. Background characteristics of respondents are presented in Appenedix D.

Prevalence of Diarrhoea among Children (0-23 months)

This section presents the bivariate associations between background characteristics and childhood diarrhoea. Chi-square test of independence was applied to test for statistical significance (p < 0.05). From preliminary analysis, the prevalence rate of diarrhoea was 13 per cent among the children (Appendix D). The results further indicate that breastfeeding practice; age of child; maternal education; maternal occupation; residence; region; preceding birth interval; source of drinking water; and type of toilet facility were significantly associated with diarrhoea.

Table 4: Prevalence of Diarrhoea among Children (0-23 months)

Variable	*p*-value	Reported Cases of Diarrhoea	
		n	%
Exposure variable			
Breastfeeding practice	0.000		
No breastfeeding		38	14.24
Exclusive breastfeeding		18	5.60
Predominant breastfeeding		36	14.41
Partial breastfeeding		202	14.74
Individual level variables			
Age of child (months)	0.000		
0-5		31	5.56
6-11		85	14.63
12-23		177	16.73
Maternal education	0.023		
No education		105	17.77
Primary		59	14.18
Secondary		124	11.36
Higher		5	5.05
Mother's occupation*	0.035		
Not working		78	16.22
Professional worker		5	5.02
Sales/services		85	10.44
Agricultural worker		93	16.52
Manual worker		33	13.46
Community level variables			
Residence	0.048		
Urban		104	10.57
Rural		190	15.54

Table 4 continued

Region	0.000		
Western		13	6.09
Central		20	7.83
Greater Accra		21	6.66
Volta		16	9.38
Eastern		39	19.17
Ashanti		45	11.73
Brong Ahafo		43	20.97
Northern		70	23.67
Upper East		15	15.79
Upper West		12	18.54
Health level variables			
Preceding birth interval*	0.026		
Less than 24 months		16	7.58
24 months or more		221	14.74
Environmental level variables			
Source of drinking water	0.005		
Improved		214	15.44
unimproved		80	9.74
Type of toilet facility	0.000		
Improved		147	10.63
Unimproved		147	17.86
Floor material	0.074		
Improved		233	13.47
Unimproved		61	12.81

** % - proportions for only reported diarrhoea cases; N = 2202*

Children who were not breastfeeding (14%), predominant breastfeeding (14%), and partially breastfeeding (15%) had higher prevalence of diarrhoea while fewer mothers (6%) who practiced exclusive breastfeeding reported of less children with diarrhoea. Children older than five months were found to have recorded higher cases of diarrhoea. Prevalence of diarrhoea was highest among children aged 12-23 months (17%) and the lowest prevalence was among infants 0-5 months (6%).

Almost two-fifth of children whose mothers had no education (18%) and one in twenty of those with higher levels of education (5%) reported diarrhoea episodes. Furthermore, the prevalence of diarrhoea was highest among children whose mothers were engaged in agricultural activities (17%) and less among children of mothers in professional working sectors (5%). Also, the proportion of diarrhoea among children in rural areas was 16 per cent compared with 11 per cent in urban areas.

Proportion of children reported with diarrhoea was highest among children in Northern Region (24%) and lowest among children in Western Region (6%). Fifteen per cent prevalence of diarrhoea was reported for children whose mothers had 24 months or more preceding birth intervals compared with 8 per cent prevalence of children whose mothers had less than 24 months birth intervals.

The prevalence of diarrhoea was higher among children with mothers who had access to improved source of drinking water (15%) compared with those who had access to unimproved source of drinking water (10%). A higher proportion of diarrhoea was linked with children whose mothers had access to unimproved toilet facilities (18%) than those who had access to improved toilet facilities (11%) (Table 4).

Factors Associated with Diarrhoea among Children (0-23 months)

In this section, five logistic regression models were estimated to examine the likelihood of childhood diarrhoea among breastfeeding children (0-23 months old) (Table 5). Model I is a bivariate model, and Model II to Model V are multivariate models. In Model I, the exposure variable (breastfeeding practices) and diarrhoea were examined while in the multivariate models (Model II to Model V) the various explanatory variable groupings were loaded hierarchically to assess their combined effects on the outcome variable (diarrhoea).

In Model I, the exposure variable (breastfeeding practices) and the outcome variable (diarrhoea) were regressed (Table 5). Mothers who were not breastfeeding (OR = 2.800, 95% CI = 1.470, 5.332), predominant breastfeeding (OR = 2.839, 95% CI = 1.466, 5.498) and partial breastfeeding (OR = 2.914, 95% CI = 1.718, 4.940) were about three times more likely to have children with diarrhoea compared to mothers who practiced exclusive breastfeeding (reference group). In Model II, individual level variables (age of child, maternal education, and maternal occupation) were added to the exposure variable. At this stage, the effect of breastfeeding practices on diarrhoea became statistically insignificant. However, age of child, maternal education, and maternal occupation gained statistical significance.

Children between ages 6-11 and 12-23 months had higher odds of being sick with diarrhoea. Between these two age groups, children aged 12-23 months (OR = 3.700, 95% CI = 2.068, 6.620) were about four times more likely to have had diarrhoea cases compared to children aged 0-5 months.

Table 5: Logistic Regression Models for Risk Factors Associated with Diarrhoea among Children (0-23 months)

Variable	Diarrhoea				
	Model I OR [95% CI]	Model II AOR [95% CI]	Model III AOR [95% CI]	Model IV AOR [95% CI]	Model V AOR [95% CI]
Breastfeeding Practice					
Exclusive breastfeeding	1	1	1	1	1
No breastfeeding	2.800** [1.470, 5.332]	1.015 [0.454, 2.269]	1.209 [0.518, 2.822]	1.370 [0.518, 3.620]	1.474 [0.547, 3.199]
Predominant breastfeeding	2.839** [1.466, 5.498]	1.486 [0.709, 3.113]	1.364 [0.636, 2.922]	1.286 [0.553, 2.987]	1.380 [0.595, 3.199]
Partial breastfeeding	2.914** [1.718, 4.940]	1.098 [0.564, 2.138]	1.190 [0.589, 2.403]	1.414 [0.644, 3.105]	1.426 [0.643, 3.163]
Age of child *(months)*					
0-5	n.a.	1	1	1	1
6-11	n.a.	3.000** [1.720, 5.231]	2.900** [1.644, 5.11]	2.386** [1.279, 4.449]	2.175** [1.160, 4.077]
12-23	n.a.	3.700** [2.068, 6.620]	3.522** [1.951, 6.357]	2.913** [1.508, 5.623]	2.736** [1.403, 5.336]
Maternal education					
No education	n.a.	1	1	1	1
Primary	n.a.	0.793 [0.529, 1.189]	1.033 [0.674, 1.583]	0.884 [0.548, 1.426]	0.894 [0.551, 1.449]
Secondary	n.a.	0.633* [0.430, 0.933]	0.917 [0.606, 1.389]	0.914 [0.576, 1.450]	0.987 [0.614, 1.586]
Higher	n.a.	0.406* [0.182, 0.902]	0.659 [0.295, 1.472]	0.640 [0.224, 1.826]	1.005 [0.314, 3.221]

Table 5 continued

Occupation					
Not working	n.a.	1	1	1	1
Professional worker	n.a.	0.374**	0.385**	0.381*	0.542
		[0.171, 0.820]	[0.177, 0.838]	[0.144, 1.010]	[0.192, 1.527]
Sales/services	n.a.	0.561**	0.636*	0.565*	0.611*
		[0.371, 0.849]	[0.420, 0.964]	[0.344, 0.928]	[0.369, 1.010]
Agricultural worker	n.a.	0.783	0.615*	0.544*	0.588*
		[0.512, 1.198]	[0.386, 0.979]	[0.322, 0.921]	[0.349, 0.988]
Manual worker	n.a.	0.765	0.806	0.808	0.895
		[0.449, 1.302]	[0.477, 1.360]	[0.441, 1.481]	[0.483, 1.657]
Residence					
Urban	n.a.	n.a.	1	1	1
Rural	n.a.	n.a.	1.314	1.305	1.254
			[0.920, 1.878]	[0.873, 1.951]	[0.809, 1.945]
Region					
Western	n.a.	n.a.	1	1	1
Central	n.a.	n.a.	1.213	1.098	1.042
			[0.562, 2.560]	[0.490, 2.461]	[0.463, 2.346]
Greater Accra	n.a.	n.a.	1.289	1.008	1.050
			[0.534, 3.032]	[0.382, 2.656]	[0.383, 2.878]
Volta	n.a.	n.a.	1.521	1.298	1.019
			[0.694, 3.348]	[0.542, 3.108]	[0.412, 2.517]
Eastern	n.a.	n.a.	3.699**	2.632**	2.398*
			[1.811, 7.349]	[1.216, 5.697]	[1.097, 5.240]
Ashanti	n.a.	n.a.	2.201*	2.021	1.754
			[1.026, 4.585]	[0.921, 4.435]	[0.793, 3.881]

Table 5 continued

Brong Ahafo	n.a.	n.a.	3.918** [1.925, 7.463]	3.088** [1.494, 6.380]	2.804** [1.332, 5.903]
Northern	n.a.	n.a.	4.735** [2.262, 9.166]	4.284** [1.999, 9.180]	3.164** [1.435, 5.903]
Upper East	n.a.	n.a.	2.674** [1.202, 5.347]	1.741 [0.766, 3.955]	1.269 [0.532, 3.025]
Upper West	n.a.	n.a.	3.769** [1.635, 7.661]	2.806* [1.207, 6.521]	2.160* [0.909, 5.135]
Preceding birth interval					
Less than 24 months	n.a.	n.a.	n.a.	1	1
24 months or more	n.a.	n.a.	n.a.	1.998* [1.053, 3.794]	1.971* [1.035, 3.753]
Source of drinking water					
Improved	n.a.	n.a.	n.a.	n.a.	1
unimproved	n.a.	n.a.	n.a.	n.a.	0.705* [0.483, 1.029]
Type of toilet facility					
Improved	n.a.	n.a.	n.a.	n.a.	1
Unimproved	n.a.	n.a.	n.a.	n.a.	1.340 [0.893, 2.009]
Floor material					
Improved	n.a.	n.a.	n.a.	n.a.	1
Unimproved					0.930 [0.611, 1.415]

Table 5 continued

Wald X^2 (df)	16.01(3)	59.66(12)	110.12(22)	92.88(23)	97.87(26)
Prob > X^2	0.0011	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.0133	0.0489	0.0842	0.0880	0.0937
Hosmer-Lemeshow X^2	0.00(2)	4.69(8)	21.30(8)	11.46(8)	11.33(8)
(df)	1.0000	0.7904	0.0064	0.1767	0.1837
Prob > X^2					

*OR - odds ratio; AOR – adjusted odds ratio; CI- Confidence Interval in square brackets; * - p < 0.05; ** - p < 0.00 ; n.a. – not applicable; Model I – Bivariate logistic regression analysis; Model II, Model III, and Model IV – Multivariate logistic regression analysis*

Also, children whose mothers had secondary and higher education were negatively associated with diarrhoea. Thus, children whose mothers attained higher formal education were less likely to have diarrhoea episodes compared to those whose mothers had no formal education. Moreover, children of (professional) working mothers and those into sales or services had lower odds of diarrhoea episodes compared to children whose mothers were not working.

In Model III, community level variables (residence and region) were included in the hierarchical model. Variables with categories that were statistically significant ($p < 0.05$) were age of child, maternal occupation, and region. At this point, maternal education lost its statistical significance. Although the odds slightly decreased, they were still positively significant. Children who were aged 12-23 months were more than three times likely to have diarrhoea compared to children aged 0-5 months.

A little increase in odds was detected for maternal occupation; however, it was still negatively associated with the occurrence of diarrhoea. Children with professional working mothers were less likely to experience diarrhoea compared to children with mothers who were not working. Further, children with mothers in Northern Region (OR = 4.735, 95% CI = 2.262, 9.166) had almost five times likelihood of diarrhoea episodes compared to those in the Western Region.

In addition, health level variables (preceding birth interval) were included in the hierarchical model to get Model IV (Table 4). The added variable obtained some statistical significance. The occurrence of diarrhoea was about two times higher among children whose mothers had preceding birth interval of 24 months or more (OR = 1.998, 95% CI = 1.053, 3.794) compared to those who had less than 24 months preceding birth interval. Once again, age of child, maternal occupation, and region exhibited statistical significance ($p < 0.05$) with diarrhoea.

The odds of children aged 12-23 months decreased marginally in Model IV yet positively. The possibility of occurrence of diarrhoea among children aged 12-23 months was roughly a bit above two positive points compared to children aged 0-5 months. With reference to children with mothers who were not working, the likelihood of diarrhoea prevalence negatively decreased a bit with children whose mothers were professional workers. Also, the odds of reported diarrhoea episodes of children whose mothers were in Northern Region decreased a little, yet it was still directionally positive compared to mothers in the Western Region.

In the final model (Model V), the last group of the explanatory variables (source of drinking water, type of toilet, and floor material) were added to the hierarchical model (Table 4). In this model, there were further marginal reductions in odds of the various variables compared to what was observed in Model IV. Among the new variables included in Model V, only source of drinking water obtained some statistical significance. Children whose mothers accessed unimproved sources of drinking water (OR = 0.705, 95% CI = 0.483, 1.029) were observed to have less reported cases of diarrhoea compared to those whose mothers used improved sources of water.

Additionally, age of child, maternal occupation, region, and preceding birth interval were of statistical importance in Model V. A further decrease in odds were noted for mothers with children aged 12-23 months who were still positively more likely to have diarrhoea compared to mothers with children aged 0-5 months. Similarly, the odds of diarrhoea occurrence was lower among children with mothers who were agricultural workers (OR = 0.588, 95% CI = 0.349, 0.988) compared to children whose mothers were not working. Statistical significant associations between children whose mothers were professional workers and diarrhoea disappeared in Model V which was evident in Model IV (Table 5).

Moreover, the odds of reported diarrhoea episodes of children whose mothers were in Northern Region decreased by one point yet was still directionally positive compared to those of mothers in the Western Region. Odds for children whose mothers had preceding birth interval of 24 months or more decreased slightly but were still close to two points more likely for them to have diarrhoea compared to those with less than 24 months birth interval. The final model exhibited significant interaction of the explanatory variables (Wald X^2(df) = 97.87(26); p = 0.000) and it fitted the data well (Hosmer-Lemeshow X^2 (df) = 11.33 (8); p = 0.1837) with the highest Pseudo R^2 value (0.937).

Breastfeeding Practices and Risks of Diarrhoea among Children (0-23 months)

The multilevel logistic regression analysis on breastfeeding practices and risks of diarrhoea among children revealed some significant associations (Appendix E). Among no breastfeeding children, those whose mothers had no education (OR =3.567, 95% CI = 1.057, 12.033) were at a higher risk of having diarrhoea while those whose mothers had higher education (OR = 0.108, 95% CI = 0.042, 0.279) reported less occurrence of diarrhoea. For partially breastfed children, those whose mothers had higher education (OR = 0.268, 95% CI = 0.901, 0.800) were much less likely to have diarrhoea. Professional working mothers who were not breastfeeding (OR = 0.021, 95% CI = 0.002, 0.190) and those who practiced partial breastfeeding (OR = 0.306, 95% CI = 0.095, 0.980) were identified to have the lowest likelihood of reported episodes of childhood diarrhoea.

In relation to place of residence, rural mothers (OR = 1.733, 95% CI = 1.212, 2.477) who practiced partial breastfeeding had higher odds of reported cases of diarrhoea among their children (Appendix E). Children whose mothers had preceding birth interval of 24 months or more (OR = 7.495, 95% CI = 0.935, 60.047) and were not breastfeeding had about seven times likelihood of having diarrhoea. Still for the same preceding birth interval group, those whose mothers practiced predominant breastfeeding (OR = 12.854, 95% CI = 1.576, 104.801) had even much greater odds of reported episodes of diarrhoea. Partially breastfed children whose mothers used unimproved sources of drinking water had lower odds of having diarrhoea. The likelihood of episodes of childhood diarrhoea were higher among mothers who practiced exclusive breastfeeding (OR = 2.954, 95% CI = 0.895, 9.748) and partial breastfeeding (OR = 2.026, 95% CI = 1.428, 2.875), and had access to unimproved toilet facilities (Appendix E).

Furthermore, the study sought to enquire whether there was a statistical difference in the occurrence of diarrhoea between exclusively breastfed, and predominantly breastfed children. From the chi-square test results in Table 6, it can be concluded at a 5 per cent significance level that there is a significant difference in the occurrence of diarrhoea between children exclusively breastfed, and predominantly breastfed.

Table 6: Hypothesis Test - Breastfeeding Practices and Prevalence of Diarrhoea

Child had diarrhoea recently	Breastfeeding practices		Total
	Exclusive breastfeeding	Predominant breastfeeding	
No	348(20.08)	1385(79.92)	1733
Yes	21(7.37)	264(92.63)	285
Total	369(18.29)	1649(81.71)	2018
χ^2 (1) = 26.4710; *p*-value = 0.000			

Discussion

Studies in sub-Saharan Africa have documented the protective effect breastfeeding has on the occurrence of diarrhoea among children (Ogbo et al., 2017; Yalcin, Berde & Yalcin, 2016). As conceptualized in this study, breastfeeding was associated with childhood diarrhoea. Further data exploration indicated that exclusive breastfeeding had a protective effect on occurrence of diarrhoea. No breastfeeding, predominant, and partial breastfeeding children were at a much higher risk of contracting diarrhoea than those who were exclusively breastfed.

However, after controlling for other potential factors, the protective effect of breastfeeding disappeared. This suggests that although breastfeeding could minimize episodes of childhood diarrhoea, other factors over-shadow this effect. Probably, mothers or caregivers do not comply with breastfeeding recommendations or with basic hygienic processes in feeding children thereby creating a conducive environment for diarrhoea causing pathogens. In other instances although children may be breastfeeding adequately, diarrhoea may occur especially when the foods are contaminated or not well prepared.

In this study, as anticipated, children who were aged 6-11 and 12-23 months had higher episodes of diarrhoea. This is expected as infants less than six months old may be undergoing exclusive breastfeeding more than those who are older than 6 months. Thus, the latter group is prone to consuming complementary foods. These categories of feeding practices may contain diarrhoea-causing pathogens. These findings are similar to evidence adduced by Mihrete et al. (2014) and Tambe et al. (2015).

Again, educational status of a mother was associated with childhood diarrhoea. This attests to the hypothetical argument put forward in the study on a possible association. It was observed that children whose mothers had secondary and tertiary education were less likely to have episodes of diarrhoea. More so, those who had tertiary education exhibited a higher shielding effect against the manifestation of childhood diarrhoea. This suggests that, as maternal educational level increases the less likely it is for children to experience diarrhoea.

The ability to read and understand or hear and appropriately apply information are, perhaps, key for mothers to better cater for their children. Hence, highly educated mothers may have higher odds of practicing optimum breastfeeding practices. As indicated by related literature, maternal education is a predictor of diarrhoea among children (Kumi-Kyereme & Amo-Adjei, 2016; Mihrete et al., 2014).

Furthermore, maternal occupation was found to be significantly associated with diarrhoea as found in this study. Specifically, children whose mothers were categorized as professional workers, sales or service, and agricultural workers had lower likelihoods of having diarrhoea compared to those who were not working. Mothers who are not working are presumed to be solely in charge of caring for children at homes. In such cases, these mothers may be financially handicapped and, thereby, have no or very low formal education especially those in rural settings. Unhygienic environments, too, may surround such mothers. These unfavorable maternal conditions, linked with not working status, could somehow influence infants and children feeding modes that may result in diarrhoea diseases.

On the other hand, mothers in the professional, sales or services, agricultural and manual sectors are probably in a position to afford some hygienic consumables for their children since they may be earning some income. Also, such mothers may be more educated or enlightened, compared to not working mothers, to make informed child care decisions. Perhaps, some of these mothers' child care decisions, for instance on breastfeeding practices, directly curb the prevalence of childhood diarrhoea among children of working mothers.

Moreover, the environment in which children live could predispose them to some morbidity; either in an urban area or in a rural setting. Place of residence, as an indirect factor, was found to be significantly associated with diarrhoea in this study. In terms of the occurrence of diarrhoea, children in rural areas bore much of the burden. For instance, the consumption of contaminated foods, drinking of unimproved water, poor handling of water, poor socio-economic status, lack of proper sanitation and poor hygiene are some factors deemed to individually or collectively contribute to higher prevalence of diarrhoea in rural environments (Pruss-Ustun, Bartram, Clasen, Colford, Cumming, Curtis, et al., 2014). Although, diarrhoea cases are common in urban areas especially in urban slums, children in rural areas are more disadvantaged (Kumi-Kyereme & Amo-Adjei, 2016). Most rural areas in the country are noted for unfavourable health and environmental conditions and are also associated with cultural beliefs that may act as agents for frequent occurrence of childhood diarrhoea (Mengistie et al., 2013; Siziya, Muula & Rudatsikira, 2013).

Regional variations in diarrhoea cases among children are unevenly distributed. Significant occurrences of childhood diarrhoea were found in Eastern, Ashanti, Brong Ahafo, Northern, Upper East and Upper West regions. The occurrence of childhood diarrhoea in these regions may be attributable to unhygienic house-keeping and poor child care. However, this study further demonstrated that children in Northern Region had the highest prevalence of diarrhoea. Northern Region is located in part of the country where access to good sanitation and portable water is still a major challenge for most of its inhabitants (UNICEF, 2010). As diarrhoea is a function of these aforementioned drivers, infants and young children are mostly disadvantaged as contaminations levels are perhaps high.

Findings further showed that preceding birth interval was significanlly associated with reported episodes of diarrhoea among children. This supports possible pathways projected in the conceptual framework. As documented by Fotso, Cleland, Mberu, Mutua and Elungata (2013) in Kenya, shorter preceding birth interval tend to lessen the time required for a mother to adequately feed younger children and that can lead to diarrhoeal morbidity and mortality. Children whose mothers had preceding birth interval of 24 months or more were more likely to have episodes of diarrhoea. Mothers who do not take advantage of lactational amenorrhea are at a higher risk of having birth intervals less than 24 months (Pirincci, Tasdemir & Oguzoncul, 2016). In such instances, feeding patterns of children can be affected as a mother with two or more children less than two years may not have enough time to appropriately cater for them.

A study conducted by Rasooly, Saeed, Noormal, Aman, Arnold, Govindasamy, et al. (2013) showed that children with a previous birth interval of less than 18 months had a higher risk of dying from certain causes of death, including sepsis and diarrhoea than children with a previous birth interval of 24-35 months. For this reason, education programmes on birth spacing by concerned health institutions targeting mothers within the reproductive age bracket are required. As mothers become more conscious of this practice, they may space their births hence having adequate time to cater for their infants and young children to avert childhood diarrhoeal diseases.

In developing countries such as Ghana, about three million people do not have access to improved drinking water (Safe Water Network, 2017). Approximately, 1000 under five child mortalities are due to diarrhoeal diseases caused by poor water and sanitation and improper handling and storage of water (WaterAid, 2017). It was found that source of drinking water used by mothers statistically contributed to childhood diarrhoea. Unimproved sources of water that are mostly contaminated contribute to a high propensity of exposing children to diarrhoeal morbidity. Elsewhere, studies have found that the use of unimproved source of drinking water is associated with diarrhoea among infants and young children (Hunter, Risebro, Yen, Lefebvre, Lo, Hartemann, et al., 2013; Plate, Strassmann & Wilson, 2004). The provision of improved source of drinking water is imperative to reducing occurrence of diarrhoea among children.

Chapter Summary

The chapter assessed breastfeeding practices and risks of diarrhoea among children aged 0-23 months. Diarrhoea prevalence was 13 per cent, and diarrhoea cases increased as children grew older. Breastfeeding practices, age of child, maternal education, maternal occupation, residence, region, preceding birth interval, source of drinking water, and type of toilet were statistically linked with diarrhoea cases. In a logistic regression analysis, categories within breastfeeding practices, age of child, maternal education, maternal occupation, region, preceding birth interval, and source of drinking water were identified as risk factors of childhood diarrhoea.

CHAPTER SIX

BREASTFEEDING PRACTICES AND RISKS OF CHILDHOOD ACUTE RESPIRATORY INFECTION

Introduction

This chapter focuses on breastfeeding practices and risks of acute respiratory infection (ARI) among children (0-23 months) in two parts. Part one shows descriptive and inferential results on breastfeeding practices and risks of ARI among children (0-23 months). During the GDHS 2014, coughing episodes among children were used as a proxy for ARI. The second part discusses the key findings in relation to relevant literature reviewed. Background characteristics of responents are presented in Appendix D.

Prevalence of ARI among Children (0-23 months)

In this section, the association between the background characteristics and ARI were examined. Again, chi-square test of independence was used to test for statistical significance. In the analysis, breastfeeding practices, age of child, residence, region and preceding birth interval were found to be independently associated ($p < 0.05$) with ARI. Prevalence of ARI among the children was 15 per cent (Appendix D).

Children who were not breastfed (20%) had the highest prevalence of ARI than exclusively breastfed children (8%) (Table 7). There were differences among the proportions of children aged 6-11 months (18%), and 12-23 months (17%) who had ARI and children aged 0-5 months (10%).

Table 7: Prevalence of ARI among Children (0-23 months)

Variable	*p*-value	Reported cases of acute respiratory infection	
		n	%
Exposure variable			
Breastfeeding practice	0.000		
No breastfeeding		54	20.24
Exclusive breastfeeding		25	7.87
Predominant breastfeeding		40	16.06
Partial breastfeeding		215	15.70
Individual level variables			
Age of child (months)	0.000		
0-5		54	9.79
6-11		102	17.64
12-23		176	16.66
Sex of child	0.417		
Male		165	14.54
Female		168	15.84
Maternal age (years)	0.915		
15-19		26	19.34
20-24		64	15.05
25-29		99	16.71
30-34		74	14.70
35-39		38	10.56
40-44		23	17.54
45-49		6	19.67
Mother's occupation	0.267		
Not working		75	15.72
Professional worker		10	11.17
Sales/services		137	16.94
Agricultural worker		78	13.93
Manual worker		30	12.55
Community level variables			
Residence	0.052		
Urban		163	16.64
Rural		170	13.98

Table 7 continued

Region	0.001		
Western		18	8.62
Central		33	12.99
Greater Accra		57	17.83
Volta		24	14.12
Eastern		51	25.32
Ashanti		63	16.52
Brong Ahafo		24	12.10
Northern		41	13.98
Upper East		12	13.33
Upper West		7	12.41
Health level variables			
Preceding birth interval	0.036		
Less than 24 months		16	7.75
24 months or more		230	15.34
Antenatal care visits	0.067		
0 visit		16	25.41
1-3 visits		27	11.11
4 visits or more		290	15.43
Environmental variable levels			
Cooking fuel	0.331	57	13.81
Gas/electricity		113	17.74
Coal/charcoal		150	14.07
Wood/straw/grass			

** less than N=2202 due to missing response; % - proportions for only reported diarrhoea cases*

The proportion of female children (16%) who had ARI was slightly higher than their male counterparts (15%) (Table 7).

Prevalence of ARI was highest (20%) among children whose mothers were aged 15-19, and 45-49 years. Lowest prevalence (11%) of childhood ARI was among mothers aged 35-39 years. ARI was most common among children whose mothers were engaged in sales or services (17%) and least common for those into professional occupations (11%).

Also, children who resided in urban areas (17%) were more prone to ARI compared with those who resided in rural areas (14%). Children with mothers in Eastern Region (25%) reported the highest prevalence of ARI while the least prevalence was recorded among children whose mothers were in Western Region (9%).

Moreover, ARI prevalence of 15 per cent was found among children whose mothers had preceding birth interval of 24 months or more compared to 8 per cent for those with less than 24 months preceding birth interval. One-fourth (25%) of children whose mothers did not attend antenatal, and slightly above one-tenth (11%) of those who had 1-3 visits reported less ARI cases. Children whose mothers used coal or charcoal as cooking fuel had the highest prevalence (17%) of ARI.

Factors Associated with ARI among Children (0-23 months)

This part examines the statistical associations between breastfeeding practices and acute respiratory infection (ARI) while adjusting for potential factors. These models consist of one bivariate logistic model and four multivariate models. Thus, Model I is a single-level model, and the rest of the models are multi-level models built hierarchically upon Model I (Table 8).

Table 8: Logistic Regression Models for Risk Factors Associated with ARI among Children (0-23 months)

Variable	Acute Respiratory Infection				
	Model I OR [95% CI]	Model II OR [95% CI]	Model III OR [95% CI]	Model IV OR [95% CI]	Model V OR [95% CI]
Breastfeeding Practice					
Exclusive breastfeeding	1	1	1	1	1
No breastfeeding	2.968** [1.531, 5.753]	2.011 [0.775, 5.220]	2.039 [0.785, 5.294]	1.321 [0.410, 4.249]	1.394 [0.430, 4.519]
Predominant breastfeeding	2.238* [1.129, 4.437]	1.790 [0.812, 3.944]	1.904 [0.871, 4.164]	1.486 [0.592, 3.727]	1.632 [0.658, 4.045]
Partial breastfeeding	2.180** [1.238, 3.837]	1.513 [0.670, 3.416]	1.617 [0.722, 3.623]	0.995 [0.389, 2.546]	1.020 [0.400, 2.603]
Age of child *(months)*					
0-5	n.a.	1	1	1	1
6-11	n.a.	1.658 [0.895, 3.071]	1.662 [0.895, 3.086]	2.325* [1.082, 4.993]	2.094 [0.963, 4.550]
12-23	n.a.	1.491 [0.792, 2.804]	1.476 [0.781, 2.790]	2.135 [0.950, 4.799]	1.985 [0.869, 4.536]
Maternal age					
15-19	n.a.	1	1	1	1
20-24	n.a.	0.767 [0.406, 1.448]	0.739 [0.396, 1.378]	1.136 [0.206, 6.249]	0.975 [0.176, 5.404]
25-29	n.a.	0.845 [0.451, 1.583]	0.836 [0.451, 1.549]	1.398 [0.259, 7.537]	1.145 [0.211, 6.193]
30-34	n.a.	0.737 [0.390, 1.390]	0.683 [0.362, 1.288]	1.146 [0.212, 6.189]	0.975 [0.178, 5.336]
35-39	n.a.	0.484* [0.249, 0.939]	0.460* [0.238, 0.889]	0.757 [0.139, 4.105]	0.582 [0.105, 3.206]
40-44	n.a.	0.889 [0.423, 1.866]	0.837 [0.400, 1.750]	1.345 [0.238, 7.603]	1.125 [0.197, 6.431]
45-49	n.a.	1.032 [0.335, 3.172]	1.012 [0.337, 3.039]	1.554 [0.228, 10.563]	1.275 [0.188, 8.638]
Maternal occupation					
Not working	n.a.	1	1	1	1
Professional worker	n.a.	0.692 [0.291, 1.641]	0.628 [0.265, 1.486]	0.635 [0.187, 2.158]	0.934 [0.258, 3.373]
Sales/services	n.a.	1.129 [0.758, 1.681]	1.142 [0.764, 1.707]	1.074 [0.658, 1.754]	1.163 [0.704, 1.921]

Table 8 continued

Agricultural worker	n.a.	0.929 [0.603, 1.430]	1.109 [0.679, 1.811]	0.942 [0.526, 1.686]	1.097 [0.596, 2.017]
Manual worker	n.a.	0.832 [0.495, 1.397]	0.872 [0.512, 1.482]	0.715 [0.376, 1.358]	0.758 [0.394, 1.460]
Residence					
Urban	n.a.	n.a.	1	1	1
Rural	n.a.	n.a.	0.880 [0.640, 1.211]	1.050 [0.725, 1.521]	1.082 [0.686, 1.705]
Region					
Western	n.a.	n.a.	1	1	1
Central	n.a.	n.a.	1.582 [0.745, 3.360]	1.669 [0.721, 3.862]	1.658 [0.725, 3.791]
Greater Accra	n.a.	n.a.	2.400* [1.203, 4.790]	1.790 [0.837, 3.829]	1.786 [0.828, 3.852]
Volta	n.a.	n.a.	1.788 [0.893, 3.580]	1.384 [0.639, 2.997]	1.374 [0.633, 2.982]
Eastern	n.a.	n.a.	3.729** [1.975, 7.042]	3.166** [1.597, 6.279]	3.039** [1.510, 6.113]
Ashanti	n.a.	n.a.	2.035* [1.039, 3.985]	1.768 [0.863, 3.622]	1.738 [0.840, 3.595]
Brong Ahafo	n.a.	n.a.	1.379 [0.698, 2.727]	1.609 [0.789, 3.279]	1.533 [0.747, 3.144]
Northern	n.a.	n.a.	1.781 [0.873, 3.632]	1.720 [0.791, 3.739]	1.578 [0.736, 3.382]
Upper East	n.a.	n.a.	1.692 [0.832, 3.441]	1.285 [0.568, 2.903]	1.292 [0.556, 3.002]
Upper West	n.a.	n.a.	1.877 [0.835, 4.215]	1.630 [0.665, 3.997]	1.651 [0.674, 4.044]
Preceding birth interval					
Less than 24 months	n.a.	n.a.	n.a.	1	1
24 months or more	n.a.	n.a.	n.a.	2.154* [1.104, 4.204]	2.150* [1.078, 4.289]

Table 8 continued

Antenatal care visits					
0 visit	n.a.	n.a.	n.a.	1	1
1-3 visits	n.a.	n.a.	n.a.	0.351* [0.144, 0.858]	0.364* [0.149, 0.883]
4 visits or more	n.a.	n.a.	n.a.	0.556 [0.270, 1.145]	0.563 [0.277, 1.146]
Wald X^2 (df)	10.54(3)	31.28(16)	58.89(26)	54.73(29)	55.01(32)
Prob > X^2	0.0145	0.0124	0.0002	0.0027	0.0069
Pseudo R^2	0.0111	0.0225	0.0389	0.0514	0.574
Hosmer-Lemeshow X^2 (df)	0.00(2)	7.70(8)	9.12(8)	7.59(8)	21.47(8)
Prob > X^2	1.000	0.4633	0.3320	0.4749	0.0060

*OR - odds ratio; CI- Confidence Interval in square brackets; * - p < 0.05; ** - p < 0.0 ; n.a. – not applicable; Model I – Bivariate logistic regression analysis; Model II, Model III, and Model IV – Multivariate logistic regression analysis*

Table 8 shows that children whose mothers were not breastfeeding (OR = 2.968, 95% CI = 1.531, 5.753) were about three times more likely to have reported of ARI compared to mothers who practiced exclusive breastfeeding (Model I). Model II consist of breastfeeding practices and individual level variables. Only maternal age was statistically significant with reported cases of ARI. Mothers of the age group 35-39 years (OR = 0.484, 95% CI = 0.249, 0.939) were less likely to have reported of ARI compared to those in the reference age group of 15-19 years.

Model III comprises breastfeeding practices, individual, and community level variables. In the model, maternal age and region were found to be statistical associated (p < 0.05) with ARI. Yet again, children with mothers aged 35-39 years (OR = 0.460, 95% CI = 0.238, 0.889) were less likely to have reported ARI compared to mothers of the age group 15-19 years. Also, children whose mothers lived in Eastern Region (OR = 3.729, 95% CI = 1.975, 7.042) were approximately 4 times more likely to have had ARI cases compared to children in Western Region.

In Model IV, health level variables were added to breastfeeding practices, individual, and community level variables in the hierarchical model. Among all the variables, age of child, region, preceding birth interval and antenatal care visits were significantly associated (p < 0.05) with ARI. Children aged 6-11 months (OR = 2.352, 95% CI = 1.082, 4.993) were slightly more than two times likely to have ARI compared to children aged 0-5 months. Similarly, mothers in Eastern Region (OR = 3.166, 95% CI = 1.597, 6.279) were about three times more likely to have children with ARI compared to mothers in Western Region. Likewise, with children whose mothers had less than 24 months preceding birth interval as the reference group, mothers who had 24 months or more preceding birth interval (OR = 2.154, 95% CI = 1.104, 4.204) were roughly two times more likely to have reported of childhood ARI episodes.

In the last model, Model V, environmental variables were entered into the hierarchical model consisting of breastfeeding practices, individual, community, and health level variables (Table 6). In this model, variables that exhibited statistical significance (p < 0.05) with ARI were region, antenatal care visits and cooking fuel. Again, with reference to children with mothers in Western Region, mothers in Eastern Region (OR = 3.039, 95% CI = 1.510, 6.113) were three times more likely to have children with ARI. Similarly, children with mothers who had preceding birth interval of 24 months or more (OR = 2.150, 95% CI = 1.078, 4.289) were two times more likely to have children with ARI episodes compared to mothers with less than 24 months preceding birth interval.

Once more, compared to mothers who had zero antenatal care visit, the odds of reported childhood ARI episodes were lower for mothers who had 1-3 antenatal care visits (OR = 0.364, 95% CI = 0.149, 0.883). Again, the risk of ARI was two times higher among children with mothers who used coal or charcoal as cooking fuel (OR = 2.034, 95% CI = 1.118, 3.701) compared to mothers who used gas or electricity for cooking. This final model showed significant interaction of the explanatory variables (Wald X^2(df) = 54.56(30); p = 0.0040). Also, it fitted the data well (Hosmer-Lemeshow X^2 (df) = 10.40 (8); p = 0.2382) and had the highest Pseudo R^2 value (0.0560).

Breastfeeding Practices and Risks of ARI among Children (0-23 months)

To examine the linkages between breastfeeding practices and risks of ARI, interactive models were generated (Appendix F). It revealed that mothers who practiced predominant breastfeeding and were of the age group 25-29 (OR = 7.450, 95% CI = 0.843, 65.833) reported higher cases of childhood ARI. Children whose mothers were aged 30-34 years (OR = 0.376, 95% CI = 0.180, 0.786) and were partially breastfed had a lower likelihood of experiencing symptoms of ARI. With maternal occupation, professional working mothers' (OR = 0.024, 95% CI = 0.002, 0.220) children who were not breastfeeding had lower odds of showing signs of ARI.

Predominantly breastfed children whose mothers had a preceding birth interval of 24 months or more (OR = 7.950, 95% CI = 0.976, 64.747) were more likely to have ARI (Appendix F). Also, mothers with 24 months or more preceding birth interval (OR = 2.108 95% CI = 1.013-4.384) and who practiced partial breastfeeding had higher odds of having children with ARI. Mothers who were not breastfeeding and visited antenatal care centers four or more times (OR = 0.121, 95% CI = 0.019, 0.748) were less likely to have children with ARI. Again, mothers who had antenatal records visits of one to three times and who either practiced exclusive breastfeeding or partial breastfeeding reported less occurrence of childhood ARI. In terms of cooking fuel, children who were exclusively breastfed and whose mothers used coal or charcoal (OR = 6.279, 95% CI = 1.185, 33.263) had higher odds of suffering from ARI (Appendix F).

In this study, it was hypothesized that there is no statistical difference in prevalence of ARI between exclusively breastfed children and predominantly breastfed children. From the chi-square test results in Table 9, it can be concluded at 5 per cent significance level that there is a significant difference in the prevalence of ARI between children subjected to the two breastfeeding practices (exclusive breastfeeding, and predominant breastfeeding).

Table 9: Hypothesis Test – Breastfeeding Practices and Prevalence of ARI*

Child had ARI in last two weeks⁺	Breastfeeding practices		Total
	Exclusive breastfeeding	Predominant breastfeeding	
No cough	348(20.07)	1386(79.93)	1734
Yes cough	21(7.42)	262(92.58)	283
Total	369(18.29)	1648(81.71)	2017
χ^2 (1) = 26.0460; *p*-value = 0.000			

***:** *Acute respiratory infection;* **+:** *Cough was used as a proxy for ARI*

Discussion

Acute respiratory infections are the leading cause of childhood morbidity and mortality in Ghana and are mostly caused by viruses (Adiku, Asmah, Rodrigues, Goka, Obodai, Adjei, et al., 2015). Common symptoms include cough, sneezing, nasal discharge, nasal congestion, runny nose, and nasal breathing. In the GDHS, each mother was asked whether their child had a cough accompanied by short and rapid breathing in order to ascertain episodes of ARI.

Breast milk contains essential anti-bacterial components that fortify immune systems of children in their early ages of breastfeeding and this protects children against respiratory tract infections (Bryan & Loscalzo, 2017; Duijts, Jaddoe, Hofman & Moll, 2010). This study found a direct association between breastfeeding practices and reported episodes of ARI. The odds of ARI were about twice among children not breastfeeding, predominant breastfeeding, and partially breastfeeding compared to those who were exclusively breastfeeding. As indicated by Tromp et al. (2017), breastfeeding for six months or longer is significantly associated with a reduced risk of respiratory infections in a Dutch population-based study. Again in Iraq, Al-Sharbatti and Aljumaa (2012) documented that formula fed infants had higher risk of acute respiratory infections compared to breastfed infants. These, undoubtedly, indicate the relevance of breast milk in preventing ARI among infants and children.

Further multivariate analysis revealed disappearance of the protective effect of breastfeeding against ARI when other risk factors were held constant. This means that the contributory effect of these risk factors far outweighs the several immuno-active potentials of breastfeeding against ARI among children in the country. As pointed out by other studies, exclusivity and duration of breastfeeding do not guarantee protection against childhood respiratory tract infections when other distal factors are considered (Kramer, Chalmers, Hodnett, Sevkovskaya, Dzikovich, Shapiro, et al., 2001; Rebhan, Kohlhuber, Schwegler, Fromme, Abou-Dakn & Koletzko, 2009).

It was found that age of child was independently associated with ARI. Similarly, in Rwanda, Harerimana et al. (2016) identified that age of a child was independently associated with ARI. Compared to infants aged 0-5 months, the occurrence of ARI was much higher in older children (6 months or more). As expected, children older than six months are given less breast milk compared to other liquids and solid foods. Other complementary foods consumed by these children mostly lack essential nutrients to maintain a good immune system especially in developing some countries. Again, most environments in which these foods are prepared are less hygienic and these may expose children to ARI and other infections.

Advanced maternal age has been linked to several maternal perinatal outcomes such as preterm birth, stillbirth, and risk of fetal death (Kenny, Lavender, McNamee, O'Neill, Mills & Khashan, 2013). Infants born preterm are most likely to have weak respiratory systems and could be exposed to infections. It was seen that maternal age was significantly associated with ARI among children. As the framework of the study conceptualized, maternal age may account for ARI in children. Children whose mothers were older (35 years or more) were at lower risk of exhibiting ARI symptoms.

Also, as mothers give birth and nurture children, they inherently accumulate some child care experiences. Hence, older mothers may have better care practices for children and this can minimize or prevent the occurrence of ARI. These care practices include may determining early signs of respiratory infections, how to quickly cure them, and choosing a better treatment approach (Bham et al., 2016). In contrast, clinically, maternal age has been found to have obstetrical risks and increased risk of chromosomal abnormalities among women aged 35 years or more that could account for airway diseases such as childhood respiratory infections (Hviid, Skovlund, Morch & Lidegaard, 2017).

In addition, an older primiparous mother probably has a higher level of synthesizing information, observant, and more patient compared to younger mothers in terms of childcare. These qualities of older and experienced mothers, perhaps, put them ahead of younger mothers in child care matters. The tendency for older mothers to appropriately adhere to infant and young children feeding methods may be higher thereby averting childhood ARI. In a study conducted by Prietsch et al. (2008) in Brazil, mothers of 30 years or older were identified as a protective factor for reducing episodes of acute respiratory infection among children. For more insight into these findings, qualitative studies are required to get deeper meanings of how mothers of various ages cater for their infants and young children to prevent infections including ARI.

In addition, regional location of children was significantly associated with episodes of ARI. Controlling for the effect of other factors, results indicated that children with mothers in Eastern and Ashanti regions were significantly more likely to have symptoms of ARI. These two regions are located within the middle forest belt of the country characterised with low temperatures and high humidity prevailing conditions. Given that the data used for analysis was collected during a rainy season, the presence of these environmental conditions in a locality might have contributed to the high prevalence of respiratory infections in children. In a related study conducted in Rwanda, places with frequent rains were found to be risk factors for childhood ARI (Harerimana et al., 2016).

WHO recommends birth interval should of at least two years (24 months) to ensure good pregnancy and childhood outcomes (WHO, 2005). This study found that preceding birth interval had significant association with childhood ARI. Research documents that birth intervals less than 24 months are associated with child morbidity or mortality (Rutstein, 2008). Hence, a short interval between births could have an adverse effect on child nutrition by causing intrauterine growth retardation or undermining the quality of child health as children may be born preterm (Ikeda, Irie & Shibuya, 2013). Also, short birth intervals may result in malnourished infants and young children who are wasted or stunted and are prone to infections including ARI (Gebretsadik & Gabreyohannes, 2016).

Antenatal care visit was significantly associated with the occurrence of ARI. The likelihood of ARI episodes was less among children whose mothers attended antenatal care centers at least once during pregnancy. Ultimately, mothers who seek antenatal care would have better knowledge on how to prevent or minimize episodes of ARI. These antenatal care centers are strategically established avenues where mothers are educated on some childhood morbidity, but not limited to ARI. Mothers are informed on how to avoid and manage early symptoms of respiratory infections in their children by practicing optimum exclusive breastfeeding for the first six months, and, thereafter, continuing with other nutritious foods. Therefore, mothers who do not seek antenatal care may take some inappropriate infant and child care decisions that could have health threating repercussions. In Ethiopia, Astale and Chenault (2015) found children whose mothers had not utilized prenatal care service to be significantly associated with episodes of ARI. Interventions meant to make antenatal care services much accessible to mothers are needed to promote education on best child care practices to reduce or prevent childhood ARI.

Fumes in cooking environments pose a risk for the contraction of respiratory morbidity (Svedahl, Svendsen, Qvenild, Sjaastad & Hilt, 2009). Cooking fuel was found to be associated with the occurrence of ARI. The usage of coal or charcoal by mothers could be a contributory factor to the occurrence of ARI among children. Emissions from cooking fuels harbour pollutants such as nitrogen oxide, carbon monoxide, and formaldehyde that adversely contribute to childhood ARI. In developing countries such as Ghana, most mothers in rural environments are both responsible for caring for children even during times of cooking.

Unfortunately, children whose mothers cook in poorly ventilated areas are likely to have episodes of ARI even if they abide by optimal breastfeeding practices. In a study by Bautista, Correa, Baumgartner, Breysse, and Matanoski (2009), the use of charcoal by mothers was found to be a risk factor that increased cases of ARI. Similar studies in sub-Saharan Africa have affirmed that respirable particulate matter from charcoal usage can affect the respiratory systems of children (Sanbata et al., 2014; Taylor & Nakai, 2012).

Chapter Summary

The main purpose of this chapter was to examine the associations between breastfeeding practices and risks of childhood ARI. The prevalence of acute respiratory infection among children was 15 per cent. Bivariate analysis suggested that breastfeeding practices, age of child, residence, region and preceding birth interval had statistical significance with childhood ARI. By holding constant other set of potential confounding variables, breastfeeding practice, maternal age, region, age of child, preceding birth interval, antenatal care visits, and cooking fuel were identified as risk factors of childhood ARI.

CHAPTER SEVEN

BREASTFEEDING PRACTICES AND RISKS OF CHILDHOOD ANAEMIA

Introduction

This chapter describes issues on breastfeeding practices and risks of anaemia among children (0-23 months) in Ghana. Issues are showcased in three aspects. First, independent heterogeneity test was conducted to ascertain associations between anaemia and selected independent variables. Second, multivariate analysis was conducted to identify risk factors of childhood anaemia. Third, significant findings are discussed taking into account reviews of related literature. Background characteristics of respondents are presented in Appendix D.

Prevalence of Anaemia among Children (0-23 months)

In this segment, chi-square test of independence was used to examine differences in the proportions of children who had anaemia in the country (Table 10). The variables that exhibited statistical significance ($p < 0.05$) with anaemia were age of child, wealth quintile, residence, region, size of child, and place of delivery. Initial analysis revealed that four in ten children (44%) were anaemic (Appendix D).

The results indicated that anaemia was somehow common in all categories of breastfeeding practices (no breastfeeding, exclusive breastfeeding, predominant breastfeeding, and partial breastfeeding). At least four in ten children in each category were anaemic.

Table 10: Prevalence of Anaemia among Children (0-23 months)

Variable	*p*-value	Reported Cases of Anaemia	
		n	%
Exposure variable			
Breastfeeding status	0.261		
No breastfeeding		55	41.87
Exclusive breastfeeding		74	42.44
Predominant breastfeeding		58	44.48
Partial breastfeeding		311	44.89
Individual level variables			
Age of child (months)	0.014*		
0-5		145	45.24
6-11		103	37.82
12-23		250	46.67
Sex of child	0.183		
Male		234	41.64
Female		264	46.57
Maternal marital status	0.239		
Never married		49	51.54
Married		307	43.17
Living with partner		127	45.17
Ever married		15	36.89
Maternal education	0.145		
No education		156	48.72
Primary		103	47.52
Secondary		222	40.55
Higher		17	38.36
Wealth quintile	0.001*		
Lowest		115	42.64
Second		111	49.63
Middle		124	53.22
Fourth		82	38.06
Highest		67	35.46
Community level variables			
Residence	0.038*		
Urban		215	42.50
Rural		283	45.50
Region	0.028*		
Western		60	53.69
Central		67	48.61
Greater Accra		78	48.78
Volta		42	50.48
Eastern		39	38.99
Ashanti		72	38.05

Table 10 continued

Brong Ahafo		39	35.92
Northern		67	44.33
Upper East		21	42.55
Upper West		11	32.37
Health level variables			
Size of child	0.043*		
Small		92	52.78
Average		172	43.92
Large		233	41.52
Place of delivery	0.000*		
Public sector		307	41.65
Private/other sector		29	32.21
Home		160	53.89
Environmental level variable			
Bottle feeding	0.592		
No		429	44.76
Yes		68	40.64
Number of children in household	0.064		
1		173	39.05
2-3		309	47.25
4 or more		17	45.95

*: *Significant at* $p < 0.05$

Older children were more likely to be anaemic. Fourty-seven per cent of children aged 12-23 months compared with 37 percent within the age cohort of 6-11 months were anaemic. Anaemia was more common in female children (47%) than in male children (42%). The highest proportion of childhood anaemia was reported by mothers who were never married (52%) and lowest proportion by ever married mothers (38%).

The prevalence of anaemia among children decreased with maternal education; the highest prevalence with no education (49%), and lowest prevalence with higher education (38%). More than half of children with mothers (53%) in the middle wealth quintile and 35 per cent of mothers in the highest wealth quintile reported of childhood anaemia. Forty-six per cent of children in rural areas had anaemia compared with 43 per cent of children living in urban areas. Children in the Western Region (54%) were more anaemic while 32 per cent of children in the Upper West Region were less anaemic. Fifty-three per cent of children who were perceived to be small at birth had anaemia compared with 42 per cent of children perceived to be large at birth.

The prevalence of anaemia was highest among children with mothers who delivered at home (54%), and three in ten mothers (32%) who delivered at private health facilities or other facilities. Forty-five per cent of children who were not bottle fed had anaemia compared to 41 per cent who were bottle fed. Anaemia prevalence was most common among households with 2-3 children (51%) than those with one child (37%).

Factors Associated with Anaemia among Children (0-23 months)

Logistic regression models were generated to examine factors associated with anaemia among children (0-23 months). Five models were produced using a hierarchical modelling procedure (Table 11). In all, Model I is a bivariate model and in the rest of the models, the study controlled for potentially confounding effect of other variables. Model I contains only breastfeeding practice. It was found that the differences between breastfeeding practicing categories and anaemia were not statistically significant ($p < 0.05$).

In Model II, individual level variables were added to breastfeeding practices and maternal education and wealth quintile were significantly associated with anaemia. Negative odds and positive odds were observed for maternal education and wealth quintile respectively.

Table 11: Logistic Regression Models for Risk Factors Associated with Anaemia among Children (0-23 months)

	Anaemia				
Variable	Model I OR [95% CI]	Model II OR [95% CI]	Model III OR [95% CI]	Model IV OR [95% CI]	Model V OR [95% CI]
Breastfeeding Practices					
Exclusive breastfeeding	1	1	1	1	1
No breastfeeding	0.976 [0.554, 1.720]	0.958 [0.461, 1.988]	0.918 [0.440, 1.912]	0.961 [0.458, 2.016]	1.106 [0.521, 2.345]
Predominant breastfeeding	1.086 [0.616, 1.916]	1.039 [0.572, 1.888]	1.048 [0.580, 1.892]	1.017 [0.561, 1.844]	1.085 [0.590, 1.995]
Partial breastfeeding	1.104 [0.720, 1.693]	1.231 [0.708, 2.141]	1.236 [0.712, 2.143]	1.273 [0.724, 2.239]	1.426 [0.803, 2.531]
Age of child *(months)*					
0-5	n.a.	1	1	1	1
6-11	n.a.	0.686 [0.415, 1.338]	0.697 [0.422, 0.154]	0.663 [0.403, 1.091]	0.655 [0.395, 1.086]
12-23	n.a.	1.061 [0.657, 1.716]	1.054 [0.655, 1.695]	0.997 [0.614, 1.620]	1.008 [0.614, 1.655]
Sex of child	n.a.				
Male	n.a.	1	1	1	1
Female	n.a.	1.214 [0.897, 1.644]	1.184 [0.872, 1.609]	1.158 [0.849, 1.580]	1.217 [0.890, 1.665]
Maternal education	n.a.				
No education	n.a.	1	1	1	1
Primary	n.a.	0.817 [0.536, 1.246]	0.818 [0.527, 1.270]	0.813 [0.521, 1.269]	0.818 [0.520, 1.287]
Secondary	n.a.	0.639* [0.422, 0.967]	0.637* [0.412, 0.985]	0.627 [0.403, 0.974]	0.661 [0.425, 0.027]
Higher	n.a.	0.835 [0.280, 2.490]	0.890 [0.292, 2.716]	0.889 [0.289, 2.730]	1.261 [0.431, 3.685]
Marital status					
Never married	n.a.	1	1	1	1
Married	n.a.	0.771 [0.434, 1.372]	0.747 [0.423, 1.319]	0.786 [0.440, 1.405]	0.727 [0.398, 1.328]
Living with partner	n.a.	0.846 [0.457, 1.564]	0.785 [0.426, 1.447]	0.785 [0.422, 1.460]	0.787 [0.415, 1.494]
Ever married	n.a.	0.539 [0.215, 0.346]	0.493 [0.192, 1.269]	0.488 [0.183, 1.302]	0.466 [0.170, 1.278]

Table 11 continued

Wealth quintile					
Lowest	n.a.	1	1	1	1
Second	n.a.	1.490 [0.964, 2.304]	1.209 [0.748, 1.952]	1.231 [0.757, 2.000]	1.286 [0.785, 2.107]
Middle	n.a.	1.830* [1.131, 2.959]	1.332 [0.772, 2.298]	1.373 [0.791, 2.384]	1.482 [0.854, 2.571]
Fourth	n.a.	0.976 [0.573, 1.664]	0.600 [0.301, 1.196]	0.611 [0.304, 1.228]	0.713 [0.355, 1.433]
Highest	n.a.	0.970 [0.513, 1.832]	0.541 [0.233, 1.256]	0.566 [0.237, 1.351]	0.686 [0.285, 1.652]
Residence	n.a.				
Urban	n.a.	n.a.	1	1	1
Rural	n.a.	n.a.	0.816 [0.530, 1.258]	0.806 [0.521, 1.249]	0.917 [0.593, 1.418]
Region					
Western	n.a.	n.a.	1	1	1
Central	n.a.	n.a.	0.925 [0.482, 1.773]	0.874 [0.450, 1.697]	0.846 [0.439, 1.628]
Greater Accra	n.a.	n.a.	1.093 [0.569, 2.099]	0.982 [0.500, 1.930]	0.895 [0.450, 1.779]
Volta	n.a.	n.a.	0.703 [0.373, 1.325]	0.625 [0.327, 1.193]	0.622 [0.324, 1.193]
Eastern	n.a.	n.a.	0.571 [0.314, 1.037]	0.524* [0.283, 0.970]	0.452** [0.242, 0.843]
Ashanti	n.a.	n.a.	0.594 [0.318, 1.109]	0.579 [0.310, 1.081]	0.556 [0.292, 1.059]
Brong Ahafo	n.a.	n.a.	0.391** [0.210, 0.726]	0.365** [0.193, 0.692]	0.373** [0.196, 0.710]
Northern	n.a.	n.a.	0.508* [0.264, 0.979]	0.464* [0.237, 0.910]	0.453* [0.229, 0.896]
Upper East	n.a.	n.a.	0.546 [0.274, 1.088]	0.446* [0.219, 0.908]	0.442* [0.215, 0.910]
Upper West	n.a.	n.a.	0.344** [0.167, 0.707]	0.322** [0.153, 0.674]	0.346** [0.164, 0.730]

Table 11 continued

Size of child					
Small	n.a.	n.a.	n.a.	1	1
Average	n.a.	n.a.	n.a.	0.635* [0.412, 0.978]	0.697 [0.450, 1.079]
Large	n.a.	n.a.	n.a.	0.592* [0.393, 0.892]	0.617* [0.407, 0.936]
Children in household					
1	n.a.	n.a.	n.a.	n.a.	1
2-3	n.a.	n.a.	n.a.	n.a.	1.647** [1.177, 2.304]
4 or more	n.a.	n.a.	n.a.	n.a.	1.761 [0.772, 4.017]
Wald X^2 (df)	0.42 (3)	23.07(16)	41.89(26)	58.70(31)	61.31
Prob > X^2	0.9363	0.1118	0.0252	0.0019	(33)
Pseudo R^2	0.0004	0.0259	0.0413	0.0577	0.0020
Hosmer-Lemeshow X^2 (df)	0.00 (2)	14.09(8)	9.83(8)	17.51(8)	0.0633
Prob > X^2	1.0000	0.0793	0.2773	0.0252	14.05(8)
					0.0805

*OR - odds ratio; CI- Confidence Interval in square brackets; * - p < 0.05; ** - p < 0.01 ; n.a. – not applicable; Model I – Bivariate logistic regression analysis; Model II, Model III, and Model IV – Multivariate logistic regression analysis*

Children whose mothers attained secondary education (OR = 0.639, 95% CI = 0.422, 0.967) were less likely to have anaemia compared to those with mothers who had no education. The odds of childhood anaemia was higher for children with mothers in middle wealth quintile (OR = 1.830, 95% CI = 1.131, 2.959) than those in lowest wealth quintile.

In Model III, community level variables were incorporated with breastfeeding practices, individual, and health level variables. It was found that maternal education and region had statistically significant associations with anaemia. The statistical significance of wealth quintile disappeared in this model. Odds of children with mothers who attained secondary education still negatively reduced slightly. Children whose mothers were in the Upper West Region (OR = 0.344, 95% CI = 0.167, 0.707) were less likely to have reported of anaemia compared to mothers in Western Region.

In Model IV, after additionally adjusting for health level variables, the results indicated that region, size of child and place of delivery were statistically associated ($p < 0.05$) with anaemia. Maternal education was not significant in this model. The likelihood of the occurrence of anaemia further reduced marginally among children in Upper West Region. Also, children who were perceived to be large at birth (OR = 0.592, 95% CI = 0.393, 0.892) were less likely to have anaemia compared to those who were small in size at birth. Besides, mothers who delivered their children at home (OR = 1.759, 95% CI = 1.196, 2.586) were 1.8 times more likely to recall childhood anaemia compared to mothers who delivered at public health facilities.

Finally, environmental level variables were loaded into the anaemia hierarchical model (Model V). In this model, variables that were statistically significant ($p < 0.05$) with anaemia were region, size of child, place of delivery and number of children in household. Children with mothers in Upper West Region, and children who were large at birth odds of anaemia morbidity appreciated a bit although still with negative odds. However, the likely occurrence of anaemia among children who were delivered at home further negatively decreased.

For number of children in household, the occurrence of anaemia was reported to be higher among families with 2-3 children (OR = 1.6, 95% CI = 1.177, 2.304) compared to those with one child in their household. Post hoc tests on the final model revealed a significant interaction of the explanatory variables (Wald X^2(df) = 61.31(33); p = 0.0020). The goodness-of-fit statistic was significant (Hosmer-Lemeshow X^2 (df) = 14.05 (8); p = 0.0805) and it recorded the highest Pseudo R^2 value (0.0633).

Breastfeeding Practices and Risks of Anaemia among Children (0-23 months)

Results were generated to appraise breastfeeding practices and risks of anaemia among children (Appendix G). Mothers with primary education who exclusively breastfed (OR = 3.157, 95% CI = 1.200, 8.302) their children were more likely to report childhood anaemia. Besides, children whose mothers attained secondary education and were partially breastfed (OR = 0.674, 95% CI = 0.441, 0.030) had lower odds of being anaemic. Mothers who were living together with their partners and were not breastfeeding (OR = 5.057, 95% CI = 0.786, 32.522) had greater chances to have children with anaemia. Still on marital status, those who were married and practiced predominant breastfeeding (OR = 0.242, 95% CI = 0.065, 0.904) were less likely to have anaemic children.

Children who were not breastfed and whose mothers were within the fourth wealth quintile (OR = 0.147, 95% CI = 0.036, 0.599) had lesser likelihood of being anaemic. Also, those within the second wealth quintile and who predominatly breastfed (OR = 2.622, 95% CI = 0.901, 7.627) their children had greater possibility of reporting childhood anaemia. Mothers who practiced partial breastfeeding and were within the highest wealth quintile (OR = 0.585, 95% CI = 0.312,) were less likely to have children with anaemia.

Children who were perceived to be large and average in size at birth, and whose mothers practiced exclusive breastfeeding (OR = 0.360, 95% CI = 0.113, 1.142) and predominant breastfeeding (OR = 0.329, 95% CI = 0.109, 0.995) respectively had lower chances of being anaemic. Children who were delivered at home and their mothers partially breastfed (OR = 1.566, 95% CI =

1.036, 2.366) them had higher odds of being anaemic. Children were likely to be anaemic in households with two or more children whether their mothers were exclusively breastfeeding (OR = 2.150, 95% CI = 0.950, 4.864) or partially breastfeeding (OR = 1.895, 95% CI = 1.284, 2.798).

This study further sought to hypothetically examine whether there was a statistical difference in the occurrence of anaemia between exclusively breastfed children and predominantly breastfed children. From the chi-square test results in Table 12, it can be concluded at a 5 per cent significance level that there is no significant difference in the prevalence of anaemia between exclusively breastfed, and predominantly breastfed children.

Table 12: Hypothesis Test – Breastfeeding Practices and Prevalence of Anaemia

Anaemia level status	Breastfeeding practices		Total
	Exclusive breastfeeding	Predominant breastfeeding	
Not anaemic	117(20.17)	463(79.83)	580
Anaemic	72(16.22)	372(83.78)	444
Total	189(18.46)	835(81.54)	1024

χ^2 (1) = 2.6153; *p*-value = 0.106

Discussion

Childhood anaemia sets in when there is a reduction in red blood cells counts and decrease in concentration of haemoglobin in the blood (Zuffo et al., 2016). Usually, the occurrence of anaemia is attributed to poor nutrition and poor health. The condition among infants and young children mostly occur when breast milk is replaced by complementary foods that may be poor in iron and other essential nutrients such as vitamin B12 and folic acid (Santos et al., 2011). In Ghana, anaemia among infants and young children is commonly attributed to iron deficiency (Ewusie et al., 2014).

The study conceptually assumed that maternal education may predispose a child to being anaemic or otherwise. It was found that children whose mothers obtained secondary education were less likely to be anaemic compared to those whose mothers had no education. It may be reasoned that most mothers with no education or primary education are not able to make informed decisions as to how to cater for their children in terms of best feeding practices. Perhaps, due to their low level of education, they may be financially constrained or environmentally disadvantaged. That may push them to offer less nutritious foods to their children. Findings of this study corroborate with a study conducted in Burma on anaemia among children that found low maternal education as a significant risk factor of anaemia (Zhao et al., 2012). Other studies with similar findings have been reported (Abubakar, Uriyo, Msuya, Swai & Stray-Pedersen, 2012; Goswmai & Das, 2015).

Also, wealth quintile was found to have significant association with anaemia. In line with the conceptual framework, children whose mothers were in the middle wealth quintile had higher odds of being anaemic than those in the poorest wealth quintile. Generally, poor iron dietary intake is associated with the poor in society (Aspuru, Villa, Bermejo, Herrero & López, 2011). The findings of this study suggest that those who may averagely possess some assets (middle wealth quintile) commonly consume diets with no or insufficient iron. These households in the middle wealth quintile are probably financially challenged to provide balance diets containing needed nutrients to prevent the occurrence of childhood anaemia. On the contrary, a study conducted in Ethiopia (Woldie et al., 2015) documented that children of poor wealth quintile are more susceptible to anaemia.

As previously anticipated, findings of this study indicate that anaemia cases are recorded in all regions of the country. Although some regions were identified as having low prevalence of childhood anaemia, all rates are still above the disease prevalence threshold of 40 per cent (WHO (2001). However, children in Eastern, Brong Ahafo, and Northern, Upper East, and Upper West regions were more likely to be anaemic compared to Western Region.

Further, findings from this study support the linkage projected between birth size and anaemia. It was found that children with large birth sizes were less likely to have anaemia compared to those with small birth sizes. As documented in previous studies, maternal anaemia has been identified to be risk factor for low birth weight (Elhassan, Abbaker, Haggaz, Abubakar & Adam, 2010; Kumar, Asha, Murthy, Sujatha & Manjunath, 2013). Based on this, the occurrence of anaemia among infants can be attributed to their mothers being anaemic during pregnancy. Another reason may be due to poor feeding practices.

The findings show that children whose mothers delivered at home had a higher propensity of reported cases of anaemia compared to those who were delivered in a public or private health facility. Baby-Friendly Hospital Initiative (BFHI), instituted by WHO and UNICEF, is to ensure that both public and private facilities become centers of optimal breastfeeding practices (WHO/UNICEF, 1991). Maternal dietary education provided at these birthplaces could play a significant role in averting the occurrence of anaemia among children.

In places such as public or private health facilities, expectant mothers and those breastfeeding are tutored on kinds of food to eat in order to improve their wellbeing. Issues on balanced diet, intake of iron-folate supplements, fortification of staple foods, and provision of multiple micronutrient powder are mostly on top of their health clinic agenda. Kikafunda et al. (2009), in their study to examine anaemia and associated factors among children in Uganda, identified place of birth to be significantly linked with anaemia. They further found that mothers who delivered at public health facilities were less likely to have children with anaemia.

Chapter Summary

In this chapter, issues pertaining to breastfeeding practices and risks of anaemia in children (0-23 months) in Ghana were presented. The occurrence of childhood anaemia was based on blood samples taken from children during the GDHS 2014. Anaemia prevalence of 44 per cent was recorded among children aged 0-23 months. It was found that age of child, wealth quintile, place of residence, region, size of child, and place of delivery were independently associated with anaemia. Also, the control for other factors indicated that maternal education, wealth quintile, region, size of child, and place of delivery were significant risk factors of childhood anaemia.

CHAPTER EIGHT

BREASTFEEDING PRACTICES AND RISKS OF CHILDHOOD FEVER

Introduction

This chapter delineates breastfeeding practices and the risk of fever among children (0-23 months) in Ghana. It contains results on descriptive associations between independent factors and childhood fever. Logistic regression is used to examine risk factors of fever among children (0-23 months). The final section of the chapter discusses the findings taking into consideration pertinent literature reviewed. Background results of respondents are contained in Appendix D.

Prevalence of Fever among Children (0-23 months)

This section examines the association between breastfeeding practices and the risk of fever. In Table 13, variables statistically associated ($p < 0.05$) with fever were breastfeeding practice, age of child, sex of child, maternal education, maternal occupation, and residence. Approximately one-tenth of children (12 per cent) had fever (Appendix D).

Proportionately, fever was highest among children who were not breastfeeding (18%) and lowest prevalence among children who have been exclusively breastfed (4%). Seventeen per cent of children aged 12-23 months had fever compared with four per cent in the age group of 0-5 months. The differences in the prevalence of fever between male and female children were not much; 14 per cent for males and 11 per cent for females.

Table 13: Prevalence of Fever among Children (0-23 months)

Variable	*p*-value	Reported Cases of Fever n	%
Breastfeeding practice	0.000*		
No breastfeeding		47	17.66
Exclusive breastfeeding		11	3.53
Predominant breastfeeding		25	10.06
Partial breastfeeding		201	14.65
Individual level variables			
Age of child (months)	0.000*		
0-5		23	4.11
6-11		80	13.98
12-23		179	16.96
Sex of child	0.004*		
Male		164	14.42
Female		119	11.26
Maternal education	0.051*		
No education		92	15.67
Primary		53	12.81
Secondary		126	11.61
Higher		11	10.90
Mother's occupation	0.002*		
Not working		48	10.16
Professional worker		3	3.39
Sales/services		108	13.30
Agricultural worker		98	17.56
Manual worker		25	10.25
Community level variables			
Residence	0.042*		
Urban		115	11.76
Rural		168	13.81
Health level variables			
Mode of delivery	0.875		
Non-caesarean		243	12.63
Caesarean section		40	14.77
Antenatal care visits	0.189		
No visit		13	20.49
1-3 visits		18	7.65
4 visits or more		251	13.35
Environmental level variables			
Source of drinking water	0.493		
Improved		184	13.29
Unimproved		99	12.23

**: Significant at $p < 0.05$*

Fever was most common among children whose mothers were aged 45-49 years and least common among those aged 20-24 years. Marginal differences in fever proportions were found with marital status. Fifteen per cent of mothers with no education, and 11 per cent of mothers with higher education reported fever cases among their children.

In terms of maternal occupation, children whose mothers were into agricultural activities recorded the highest prevalence (18%) of fever compared with 3 per cent prevalence among children with mothers who were professional workers. Also, there was a minimal difference of fever prevalence between urban and rural areas. Twelfth per cent of children in urban areas had fever while 14 per cent in rural areas reported of fever cases. Likewise, the prevalence differentials of fever for place of delivery were small. Slightly more who were children delivered through caesarean section had fever in the last two weeks compared with those children delivered vaginally.

Children with mothers who did not attend antenatal care (20%) had the highest prevalence of fever and the lowest prevalence was among those who had 1-3 antenatal care visits (8%). With source of drinking water, there was a slight prevalence difference of fever between children with mothers who had access to improved and unimproved sources of water.

Factors Associated with Fever among Children (0-23 months)

Table 14 shows results of logistic regression models on factors associated with fever. The first model is a bivariate model consisting of breastfeeding practices and fever (Model I). In the second to fifth models the study controlled for other explanatory variables. In Model I, the results indicated that mothers who were not breastfeeding (OR = 5.856, 95% CI = 2.741, 12.510) were about six times more likely to report childhood fever compared to mothers who practiced exclusive breastfeeding.

In Model II, in addition to the breastfeeding practices, individual level variables were held constant in the hierarchical model. However, breastfeeding practices did not exhibit any statistical significance in this model. The individual level variables statistically associated ($p < 0.05$) with breastfeeding were age of child, sex of child, and maternal occupation. Children who were aged 12-23 months (OR = 3.549, 95% CI = 1.667, 7.555) were four times more likely to have fever compared to children of the age group 0-5 months. With reference to sex of children, female children (OR = 0.716, 95% CI = 0.526, 0.974) were less prone to fever. Further, children with mothers who were professional workers (OR = 0.113, 95% CI = 0.023, 0.558) were less likely to recall instances of fever compared to children with mothers who were not working.

In Model III, residence as a community level variable was put into the hierarchical model. Residence did not show any statistical significance in the model. Instead, age of child, sex of child, and maternal occupation were statistically significant ($p < 0.05$) with fever.

Odds for children aged 12-23 months increased slightly and still maintained strong statistical association with prevalence of fever compared to children in the age cohort 0-5 months.

Table 14: Logistic Regression Models for Breastfeeding Practices and Risks of Fever

Variable	Fever Model I OR [95% CI]	Model II OR [95% CI]	Model III OR [95% CI]	Model IV OR [95% CI]	Model V OR [95% CI]
Breastfeeding Practice					
Exclusive breastfeeding	1	1	1	1	1
No breastfeeding	5.856** [2.741, 12.510]	2.080 [0.694, 6.229]	2.201 [0.713, 6.788]	2.092 [0.689, 6.354]	2.132 [0.701, 6.482]
Predominant breastfeeding	3.053** [1.356, 6.871]	1.582 [0.630, 3.972]	1.650 [0.649, 4.198]	1.620 [0.643, 4.080]	1.611 [0.635, 4.083]
Partial breastfeeding	4.684** [2.414, 9.090]	1.815 [4.715]	1.916 [0.720, 5.095]	1.856 [0.705, 4.880]	1.874 [0.709, 4.948]
Age of child *(months)*					
0-5	n.a.	1	1	1	1
6-11	n.a.	3.074* [1.477, 6.396]	3.068** [1.462, 6.438]	3.059** [1.464, 6.394]	2.782* [1.329, 5.823]
12-23	n.a.	3.549** [1.667, 7.555]	3.581** [1.665, 7.703]	3.630** [1.696, 7.768]	3.403** [1.597, 7.251]
Sex of child					
Male	n.a.	1	1	1	1
Female	n.a.	0.716* [0.526, 0.974]	0.721* [0.530, 0.981]	0.733* [0.538, 0.999]	0.725* [0.532, 0.988]
Maternal education					
No education	n.a.	1	1	1	1
Primary	n.a.	0.821 [0.535, 1.259]	0.782 [0.487, 1.255]	0.796 [0.495, 1.281]	0.804 [0.498, 1.300]
Secondary	n.a.	0.802 [0.535, 1.203]	0.803 [0.497, 1.296]	0.799 [0.498, 1.282]	0.898 [0.556, 1.452]
Higher	n.a.	2.733 [0.711, 10.497]	2.854 [0.716, 11.365]	2.582 [0.681, 9.784]	3.347 [0.846, 13.239]
Maternal occupation					
Not working	n.a.	1	1	1	1
Professional worker	n.a.	0.113** [0.023, 0.558]	0.105* [0.020, 0.533]	0.106** [0.216, 0.520]	0.128* [0.024, 0.669]
Sales/services	n.a.	1.303 [0.817, 2.077]	1.332 [0.848, 2.091]	1.306 [0.832, 2.050]	1.440 [0.908, 2.283]
Agricultural worker	n.a.	1.786* [1.091, 2.926]	1.772* [1.036, 3.030]	1.755* [1.021, 3.017]	1.791* [1.067, 3.004]
Manual worker	n.a.	0.998	1.024	0.987	1.086

Table 14 continued

		[0.555, 1.795]	[0.568, 1.845]	[0.546, 1.785]	[0.593, 1.988]
Residence					
Urban	n.a.	n.a.	1	1	1
Rural	n.a.	n.a.	1.043 [0.722, 1.507]	1.079 [0.745, 1.564]	0896 [0.608, 1.320]
Mode of delivery					
Non-caesarean	n.a.	n.a.	n.a.	1	1
Caesarean section	n.a.	n.a.	n.a.	1.248 [0.784, 1.985]	1.335 [0.834, 2.136]
Antenatal care visits					
0 visit	n.a.	n.a.	n.a.	1	1
1-3 visits	n.a.	n.a.	n.a.	0.327* [0.132, 0.812]	0.951* [0.119, 0.731]
4 visits or more	n.a.	n.a.	n.a.	0.633 [0.280, 1.430]	0.611 [0.272, 1.368]
Source of drinking water					
Improved	n.a.	n.a.	n.a.	n.a.	1
Unimproved	n.a.	n.a.	n.a.	n.a.	1.003 [0.720, 1.398]
Wald X^2 (df)	24.91(3)	84.48(16)	84.60(17)	88.45(20)	88.93(21)
Prob > X^2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.0259	0.0653	0.0654	0.0708	0.0708
Hosmer-Lemeshow X^2 (df)	0.00(2)	10.38(8)	10.80(8)	13.00(8)	11.77(8)
Prob > X^2	1.0000	0.2394	0.2131	0.1117	0.1616

*OR - odds ratio; CI- Confidence Interval in square brackets; * - p < 0.05; ** - p < 0.01 ; n.a. – not applicable; Model I – Bivariate logistic regression analysis; Model II, Model III, and Model IV – Multivariate logistic regression analysis*

Again, positive increment of odds for fever among female children was observed compared to male children. Similarly, mothers who were professional workers were still less likely, even though the odds reduced marginally, to have children with fever, and agricultural workers were more likely to have children with fever compared to mothers who were not working.

Also, health level variables (mode of delivery and antenatal visits) were added to Model IV. Only one of the added variables (antenatal visits) had statistical association with prevalence of fever. Mothers who went for antenatal care visits 1-3 times (OR = 0.327, 95% CI = 0.132, 0.812) were less likely to have reported of childhood fever compared to children with mothers who did not go for antenatal care services. With the existing variables, it was found that age of child, sex of child, and maternal occupation were also statistically associated with fever.

Children in the age group 12-23 months gained a bit higher positive odds of having fever compared to children aged 0-5 months. Once more, female children with slightly increased odds were less likely to be associated with fever cases compared to male children. Odds for children of professional working mothers getting fever rather increased in this model. The likelihood of children to be linked with fever was less among mothers who were professional workers compared to children with mothers who were not working.

In Model V, source of drinking water, an environmental level variable, was further accounted for in the hierarchical model. The addition of this variable did not contribute to any statistical significance in the model. Statistically, variables that were identified to be associated ($p < 0.05$) with fever were age of child, sex of child, maternal occupation, and antenatal care visits. The likelihood for the occurrence of fever was still three-fold, although it decreased a little, among children aged 12-23 months compared to those aged 0-5 months.

Again, female children were less likely to have fever compared to their male counterparts. Also, children with professional working mothers continually showed lower but with a bit increase in odds of reported fever cases compared to children with mothers who were not working. Further, with reference to children whose mothers did not go for antenatal care services, those who had attended antenatal care centers 1-3 times had increased odds of having fever although negative. Evaluating this model, it indicated that the interactions among explanatory variables were significant (Wald X^2 (df) = 88.93(21); p = 0.000) and the model fitted the data well (Hosmer-Lemeshow X^2 (df) = 11.77 (8); p = 0.1616). Besides, it displayed the highest Pseudo R^2 value (0.0708).

Breastfeeding Practices and Risks of Fever among Children (0-23 months)

The interaction terms on breastfeeding practices and risks of fever among children were assessed and some significant associations were observed (Appendix H). Female children who were partially breastfed (OR = 0.682, 95% CI = 0.477, 0.977) had lesser odds of experiencing fever. Children whose mothers attained secondary education and either not breastfed (OR = 0.278, 95% CI = 0.105, 0.736) or partially breastfed (OR = 0.487, 95% CI = 0.487, 1.068) were less likely to have fever. A similar observation was made in relation to mothers who were into agriculture; higher odds for both not breastfeeding (OR = 4.378, 95% CI = 1.191, 16.083) and partial breastfeeding (OR = 2.172, 95% CI = 1.293, 3.648). However, professional working mothers (OR = 0.227, 95% CI = 0.051, 1.011) who practiced partial breastfeeding had lower likelihood of having children with fever.

Children who were in rural areas and partially breastfed (OR = 1.395, 95% CI = 0.968, 2.011) were more likely to have episodes of fever. Also, mothers who had caesarean sections and exclusively breastfed (OR = 4.615, 95% CI = 0.956, 22.261) their children reported higher occurrence of childhood fever. The occurrence of fever was much less among mothers who had one to three antenatal visits and either not breastfeeding (OR = 0.101, 95% CI = 0.009, 1.133) or partially breastfeeding (OR = 0.295, 95% CI = 0.106, 0.818). Children who were predominantly breastfed and whose mothers had access to unimproved source of drinking water (OR = 0.395, 95% CI = 0.142, 1.097) were less prone to the occurrence of fever.

Also, the study sought to enquire whether there is a statistical difference in the occurrence of fever between exclusively breastfed children and predominantly breastfed children. From the chi-square test results in Table 15, it can be concluded at a 5 per cent significance level that there is a significant difference in episodes of fever between exclusively breastfed and predominantly breastfed children.

Table 15: Hypothesis Test – Breastfeeding Practices and Prevalence of Fever

Child had fever in last two weeks	Breastfeeding practices		Total
	Exclusive breastfeeding	Predominant breastfeeding	
No	354(20.17)	1401(79.83)	1755
Yes	15(5.70)	248(94.30)	263
Total	369(18.29)	1649(81.71)	2018

χ^2 (1) = 32.0402; *p*-value = 0.000

Discussion

Fever occurs when the body temperature of a child exceeds 38°C (100.4°F) and this rise in temperature can occur at any point in the year (Baraff, 2000). Fever among children especially those under one year can be attributed mostly to viral infections (O'Meara et al., 2015). Other causes can be due to bacteremia, pneumonia, malaria, urinary tract infection, ear infections, bronchiolitis, and gastroenteritis (Crump, Morrissey, Nicholson, Massung, Stoddard, Galloway, et al., 2013; D'Acremont, Kilowoko, Kyungu, Philipina, Sangu, Kahama-Maro, et al., 2014).

In this study, breastfeeding was found to be significantly associated with episodes of fever among children (0-23 months). A further bivariate logistic analysis showed that not breastfeeding, predominantly breastfeeding, and partially breastfeeding children were most likely to report fever. This direct linkage is conceptually relevant in this study. This, therefore, suggests that exclusive breastfeeding has a protective effect against childhood fever (Lin, Sun, Lin, He, Deng, Kang, et al., 2014). Likewise, Yarnoff et al. (2013) indicated that for an infant younger than six months old, practice of exclusive breastfeeding instead of giving the infant solid foods might decrease the likelihood fever. In another study conducted by Kuchenberker, Jordan, Reinbott, Hermann, Jeremias, Kenney, et al. (2015) to assess exclusive breastfeeding and its effect on growth in Malawi, they observed that exclusively breastfed infants had significantly fewer episodes of fever.

Similarly, in other studies, both exclusive breastfeeding and predominant breastfeeding had been shown to have defensive effects against childhood infectious diseases. One of such studies is by Netzer-Tomkins et al. (2016) who explored the possible correlations between breastfeeding and neonatal fever in Israel. Other authors have demonstrated that breastfed children's response to infectious disease is different from those who are not breastfed. The explanation to this may be that their in-built immune system is attributable to anti-inflammatory and immunomodulatory agents present in breast milk (Pisacane et al., 2010).

In this study, it was further found that age of child was significantly associated with fever and the prevalence of fever increased with age of child. Findings indicated that children aged 6-11, and 12-23 months were more likely to have fever compared to those aged 0-5 months. Higher odds of fever occurrence were observed among children aged 12-23 months. Explanation to this finding may be that, during early ages of a child, especially the first six months, mothers take extra good care of their infants, as they are fragile than older children. This minimizes the occurrence of fever during the first half of life during infancy (0-5 months) as compared to older children who may receive less care. Another plausible reason may be that most of these infants are well clothed or sleep in mosquito nets (Atieli, Zhou, Afrane, Lee, Mwanzo, Githeko, et. al., 2011).

Epidemiological studies show that during childhood, body temperatures tend to be highest at about 18-24 months of age (Consolini, 2017). Parasitic loads among children aged one to two years are higher, due to high mobility, and their bodies in response release endogenous pyogenic mediators to fight infections. It is during this pathophysiological process that their body temperatures tend to rise resulting in higher occurrence of fever. In a study conducted by Hamooya et al. (2015) among children under five years, those aged 12-24 months recorded higher frequency of fever. This is consistent with the findings of this study.

In addition, the sex of a child can predetermine severity of infectious diseases from the point of delivery to adulthood (Muenchhoff & Goulder, 2014). As theorized in this study of a possible linkage, there was significant heterogeneity between sex of child and occurrence of fever in this study. Precisely, female children significantly had lower odds of episodes of fever compared to their male counterparts. It has been reported that females have stronger humoral and cellular immune responses to infections or antigenic stimulations than males (Fish, 2008).

The in-built immunity in females is beneficial in protection against pathogens by minimizing the occurrence of fever. Thereby, male infants and children who are poorly fed with complementary foods may be more susceptible to having high temperature than their female counterparts. Findings of this study are consistent with studies conducted in Ghana and Nigeria that documented that male children have higher rate of fever than female children (Etuk, Egua & Muhammad, 2008; Nyarko & Cobblah, 2015). In contrast, Hamooya et al. (2015) did indicate a non-significant association between the sex of a child and reported episodes of fever.

Studies have also indicated the effect of maternal occupation on the breastfeeding practices that may lead to childhood morbidity (Nkrumah, 2017; Taddele, Abebe & Fentahun, 2014). The findings further suggest that mothers who were professional workers reported less childhood fever cases compared to other maternal occupations. However, children whose mothers were into agricultural activities were more likely to have fever. Perhaps, professional working mothers may have alternative nutritious complementary foods for the infants and young children compared to mothers in informal sector such as agriculture. This may prevent other infections or comorbidities that mostly lead to fever cases among malnourished children.

WHO recommends that a mother should attend antenatal care services at least for four times (WHO, 2016). These antenatal centers provide essential services to mothers meant to empower them in taking appropriate decisions in terms of child care. Findings of this study indicate that children whose mothers attended antenatal centers were found to be significantly associated with episodes of fever. The study further showed that children whose mothers attended antenatal care centers 1-3 times were less likely to have episodes of fever.

Based on the findings, it can be said that insufficient antenatal attendance by mothers may be linked to high prevalence of fever among children. This indicates that children whose mothers do no attend antenatal care centers are prone to experiencing fever. During antenatal visits, infants and young children are inoculated to introduce anti-bodies into their systems to facilitate in counteracting virus and bacterial infections that mostly cause high body temperature. Educating mothers on how to feed their children to ensure resilient immune system would perhaps reduce or prevent high cases of childhood fever.

Chapter Summary

The chapter focused on breastfeeding practices and risks of fever among children (0-23 months) in Ghana. A nationally representative sample of children aged 0-23 months was used and the prevalence of childhood fever was 12 per cent. A test of heterogeneity showed that breastfeeding practices, age of child, sex of child, maternal education, maternal occupation, and residence were significantly associated with fever. Further, a multi-level analysis was conducted to ascertain the combined effect of breastfeeding practices and selected explanatory variables. Statistical significances were found among breastfeeding practices, age of child, sex of child, maternal occupation, and antenatal care visits.

CHAPTER NINE

SPATIAL ANALYSES OF BREASTFEEDING PRACTICES AND CHILDHOOD MORBIDITY

Introduction

This chapter examines the spatio-temporal variations in breastfeeding practices and childhood morbidity in the country. Specific issues presented in this chapter dwell on breastfeeding practices, and childhood morbidity in relation to spatial autocorrelation (Global Moran's *I*), spatial cluster analysis (Local Moran's *I*) and hot spot analysis. Clustering and hot spots of breastfeeding practices and childhood morbidity were ascertained based on the 216 districts in the country (Appendix I). Geospatial data used for analysis were extracted from GDHS 2014.

Spatial Autocorrelation of Breastfeeding Practices and Childhood Morbidity

The results indicate a positive spatial autocorrelation for breastfeeding practices in the country. It was found that no breastfeeding (Moran's I = 0.099; p = 0.000), exclusive breastfeeding (Moran's I = 0.121; p = 0.000), and predominant breastfeeding (Moran's I = 0.114; p = 0.000) had clustering of similar values. This means that there is less than one per cent likelihood that these clustered patterns could be the result of random chances (Table 16). On partial breastfeeding, given a Moran's I of 0.047 (p = 0.052), there is less than 10% odds that the clustered pattern could be a result of random chance.

Table 16: Spatial Autocorrelation (Global Moran's *I*) of Breastfeeding Practices

Morbidity	Moran's Index	Expected Index	Variance	z-score	p-value
Not breastfeeding	0.099038	-0.004651	0.000692	3.940287	0.000081
Exclusive	0.121369	-0.004651	0.000734	4.651563	0.000003
Predominant	0.113792	-0.004651	0.000722	4.406906	0.000010
Partial	0.047261	-0.004651	0.000716	1.940521	0.052316

Also, this study revealed positive spatial autocorrelation for childhood morbidity in the country. There were clustering of similar values for diarrhoea (Moran's I = 0.096; p = 0.000), and ARI (Moran's I = 0.073; p = 0.004), suggesting that there is less than one per cent possibility that these clustered patterns could be the result of random chance (Table 17). With anaemia, given a Moran's I of 0.057 (p = 0.024), there is less than five per cent likelihood that this clustered pattern could be the result of random chance. On fever, given the Moran's I of 0.028 (p = 0.224), the pattern does not appear to be significantly different than random.

Table 17: Spatial Autocorrelation (Global Moran's *I*) of Childhood Morbidity

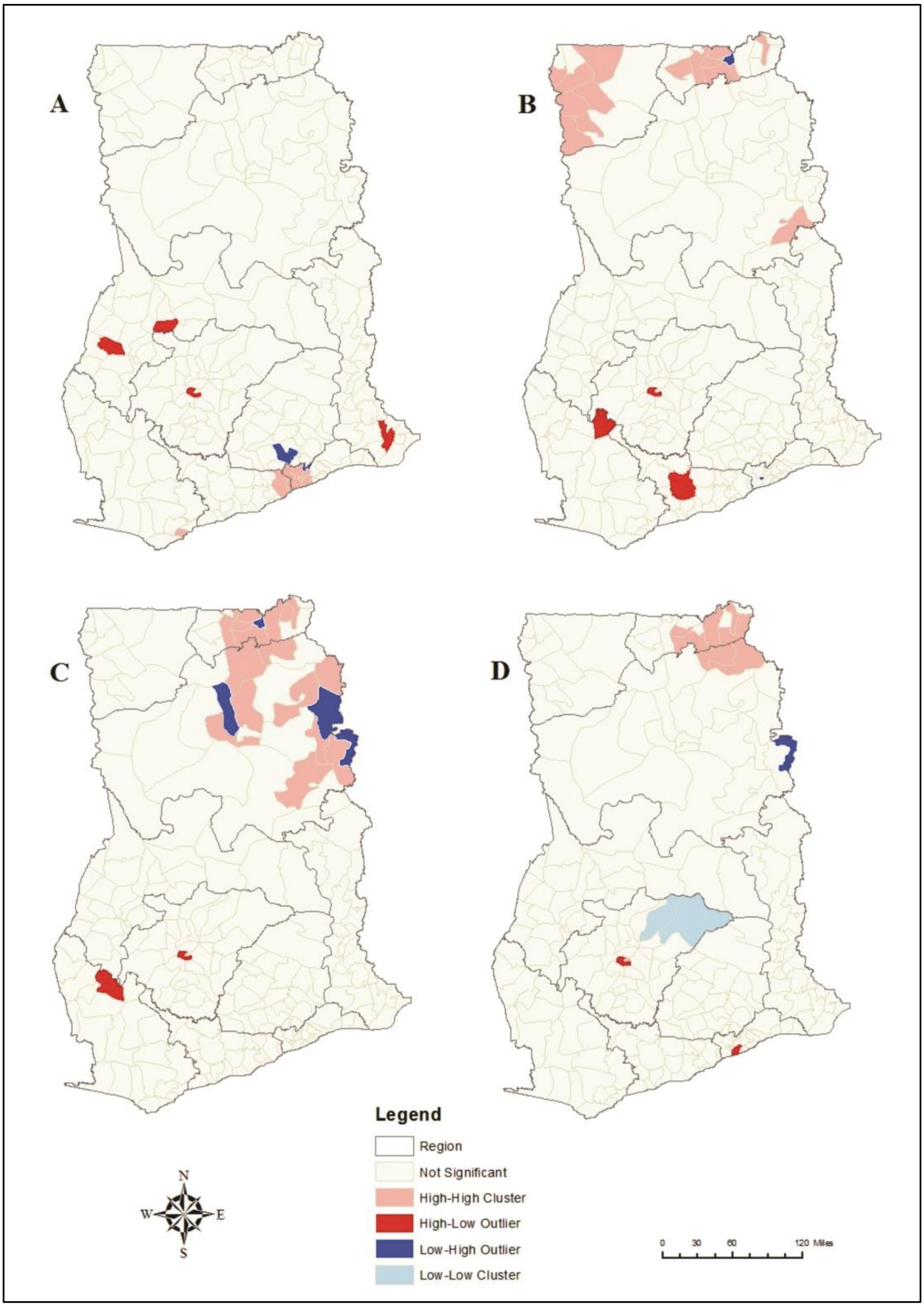
Morbidity	Moran's Index	Expected Index	Variance	z-score	p-value
Diarrhoea	0.096479	-0.004651	0.000728	3.748256	0.000178
ARI	0.072805	-0.004651	0.000726	2.874740	0.004044
Anaemia	0.056534	-0.004651	0.000737	2.253649	0.024218
Fever	0.028028	-0.004651	0.000724	1.214795	0.224444

Spatial Cluster Analysis of Breastfeeding Practices

Spatial clusters of breastfeeding practices (no breastfeeding, exclusive, predominant, partial) were identified in the country. In each region, districts were used as the main elements for the identifications. Clusters were labeled as: not significant; high-high cluster; high-low outlier; low-high outlier; and low-low cluster. Each map (A to D) in Figure 8 represents a type of breastfeeding practice, showing names of identified clustered districts.

Figure 8, Map A, shows nine districts (see Appendix J) with high levels of no breastfeeding practice. Seven of these districts were in Greater Accra Region. Also, four districts (two in Brong Ahafo, and one each in Ashanti and Volta) showed comparatively high levels of no breastfeeding practice. Also, 14 districts (see Appendix K) showed high levels of exclusive breastfeeding practice in Map B; seven in Upper West and six in Upper East regions. Three districts (each found in Ashanti, Western, and Central) showed comparatively high levels of exclusive breastfeeding practice.

Clustering of predominant breastfeeding revealed that 17 districts (see Appendix L) had high levels of predominant breastfeeding practice. Out of these districts, nine were in Northern, and eight in Upper East regions. Two districts (one each in Ashanti and Western) showed comparatively high levels of predominant breastfeeding practice. With partial breastfeeding, eight districts (see Appendix M) showed high levels in Map D; and five of them were in Upper East Region. Two districts (one in Ashanti and the other in Greater Accra) showed comparatively high levels of breastfeeding practices.



***A:** Not breastfeeding; **B:** Exclusive breastfeeding; **C:** Predominant breastfeeding;*
***D:** Partial breastfeeding*

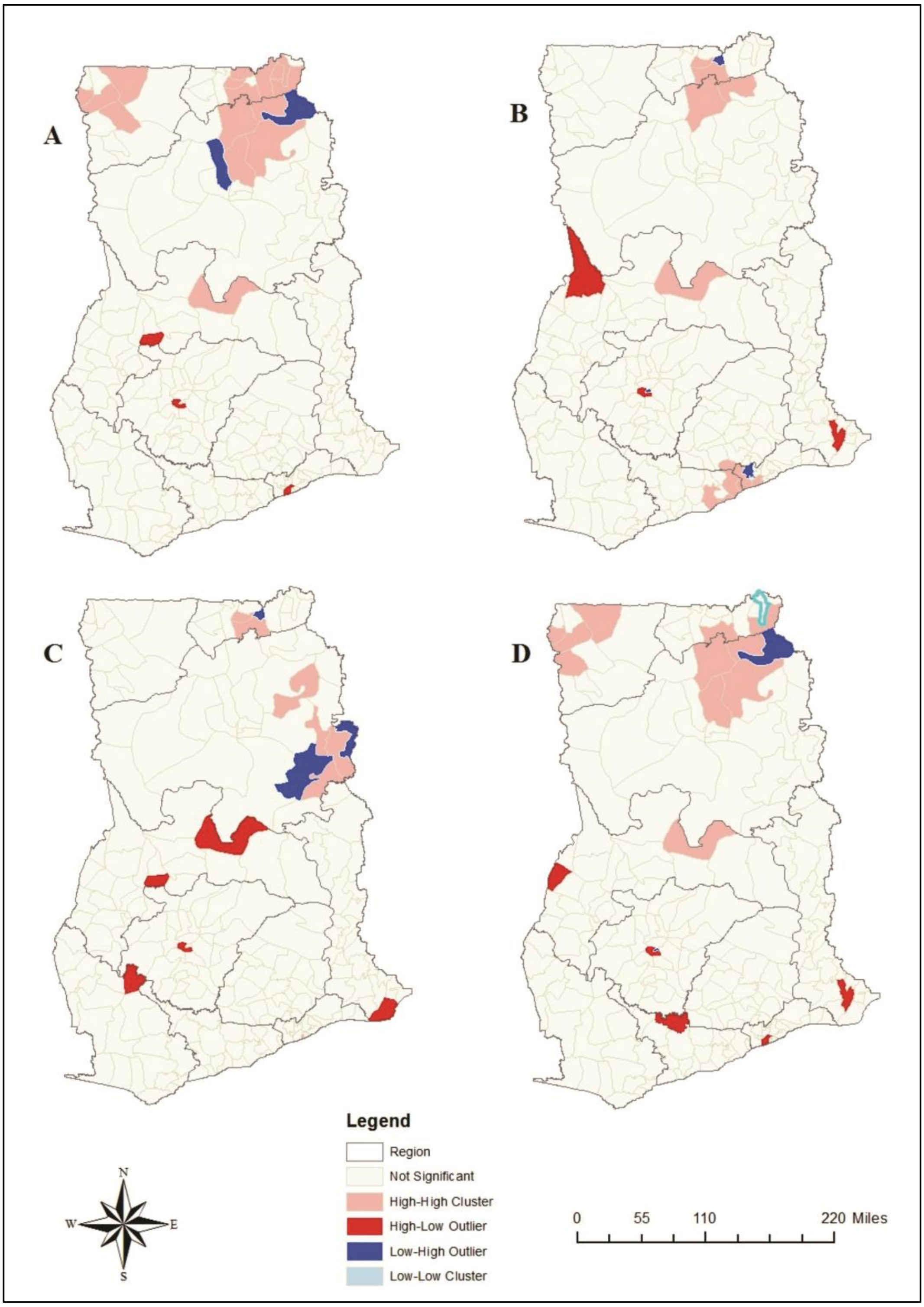
Figure 8: Spatial Cluster Analysis (Local Moran *I*) of Breastfeeding Practices

Spatial Cluster Analysis of Childhood Morbidity

Childhood morbidity (diarrhoea, ARI, anaemia, and fever) clusters were identified in the country. The clustering of districts was also classified as: not significant; high-high cluster; high-low outlier; low-high outlier; and low-low cluster. Figure 9 displays results on spatial cluster analysis of childhood morbidity (Maps A to D); and each map has a corresponding appendix to show names of districts.

In Figure 9, 16 districts (see Appendix N) in Map A were found to have highly clustered levels of diarrhoea cases. Half of the highly clustered districts were found in Upper East Region. The rest of the highly clustered districts were found in Upper West (3), Northern (4), and Brong Ahafo (1) regions. Also, three districts showed comparatively high levels of episodes of diarrhoea. Map B displays 14 districts (see Appendix O) identified with high clustered cases of ARI. Five of them in Central, four in Upper East, two in Greater Accra and one in Eastern. Three districts (one each in Brong Ahafo, Ashanti, and Volta) showed comparatively higher cases of ARI.

With anaemia, in Map C, it was found that seven districts showed high cases of anaemia (see Appendix P). Four of the districts were in Northern, two in Upper East, and one in Greater Accra regions. Five districts (two in Brong Ahafo, and one each in Ashanti, Western and Volta) showed comparatively high levels of anaemia. Also, in Map D, 11 districts (see Appendix Q) displayed high cases of fever; four districts each were found in Northern; and Upper West; two in Upper East; and one in Brong Ahafo. Five districts showed relatively high cases of fever.



A: *Diarrhoea;* ***B:*** *Acute Respiratory Infection;* ***C:*** *Anaemia;* ***D:*** *Fever*

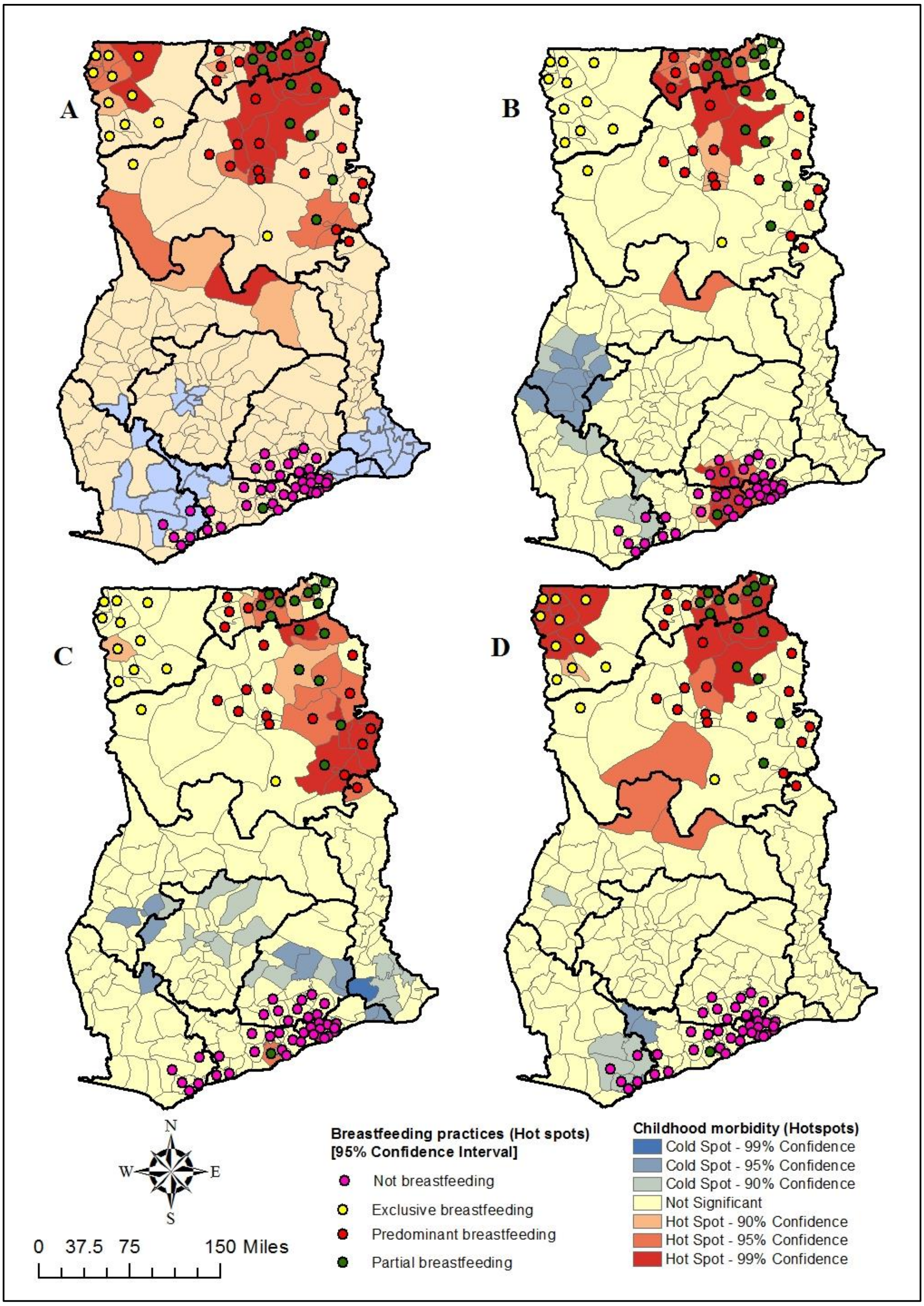
Figure 9: Spatial Cluster Analysis (Local Moran *I*) of Childhood Morbidity

Hot Spots of Breastfeeding Practices and Childhood Morbidity

Prior to the data analysis, significant hot spots of breastfeeding practices were examined using 95% confidence intervals (CI). Colours that were used to indicate hot spots were: pink for not breastfeeding; yellow for exclusive breastfeeding; red for predominant breastfeeding; and green for partial breastfeeding. Also, hot spots of childhood morbidity were assessed with confidence intervals of: 99%; 95%; and 90%.

In Figure 10, on Map A, it was found that 19 districts (99% CI), eight districts (95% CI), and one district (90% CI) (see Appendix R) were significant hot spots of diarrhoea. In Map B, it was found that 19 districts (99% CI), eight districts (95% CI), and one districts (90% CI) were found to be significant ARI hot spots (see Appendix S). Map C shows that eight districts (99% CI), nine districts (95% CI), and one districts (90% CI) were hot spots for high prevalence of childhood anaemia (see Appendix T). Map D revealed that seventeen districts (99% CI), four districts (95% CI), and two districts (90% CI) were significant hot spots linked with high episodes of fever (see Appendix U).

Overlaying prevalence of breastfeeding practices on each map (A-D) for childhood morbidity, 31 districts (95% CI) were found to be significant hot spots where children were not breastfeeding (see Appendix V). Also, with exclusive breastfeeding (Map B), 28 districts (95% CI) (see Appendix W), were found to be significant hot spots. It was further found that 31 districts (95% CI) in Map C were significant hot spots for predominant breastfeeding (see Appendix X). Map D indicates that 13 districts (95% CI) were significant hot spots where children were partially breastfeeding (see Appendix Y).



***A:** Diarrhoea; **B:** Acute Respiratory Infection; **C:** Anaemia; **D:** Fever*

Figure 10: Hot Spots of Breastfeeding Practices and Childhood Morbidity

Discussion

The chapter examined spatial variations of breastfeeding practices and childhood morbidity in the country. This was done using various clusters in which prevalence data on the study phenomena were collected during the GDHS 2014. Geostatistical procedures specifically consisting of spatial autocorrelation analysis (Global Moran's *I*), cluster analysis (Local Moran's *I*) and hot spot analysis (Getis-Ord Gi*) were applied. The latter was then used to generate composite maps to ascertain hot spots of breastfeeding practices (no breastfeeding, exclusive, predominant, partial) and child morbidity (diarrhoea, ARI, anaemia, fever) among the districts in the country.

The study found positive spatial autocorrelation for breastfeeding practices in the country. It further found significant clustered prevalence of not breastfeeding largely among districts in Greater Accra and Western Region. Thirty-four districts were found to be hot spots where children were not breastfeeding. Most of these hot spot districts were located in Greater Accra and Central with Accra Metro having the highest record. Occupational factors may largely be contributing to most mothers not breastfeeding in the metropolis; or these children probably were weaned off breastfeeding early.

Generally, breastfeeding in urban areas are low compared to rural areas. It is plausible that most mothers do not frequently breastfeed their children due to their busy formal schedules characteristic of people in places like Accra, the capital city. Besides, most mothers in these urban settings are financially sound to afford baby formulae to feed their babies. And this practice certainly translates to less or no breastfeeding. Again, entrusting babies, aged at least three months, into care-givers homes or crèches may account for mothers not breastfeeding in urban areas like Accra. These and other distal factors, not mentioned, might have contributed to clustering of high prevalence values in Accra Metropolis; making it a hot spot of no breastfeeding.

Similarly, significant clustered patterns of exclusive breastfeeding were found in districts within Upper West, Upper East and Northern regions. These were positive and spatially autocorrelated. Specifically, 31 districts, located in Upper West, Upper East and Northern were identified as hot spots for exclusive breastfeeding. Highest rated hot spot districts for practice of exclusive breastfeeding were Daffiama-Bussie-Issa, Wa Municipality, Wa West, and Bolgatanga. Most areas in these districts are rural. From the literature, mothers in rural areas tend to frequently practice exclusive breastfeeding despite presumed myths and beliefs on breastfeeding. In a study by Ayawine and Ae-Ngibise, (2015), it was documented that cultural practices do not, in all times; deter mothers from practicing exclusive breastfeeding.

Another factor that probably determines the knowledge of mothers on benefits of exclusive breastfeeding is education. In a study conducted by Boakye-Yiadom, Yidana, Sam, Kolog and Abotsi (2016), high knowledge on exclusive breastfeeding among rural mothers was found. They also found exclusive breastfeeding a common practice among them. In relation to how the GDHS 2014 data were collected, exclusive breastfeeding in these areas is expectantly high since most mothers might have breastfed their children within the specified (24 hours recall) period preceding the survey. The aforementioned reasons, therefore, might have led to high prevalence of exclusive breastfeeding in identified hot spot districts especially in the Upper West Region.

In addition, there was a positive spatial autocorrelation for practice of predominant breastfeeding in the country with much of the clustering of prevalence occurring in the northern sector. Thirty-three districts were identified as hot spots. These districts were located in the north-eastern quadrant of the country; concentrating largely at Upper East and partly Northern. However, Gushiegu District in the Northern Region had the highest prevalence of predominant breastfeeding. High prevalence of predominant breastfeeding in these areas indicates that mothers feed their children with breast milk and additionally add other liquid foods. As documented in a related literature, even though breastfeeding is high in these parts of the country, mothers tend to introduce liquids and semi-solid foods early to children (less than six months) (Abang, 2013). The hot spot districts identified show that although mothers highly practice breastfeeding they nonetheless fed their children frequently with other liquids and semi-solid foods on daily basis.

Also, there was positive spatial autocorrelation for prevalence of partial breastfeeding. The clustering occurred mostly in the north-eastern part of the country. Further analysis showed that 17 districts, mostly in Upper East, were found to be hot spots for the practice of partial breastfeeding. Bawku West recorded the highest rate of partial breastfeeding. With partial breastfeeding, children breastfeed and also eat other solid foods. Hence, deductions could be made that mothers in this district commonly gave their children solid foods aside breast milk. Probably, mothers who practiced partial breastfeeding in this district generally had children aged 6-23 months. These older children may be commonly consumed solid foods and at the same time might be breastfed on demand.

Similarly, the study found positive autocorrelation of childhood morbidity prevalence in the country. Prevalence of diarrhoea, ARI, and anaemia significantly clustered except for fever that had prevalence patterns not significantly different than random.

Seventeen districts showed highly clustered prevalence of diarrhoea. Most of the hot spot districts for the prevalence of diarrhoea were concentrated in Upper West, Upper East and Northern regions. A few were located in Brong Ahafo. Upper East had the highest proportion of diarrhoea hot spot districts. However, Savelugu-Nanton District in Northern Region was the hottest spot of the occurrence of diarrhoea.

In the Multiple Indicator Cluster Survey (GSS, 2011), Northern Region recorded the highest prevalence of childhood diarrhoea. Records of high prevalence of diarrhoea in this part of the country could be attributed to environmental factors such as insufficient access to potable water and poor sanitation. These factors expose children to morbidities; and diarrhoea is the commonest. A study conducted by Cheng, Kelly, Renwick and Yang (2013) documented that 50 per cent of the population in Northern Region have access to improved drinking water. And in Savelugu-Nanton, less than 50% of its inhabitants had access to improved drinking water. Again open defecation is wide spread among districts in the region despite the implementation of interventions such as Community-Led Total Sanitation (UNICEF, 2015). Also, another contributory factor may be high consumption of foods containing diarrhoea-causing pathogens by children in the region especially in Savelugu-Nanton.

Additionally, hot spots for ARI were commonly clustered in Upper East and Greater Accra. Also, some districts in Eastern, Central and Brong Ahafo were identified as hot spots for episodes of ARI. The top rated hot spot for childhood ARI was Accra Metro. In densely populated urban areas like Accra, overcrowding in slums can cause ARI among children. Aside that, mothers in these urban-poor locations mostly resort to usage of charcoal or fuel wood that emit agents of ARI. Likewise, children in urban areas are sometimes exposed to pollutants such as carbon monoxide, nitrogen oxide and sulfur dioxide emitted by cars stacked in traffic. As mothers move with their children, they inhale these pollutants over time and this may result in ARI.

Hot spot districts identified for prevalence of anaemia were located along the north eastern corridor of the country. These districts were situated in Upper East and Northern regions. However, highly significant hot spot districts for anaemia were found in Northern with Zabzugu having the highest prevalence of anaemia. This finding is similar to that of Ewusie et al. (2014) who revealed that Upper East Region had the highest prevalence rate of anaemia.

During the GDHS 2014, blood samples were taken from children to test for aneamia and a number of children who were anaemic had low haemoglobin levels less than 11 gram per deciliter (g/dl) (GSS, GHS, ICF Macro, 2015). This is caused by the kinds of foods children consume that predispose them to reduced red blood cells and consequently decreased levels of haemoglobin. This, therefore, suggests that most children in Zabzugu may be consuming poor diets. Thus, diets that do not contain essential quantities of iron and micronutrients required to boost haemoglobin levels. Aside the aforementioned reasons, there are food insecurity issues in the region and this may compound dietary deficiencies of children, hence, resulting in high malnutrition and wasting among children (Glover-Amengor, Agbemafle, Hagan, Mboom, Gamor, Larbi, et al., 2016).

There were also districts identified as hot spots of fever in Upper West, Upper East, and Northern regions. Among these regions, districts in Upper West were commonly hot spots for the occurrence of childhood fever. Lawra and Jirapa districts in Upper West, including East Mamprusi district in Northern, recorded the highest prevalence of fever in the country. The high rate of fever in these locations can be as a result of high prevalence malaria; since fever is a symptom of malaria that is common among children in these areas. Other childhood infections caused by viruses and bacteria among children could also contribute to high prevalence of fever in these districts (D'Acremont et al., 2014).

Chapter Summary

This chapter examined hot spots of breastfeeding practices and childhood morbidity. Geostatistical tools including spatial autocorrelation, cluster analysis and hot spot analysis were applied to assess the requisite data. Hot spot districts identified for breastfeeding practices were Accra Metro (no breastfeeding), Daffiama-Bussie-Issa, Wa Municipal, Wa West, and Bolgatanga (exclusive breastfeeding), Gushiegu (predominant breastfeeding), and Bawku West (partial breastfeeding). Districts noted as hot spots for childhood morbidity were Savelugu-Nanton (diarrhoea), Accra Metro (ARI), Zabzugu (anaemia), and Lawra, Jirapa, East Mamprusi (fever).

CHAPTER TEN

VIEWS OF MOTHERS ON BREASTFEEDING PRACTICES AND CHILDHOOD MORBIDITY MANAGEMENT

Introduction

This chapter presents views of mothers on breastfeeding practices and childhood morbidity management in purposively selected localities within the country. It starts with results on background characteristics of participants interviewed in Upper West, and Western regions. Mothers were interviewed on knowledge of breastfeeding practices; their understanding of breastfeeding practices; challenges of breastfeeding practices; morbidities among children; views on morbidities noticed among children; and how they managed morbidities noticed in their children (0-23 months).

Background Characteristics of Participants

Twenty mothers were interviewed. The results from the qualitative study indicated that 14 mothers were within the age group of 21-30 years (Table 18). Nine of them had attained primary education. Eighteen mothers were married. Seven mothers were into trading (selling of food stuff, and provisions). An equal number (9) of the children were within the age brackets of 6-11 months and 12-23 months, and female children were 12. Ten mothers each were from the two selected regions (Western and Upper West), and they were split equally between urban and rural residences.

Table 18: Background Characteristics of Participants

Variable	Frequency
Maternal age *[mean = 26.85; SD = 5.274]*	
≤ 20	3
21-30	14
31-40	3
Maternal education	
No education	3
Primary	9
Junior High School	4
Senior High School	2
Higher	2
Maternal marital status	
Never married	1
Married	18
Ever married	1
Occupation	
Unemployed	6
Trader	7
Seamtress	2
Teacher	1
Hair stylist	2
Pito brewer	1
Weaver	1
Age of child *(months) [mean = 10.40; SD = 3.872]*	
0-5	2
6-11	9
12-23	9
Sex of child	
Male	8
Female	12
Region	
Western	10
Upper West	10
Residence	
Urban	10
Rural	10

N = 20

Knowledge on Exclusive Breastfeeding and Complementary Feeding

Mothers in both regions demonstrated sufficient knowledge on the concept of exclusive breastfeeding in terms of its importance and the expected duration of the act. Also, with complementary feeding, adequate knowledge was exhibited in terms of when and how to initiate it. Mothers commonly knew that exclusive breastfeeding is about giving children only breast milk. The following are some excerpts from mothers:

> *"It is about feeding your child with breast milk alone without any food or water".* (Mother 4, Rural, Western)
>
> *"Within this period, the child is not supposed to eat or drink anything apart from the breast milk. You are not supposed to even give the child any refined milk".* (Mother 3, Urban, Upper West)

Mothers in Upper West Region, however, seemed to have better knowledge on the importance of the practice. It was known to mothers that exclusive breastfeeding makes children healthy and strong. Dialogues with mothers further indicated that they knew that exclusive breastfeeding protected children from sicknesses. It suggests that mothers know that breast milk fortifies immune systems of children. A participant narrated:

> *"If you give the child only breast milk, it can protect the child from diarrhea and still make the child strong and healthy. The child would not fall sick so often".* (Mother 5, Rural, Upper West)

Again, some mothers knew that exclusive breastfeeding prevented early postpartum conception. Although the mothers did not know the exact biological mechanisms through which this occurred, they were conscious of its potential to delay ovulation, thereby preventing closely spaced child bearing.

A mother's response on effect of exclusive breastfeeding drives home the point clearly thus:

> *"It* [exclusive breastfeeding] *is a kind of family planning to the mother as well"*. (Mother 1, Urban, Upper West)

Findings also revealed that mothers appreciated the positive effect that exclusive breastfeeding has on children's mental development; as children were observed to be smart, and agile. It was therefore deduced from their views that exclusive breastfeeding may possibly improve cognitive capabilities of children. A mother illustrated:

> *"The nurses told us that when you do that* [exclusive breastfeeding], *it gives the child knowledge and wisdom and also improves the child's performance in school"*. (Mother 2, Rural, Upper West)

Interviews with mothers showed that, most of them were aware of the recommended six months of exclusive breastfeeding. They also indicated that exclusive breastfeeding should be a regular practice. Below is a mother's response that sums mothers' level of awareness of the duration for exclusive breastfeeding:

> *"What I heard about it is that if you give birth and your child is not up to six months. And also the child has to breastfeed every day at any time"*. (Mother 2, Urban, Western)

The interviews further showed that mothers from both regions seemingly had appreciable knowledge of complementary feeding in relation to when to start, and the kinds of food to give to children. They knew that complementary feeding is part of the continuum of being exclusively breastfed after the sixth month. There was also a general awareness among mothers that during complementary feeding they are still expected to continue breastfeeding. As said by mothers, complementary feeding is:

> *"Feeding your child with other foods and liquids while still breastfeeding"*. (Mother 4, Rural, Western)
>
> *"If the child gets to the required months six, you can start with other foods"*. (Mother 5, Rural, Upper West)

Also, it was clear that apart from knowing when to start complementary feeding, mothers knew which kind of foods to introduce to their children. It was evident from the interviews that mothers preferably gave children soft foods for easy swallowing. Mothers said:

> *"Hmmm, that one too they said when the child is six months you can add other foods that the mother eats apart from 'ampesi' that is too hard, for the rest like rice you can mash them"*. (Mother 2, Urban, Western)
>
> *"You can start with porridge and 'tuo-zafi' that is very light and you prepare the soup without or with little pepper for her. The soup can be groundnut soup or vegetable leaves like beans leaves or pumpkin leaves"*. (Mother 5, Rural, Upper West)

Interviews with some mothers also suggested that they are to avoid giving cold foods to children. And in addition to foods given to children, it became evident that fruits and protein foods are good for children during complementary feeding periods. Mothers, especially those in Western Region, recommended giving fruits to children. A mother indicated:

> *"You shouldn't give your child cold foods. The food should be always be warm and you should be changing the food for the child and add fruits too as well as meat".* (Mother 5, Urban, Western)

Sources of Knowledge

The common source of knowledge as mentioned by mothers was information from health personnel. Some mothers did mention that nurses and midwives educated them on breastfeeding practices at clinics or antenatal centers. This was evident in dialogues with mothers in both regions. Mothers who heard about breastfeeding practices from health personnel said:

> *"We heard this the time we used to go for antennal care from the nurses. Also during weighing, the nurse keeps on telling us".* (Mother 2, Rural, Upper West)

> *"We heard about exclusive breastfeeding at child welfare clinic".* (Mother 4, Rural, Western)

> *"I heard this from our clinic when I went there to deliver. Also during antenatal care, they used to tell us these things. After birth, the nurses told us to come back for postnatal care in the third day. During the postnatal care, they taught me how I should breastfeed the child. They taught me how to hold the baby for her to breastfeed".* (Mother 5, Rural, Upper West)

Other sources included information from both the print, and broadcast media. Likewise, mothers got to know issues on exclusive breastfeeding and complementary feeding through television programmes, radio broadcast and some personally read about the breastfeeding practices:

"I hear breastfeeding practices issues from TV". (Mother 4, Urban, Western)

"I read about breastfeeding practices from books". (Mother 3, Urban, Upper West)

"I heard about it from the radio as well". (Mother 2, Rural, Western)

Challenges of Exclusive Breastfeeding

The analysis showed that mothers encounter a number of challenges at home and at workplace in practicing exclusive breastfeeding. Aside these, the society and their health-related issues at certain times appear to pose some challenges to mothers in their bid to practice exclusive breastfeeding.

Household Chores

It emerged from the data that cooking and fetching water were household chores that mostly interfered with the practice of exclusive breastfeeding. With mothers in Upper West Region, periods of cooking foods for their families were regularly mentioned. As indicated by these mothers they cooked their staple food [*tuo-zafi*] on daily basis and this sometimes posed challenges to exclusive breastfeeding in the home. Also, fetching water was mentioned as a stressful activity since some of them have to walk to public service points to get water using gallons or head pans. Some of these sources of water, the mothers mentioned, are located at distant locations, and at times unsuitable to send their children along. Even when the need arises for them to carry their children along, they are mostly unable to breastfeed when the children need to be fed. Mothers in Wa shared the views that:

> *"If you are cooking, especially tuo-zafi and the child is crying, you may find it very difficult to stop and breastfeed her. You would have to still leave her with someone until you finish".* (Mother 3, Urban, Upper West)
>
> *"Fetching of water poses some challenges. You can't carry water while the baby is breastfeeding. Most at times, you have to back the child until you pour the water. Sometimes too, you would have to leave the child at home and go to the borehole to fetch water".* (Mother 5, Urban, Upper West)

Formal and Informal Work Schedules

Mothers in the formal sector narrated more challenges in relation to the practice of exclusive breastfeeding. Interviews with mothers revealed that handling children and carrying out official duties was not conducive since they cannot carry the child along when performing official errands. This sometimes affects how they exclusively breastfeed their children. Some mothers stated emphatically that they do not have enough time at the work place. This leaves them no option than to feed their children with other foods since the periods they may breastfeed them would not be enough while at work. Again, others had tight schedules set for them at their work places which sometimes delay breastfeeding their children till they (mothers) got home. Mothers narrated:

> *"May be at work they asked you to go somewhere to do something, you may be forced to leave the child with the baby-sitter and go. You would not like to send the child wherever you*

are going. The time the child is supposed to breastfeed, on your return, that time would be past posing challenge to the child". (Mother 1, Urban, Upper West)

"Because I don't have time in the work that I do so if I don't give him food early and it's only the breast milk that he is going to rely on, he will be hungry. As for breastfeeding, I breastfeed him but I have to add other foods too". (Mother 4, Urban, Western)

"Assuming you created a portion in the farm and you must finish it before sunset so that tomorrow you continue at other place, and the baby is also crying. The only option would be to back the baby and continue working until you finish that portion. In the house, he can then suck". (Mother 2, Rural, Upper West)

Family Influences

Close associates such as grandmothers, co-tenants, and other relatives were found to be people who sometimes challenge mothers on the practice of exclusive breastfeeding. These individuals were widely mentioned in interviews with mothers in Upper West Region. Among them, grandmothers were commonly mentioned as posing challenges to mothers' decisions on exclusive breastfeeding. Their persistent suggestions and demands for water and foods be given to children who are supposed to be exclusively breastfed were noted in the data. Some grandmothers intentionally give substances such as water to children when bathing them. Others, such as aunties and cousins were noted for giving foods to children (less than six months) without the notice of the children's mothers. The following are reports on some typical influencing behaviours on the exclusive breastfeeding practice:

> *"When she* [mother-in-law or grandmother] *was bathing the baby, she used to fetch some of the bucket water into her* [child] *mouth. I told her* [mother-in-law or grandmother] *not to be doing that. She told me that, the nurses are doing that and killing people's children. She said that, some children come to earth because of food and must be given the food".* (Mother 2, Urban, Upper West)
>
> *"One day, I was cooking and gave the child to one of my aunties but she sent the child outside and gave her* [child] *'Pito'* [locally brewed alcoholic beverage]. *I smelt the 'Pito' from her* [child] *mouth but my aunty denied giving her* [child] *such drink. Later, the alcohol was then working in her system and she cried heavily until my aunty then confessed that she actually gave her the drink".* (Mother 5, Rural, Upper West)

Low Breast Milk Production

The data revealed that insufficient breast milk was a major challenge that limits efforts of mothers towards attaining optimum exclusive breastfeeding especially among mothers in Western Region. Mothers who were unable to meet their children's demands for breast milk found themselves in a state of despair. Some of these mothers had no other choice than to give their children other foods to supplement the insufficient breast milk. Mothers interviewed described it as:

"Before she was one month, she used to cry a lot and most times that I was not okay with it and when she breastfeeds too, it wasn't enough for her so it became a problem". (Mother 5, Rural, Western)

"The child really likes crying and it was worrying me so I thought hunger could be a factor so I said let me try giving him food and see because even when he has finished breastfeeding, he would still be crying so that's why I started giving him food. And I realized afterwards that it was indeed because of hunger that he was crying so I gave him food". (Mother 6, Urban, Western)

Swollen Breasts and Sore Nipples

Some mothers who were responding to treatment for swollen breasts recounted how difficult it was to exclusively breastfeed their children due to swollen breasts. Other mothers with sore nipples narrated how serious it could be to practice exclusive breastfeeding. A mother in Inchaban Nkwanta and another in Siriyiri cried out:

"Because I had a problem in one of my breasts [swollen] *... it was difficult".* (Mother 3, Rural, Western)

"Assuming you have boil or sore nipples it becomes a serious challenge in exclusive breastfeeding". (Mother 1, Urban, Upper West).

Complementary Feeding Practices

In Upper West Region, most mothers introduced complementary foods such as: porridge made from millet or corn dough; and *tuo-zafi* with vegetable leaves soup, dry okro soup, and cassava leaves soup, groundnut soup, or pumpkin leaves soup. While in Western Region, complementary foods predominantly given to children were tom brown, weanimix, mashed *kenkey*, *banku*, *fufu*, *mpotompoto*, and fruit juice. Most mothers used local foods to feed their children. Comparatively, more children in Western Region were given complementary foods early than those in Upper West Region. Participants recounted:

> *"Oh the moment he was six months old I started trying him with every food and he eats them".* (Mother 3, Urban, Western)
>
> *"I marsh the rice like 'tuo' and prepare 'nkontemire' stew with fish powder and give to him. I also use some of the fish powder for light soup and give to him as well".* (Mother 5, Urban, Western)
>
> *"I use corn dough* [for porridge] *and sugar. With 'tuo-zafi', I use vegetable leaves to prepare the soup. I also add dry fish and dawadawa to the soup".* (Mother 1, Rural, Upper West)
>
> *"I usually grind the maize and soak the flour to form dough. Sometimes the dough becomes a bit sour. You let them grind the flour so smooth and when about to prepare, you can still sieve the maize particles so that the porridge becomes so smooth for the child to eat".* (Mother 3, Rural, Upper West).

Access to Complementary Food Items

The acquisition of food items by mothers to prepare required complementary foods for their children was a challenge for most mothers in Upper West Region. The unavailability of food items to feed children, insufficient funds to buy requisite foods, and unavailability of needed foods were issues mothers had to deal with in their quest to acquire complementary food items. The following quotations illustrate what mothers said on challenges they encounter in trying to acquire complementary foods:

> *"It was not easy. Somebody* [child] *who was only breastfeeding and later started eating porridge and other foods, it was not easy finding the food to sustain all of us, as we the parents were not working. Everything we the parents eat, he would also eat the same. In fact it was not easy".* (Mother 2, Urban, Upper West)

> *"The flour used to be available but the soup ingredients used not to be available due to lack of money".* (Mother 5, Rural, Upper West)

> *"At times getting the food items to purchase is a problem. You may not have the money to purchase them and sometimes too you may have the money but getting them to buy also poses a challenge. Getting quality ones to buy is not always easy".* (Mother 3, Urban, Upper West)

Preparing and Giving Complementary Foods to Children

Interviews with mothers, particularly the working ones, further suggested that preparing complementary foods and feeding children appropriately was a key obstacle. According to mothers, time to prepare food for children, particularly during working hours was a key obstacle. Also, mothers expressed concerns about the lack of means to keep the foods they have prepared warm. Some narratives of mothers are shared in the extracts below:

> *"Preparing the food is the problem. If there is no time to feed her at work and also when you send the food to the work place and it cools, you cannot feed the child as required. As you don't have heater or microwaves or coal pot at work place, it becomes a serious headache"*. (Mother 1, Urban, Upper West)
>
> *"The way the mother of the child would feed the child, the baby nurse or any other person cannot feed the child like that. The other people would not have that time to feed the child. So it is good you the mother always find that precious time to feed the child"*. (Mother 2, Urban, Upper West)

Morbidities Noticed in Children

The data gathered from mothers indicated that children do have some morbidity during the periods of breastfeeding practices. Morbidities noticed in children included diarrhoea, fever, and ARI. Diarrhoea was the morbidity most reported by mothers. Some children were noticed to have experienced multiple morbidities (some concomitantly). The following excerpt exemplify what the mothers said:

> *"He* [child] *had running nose, sometimes too his body becomes hot a bit and he'll be going to toilet small, small. And sometimes too he coughs a bit"*. (Mother 3, Rural, Western)

Views of Mothers on Morbidities among Children

Mothers expressed their views on the occurrence of morbidities they observed in their children. Views were expressed in relation to weather conditions, mosquito bites, frequent bathing, and primary teeth development. The occurrence of fever was ascribed to malaria ('mosquito bites'), and this was the most mentioned cause by mothers. Some mothers even attributed fever to frequent bathing of children. Also, diarrhoea was generally said to be as a result of primary teeth (baby teeth) development in most children. Further exploration of the views from mothers suggested that sucking of warm breast milk by children causes diarrhoea. The following views were expressed:

> *"Sometimes it's the current weather that is cold which can cause children to cough".* (Mother 2, Urban, Western).
>
> *"With the fever, I think it is due to malaria".* (Mother 1, Rural, Upper West)
>
> *"Regular bathing caused the fever".* (Mother 5, Urban, Upper West)
>
> *"It* [diarrhoea] *was due to the teeth development. If the teeth are developing her body becomes so warm and she runs diarrhea as well".* (Mother 4, Rural, Upper West)
>
> *"The diarrhoea might be caused when the breast milk is warm or hot".* (Mother 1, Rural, Western).

On whether complementary foods could account for morbidities noticed in children, giving cold foods to children was frequently mentioned. Interviewees also indicated that the intake of cold foods by children could even cause malaria. On the contrary, few mothers were adamant as to whether complementary foods can account for childhood morbidity. The occurrence of childhood morbidity was also assumed not to be a function of complementary feeding. Some views of mothers are as follows:

"For instance, if you give him cold food he will get diarrhoea". (5th urban mother, Western)

"If you don't give the child good food, she can be affected by the diarrhea". (Mother 1, Urban, Upper West)

"Oh! I don't think it's the foods I give him that accounted for the diseases". (Mother 2, Urban, Western)

"It's not from the feeding. It's just sickness". (Mother 3, Rural, Upper West)

Management of Morbidities Noticed in Children

Morbidities noticed in children were managed in various ways. Some mothers sent their children to health facilities; some preferred using orthodox medicines, and others used herbal medicine to manage childhood morbidity. Mothers in Western Region generally reported more of childhood morbidity cases to health personnel compared to those in Upper West Region who commonly self-prescribed medicines for their children.

It was revealed that sending children to a health facility was a measure taken by some mothers to manage morbidities noticed in their children. Two main points of call were identified including hospitals (regional or district) and clinics. Also, regular visits were made to hospitals to report morbidities noticed in children were contained in responses given by a segment of mothers. Mothers did so to ensure that their children got the optimum management of the morbidity. Further, a number of mothers indicated that aside going to health facilities, health personnel in some instances prescribed medicines for them to purchase from pharmacy shops or over-the-counter medicine vendors.

"When I went to child welfare clinic they told me to go and buy ORS for child… and it [diarrhoea] *stopped"*. (Mother 4, Urban, Western)

"As for my child I always take him to the hospital … And I followed all the instructions they gave me with the drugs and I gave it to him and he became well". (Mother 3, Rural, Western)

"With the drug store, it was the nurses who wrote the paracetamol syrup for me to buy at the drug store because they were in short supply in the facility". (Mother 5, Rural, Upper West)

Some mothers preferred to use self-prescribed medicines to treat morbidities noticed in their children. Their reasons were that they know such medicines given to their children aid in managing morbidity noticed. Also, the application of both home-based therapies and subsequently introducing orthodox morbidity management strategies were being mentioned by some mothers. Mothers resorted to this practice due to their inability to continue sending their children to health facilities. Hence, old prescription of medicines gotten from health personnel were used as first aid to treat recurring morbidities.

"Oh no, I don't send him to hospital, as for me, I know that if a child has temperature you give him paracetamol syrup so when I give him, he becomes ok". (Mother 4, Urban, Western)

"I usually use warm water (neither hot not cold) to bath him and then buy paracetamol syrup for him". (Mother 2, Rural, Upper West)

"I always mention the drugs and they remove for me because cannot tell what is wrong with the child. Recently he had diarrhea and I went to the chemist shop to buy some drugs for him". (Mother 1, Rural, Upper West)

As part of managing morbidities noticed in children, some mothers opted to use traditional modes. Findings suggest that the usage of leaves, roots, and other concoctions were common among such mothers. The potency of these traditional medicines as preached by others, probably by those who used or sold them, coaxed mothers into using such medicines. A mother narrated:

"I boiled some herbs for her. I don't know the name actually. The herbs were meant for the malaria and the fever. When she had fever, due to malaria, people said it was convulsion so I should buy those herbs for her and I did". (Mother 1, Urban, Upper West)

Discussion

In their responses, mothers demonstrated well enough that they had knowledge on exclusive breastfeeding. As recommended, for a mother to practice exclusive breastfeeding, she should feed her infant with only breast milk without adding any other foods or liquids for the first six months of the infant's life. In this study, mothers knew these issues and even knew when to initiate breastfeeding after delivery. This finding reflects similar qualitative studies conducted in Ghana (Mogre et al., 2016) and Ethiopia (Tadele, Habta, Akmel & Deges, 2016). Also, the mothers knew the benefits of colostrum (first milk that flows a day or two after parturition). These assertions by mothers are supported by related biological studies that explain that colostrum helps an infant to grow healthy, devoid of morbidities and make them smart later in life (Godhia & Patel, 2013).

Complementary feeding is expected to commence after the recommended six months of exclusive breastfeeding. During complementary feeding, a mother is supposed to continue breastfeeding while giving her child some foods. Mothers in this study had adequate knowledge on when to start complementary feeding, the kinds of food to start feeding children with and how to vary the foods they give to their children. These corroborate with other similar studies conducted to assess knowledge of mothers on complementary feeding (Berisha, Ramadani, Hoxha, Gashi, Zhjeqi, Zajmi, et al., 2017; Sanusi, Leshi & Agada, 2016). Further, findings suggest that foods initially given to children by mothers are soft in texture for easy swallowing and this conforms with the guiding principles for introducing complementary foods to infants and young children (WHO, 2017).

Common source of knowledge on breastfeeding practices was from health workers at health facilities. Mothers explained that they are educated by nurses and midwives on how to initiate breastfeeding early and how to position their infants to properly breastfeed. Further discussions with mothers suggested that they are equally counselled on how long to keep breastfeeding, and how to start adding other foods to their children's diet in addition to giving them breast milk. Akinyinka, Olatona and Oluwole (2016) similarly highlighted in their study that knowledge on breastfeeding was high among mothers in Nigeria. And Tadele et al. (2016), in Ethiopia, further ascertained that mothers' main source of information on breastfeeding was health professionals.

The findings revealed disparities between mothers' knowledge of exclusive breastfeeding and its practice. More mothers in Upper West Region practiced exclusive breastfeeding compared to mothers in Western Region. Generally, the high levels of knowledge on exclusive breastfeeding that mothers have sometimes do not translate into equal level of practice (Setegn, Belachew, Gerbaba, Deribe, Deribew, & Biadgilign, 2012). As explained by the Breastfeeding Self-Efficacy Framework (Dennis, 1999), knowledge only is not enough for a mother to practice exclusive breastfeeding. The environment mothers live and their level of confidence do play critical roles in putting their knowledge into practice.

In addition, the practice of complementary feeding was common in both regions as more mothers had enough practical ways of feeding their children. Children commonly consume complementary foods since the practice of optimum breastfeeding is generally low in the country (Abizari, Essah, Agyeiwaa & Amaniampong, 2017). It further revealed that selections of complementary foods given to children were determined by the availability of local foods. In the Ghanaian context, most foods contain large quantities of carbohydrates, fewer proteins and less essential vitamins and micronutrients. Therefore, in situations where mothers are inclined to eating more carbohydrate foods, their children are likely to be eating such composition of foods; as demonstrated by the Social Theory (Bourdieu, 1984).

Moreover, the interviews conducted provided insight to views by breastfeeding mothers in relation to challenges they encounter in their bid to exclusively breastfeed as well as complementarily feed their children. Some mothers identified performing household chores (especially cooking and fetching water) as a challenge to practicing optimum exclusive breastfeeding. Mothers being overwhelmed at combining exclusive breastfeeding and household chores may be attributed to weak social support systems. This is in the light of increasing urbanization leading to the rise of nuclear families compared to extended family systems that used to offer needed social support for mothers in the country (Diji et al., 2017). The disintegration of larger families into smaller ones sometimes poses constraints that tend to limit the practice of exclusive breastfeeding.

Also, by tradition, husbands are not supposed to take part or assist in household chores since these activities are highly gendered and biased towards women. For instance, a (married) mother narrated how she undertakes all household chores – “sweeping, heating of water to bath the child, washing (dishes and clothing), cooking and fetching of water”. Daily performance of these activities by mothers may result in accumulated stress and that could negatively influence how their infants are exclusively breastfed.

Further, at work places (both formal and informal) mothers equally encounter challenges that hinder the practice of exclusive breastfeeding. These challenges were evident in both formal and informal work places. The early return to work by breastfeeding mothers in civil and public services – after three months of maternity leave – tend to compound exclusive breastfeeding challenges at the work place (Dun-Dery & Laar, 2016; Ghana Legal, 2003).

These mothers may express breast milk to be given to children while they are at work (GHS, 2017). Although this would be appropriate sometimes, the certainty that children might be given the expressed breast milk in good condition is questionable. Also, mothers in hustle and bustle local trading centers would have to combine uncoordinated activities by attending to clients and at the same time trying to optimally breastfeed their children. As a result, exclusive breastfeeding is breached with early weaning inevitable (Gonah & Mutambara, 2016).

In addition, within societies, mothers may be challenged in their quest to the practice exclusive breastfeeding. Grandmothers were commonly mentioned as individuals who had much influencial decisions relating to how mothers, particularly young mothers, should breastfeed. Particularly in Ghana, grandmothers (mother-in-laws) have much say in relation to health care of their grandchildren (Gupta, Aborigo, Adongo, Rominski, Hodgson, Engmann, et al., 2015). Grandmothers tend to act as advisors and sometimes authorize what kinds of foods to be given to children. The practice of giving infants herbs, water, or concoctions are common habits of grandmothers in most rural communities in Ghana (Iddrisu, 2013) and elsewhere (Thet, Eikhaing, Diamond-Smith, Sudhinaraset & Aung, 2016). Mothers (daughter-in-laws) staying with the grandmothers, due to respect, may not be able to oppose all actions they (grandmothers) take even when that contravenes with the practice of exclusive breastfeeding.

Also, while mothers may intend to exclusively breastfeed their children, physical conditions may inhibit such intentions. For instance, breast abnormalities such as sore nipples (Cherop, Keverenge-Ettyang & Mbagaya,

2009) could lead to less breastfeeding and consequently low breast milk production. Mothers mentioned this as a peculiar shortcoming that thwart their willingness to practice or continue to exclusively breastfeed their children. Agunbiade and Ogunleye (2012) documented similar findings in a study conducted in Nigeria. They identified swollen breast, nipple problems, and perceived milk insufficiency among breastfeeding mothers as a critical impediment to breastfeeding. These shortcomings, physiological and anatomic conditions, impede their intentions to practice or continue exclusive breastfeeding as described in the Theory of Planned Behaviour (Ajzen, 2002).

Moreover, it was found that mothers had challenges accessing complementary food items or ingredients. The lack of or insufficient financial resources posed challenges to some mothers in purchasing required complementary foods. This is a common challenge associated with mothers in rural areas where mothers are not economically endowed to afford childrens' foods. Zahiruddin et al. (2016) also found comparable issues in their qualitative study which explored challenges and patterns of complementary feeding in India. On the other hand, not having the requisite knowledge on where to acquire quality complementary foods for children was a related challenge for mothers. With the influx of so many low-quality complementary foods in the markets, mothers need to be knowledgeable enough to buy appropriate foods for their children to ensure healthy growth and development (Olatona et al., 2017).

In furtherance, preparing and giving complementary foods to children while at work was a challenge for especially formal working mothers. Mothers are supposed to adhere to diversifying – adequate nutrient – rich foods and hygienic practices when preparing complementary foods for children (WHO, 2017). And weaned children also need to eat frequently, and consistently. This requires mothers to always prepare foods for their children to ensure their healthy growth. Aside this, foods prepared for children are supposed to be kept warm to avoid contamination. Working mothers who may not have effective food storage containers to keep their children's food warm are likely to give them cold foods. In instances where children are not fed because foods are cold, then the expected frequency and consistent feeding cycle of children would be breached. Children may even be exposed to consuming cold foods when other caregivers are to feed them in the absence of their mothers (Zahiruddin et al., 2016).

Furthermore, mothers mostly noticed diarrhoea in their children. Diarrhoea is a main cause of childhood morbidity in most low-income countries (Gascon, Vargas, Schellenberg, Urassa, Casals, Kahigwa, et al., 2000). Mothers commonly attributed the occurrence of diarrhoea to the kind of foods given to children. As supported by similar studies, the cause of this morbidity among children has been attributed to the consumption of cold and unhygienic foods (George, Perin, de Calani, Norman, Perry, Davis, et al., 2014). In Ghana, diarrhoea cases among infants and young children may further be linked to unfavourable water and sanitation conditions in especially rural communities (Tetteh, 2013). Mothers who therefore do not follow basic hygienic processes of preparing food are most likely to expose their children to episodes of diarrhoea.

To manage diarrhoea cases noticed in children, mothers reported that they usually sent their children to the hospital or clinic for treatment. Mothers are encouraged to send their children to a health facility for proper diagnoses of illness and effective treatment. In contrast, other studies have demonstrated that mothers prefer to use oral rehydration therapy (ORT) to manage diarrhoea (Amare & Mullu, 2015; Mukhtar, Izham & Pathiyil, 2011). A mother's choice of a morbidity management strategy is underpinned by her belief that she can get the appropriate cure for the morbidity noticed in her child; as explained in the Health Belief Model (Rosenstock, 1974).

Chapter Summary

The main aim of this chapter was to explore the views of mothers on breastfeeding practices and childhood morbidity management in selected localities in the country. The data collected were inductively analyzed. Findings in relation to the research questions suggest that mothers had adequate knowledge on breastfeeding. Also, mothers encountered breastfeeding practices challenges at home and at workplace, within their societies, and in relation to their health status. Diarrhoea was mostly noticed in children and this was perceived to be largely caused by primary teeth development and eating of cold fools. To manage diarrhoea cases, most mothers presented their children to a hospital or a clinic.

CHAPTER ELEVEN

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

There are several studies that have been conducted worldwide and in Ghana on child health and nutrition issues. Generally, these studies focus on factors associated with breastfeeding practices or with specific child morbidity. Moreover, most of these studies on breastfeeding practices and related outcomes used children aged 0-59 months (under five years). According to WHO (2002), mothers are recommended to exclusively breastfeed their infants for six months. Thereafter, these children can be introduced to complementary foods. Coupled with complementary feeding, breastfeeding can continue till children are two years. These recommendations are supported with evidence-based epidemiological studies.

With the aforementioned premise, the present study sought to assess breastfeeding practices and risk of childhood morbidity among children aged 0-23 months in the country. This was done taking into consideration a host of independent variables consisting of the main outcome variables and several explanatory variables. This study was guided by both the positivist and interpretivist philosophical perspectives. The former paradigm aided the study to objectively examine the relationship between breastfeeding practices and childhood morbidity by controlling for other risk factors. Again, breastfeeding practices and childhood morbidity were spatially studied. With the later paradigm, views of mothers on breastfeeding practices and childhood morbidity were explored.

A mixed method design was applied for collecting, analyzing, and synchronizing data with both quantitative and qualitative approaches to better respond to the set of research questions. Specifically, the study applied an explanatory sequential mixed methods approach. Initially, quantitative procedures were used to assess a large household dataset from GDHS 2014. The quantitative data was used for two purposes. One was to run bivariate and multivariate logistic regression analyses using explanatory, exposure, and outcome variables. And, second, GPS coordinates were used to analyze spatial patterns and hot spots of breastfeeding practices and childhood morbidity. This was followed with a qualitative data analysis to get deeper and add social meanings on breastfeeding practices and childhood morbidity among mothers.

The conceptual framework for the study was developed based on arguments put forward in two frameworks; thus UNICEF Framework for Child Malnutrition, and Analytical Child Survival Framework. The review of related literature facilitated in the selection of study variables and subsequently in the construction of a conceptual framework to guide the data analysis.

This final chapter of the study focuses on the summary of main findings, conclusions, and recommendations for policy, and recommendations for further research. In addition, the chapter presents the strengths and limitations of the study, and outlines the study's contribution to knowledge.

Summary of Main Findings

The study found that diarrhoea prevalence was 13 per cent in the country, and diarrhoea cases increased as children grew older. In a bivariate analysis, breastfeeding practices, age of child, maternal education, maternal occupation, residence, region, preceding birth interval, source of drinking water, and type of toilet were statistically linked with diarrhoea cases. Also, multilevel logistic modelling regression analysis revealed that comnined categories within breastfeeding practices and other factors (age of child, maternal education, maternal occupation, region, preceding birth interval, and source of drinking water) were risk factors of childhood diarrhoea.

Findings suggest acute respiratory infection (ARI) prevalence among children aged 0-23 months was 15 per cent. Bivariate analysis showed that breastfeeding practice, age of child, residence, region and preceding birth interval exhibited statistical significance with childhood ARI. By holding constant other set of potential explanatory variables, some combined effects among breastfeeding practices, maternal age, and region, age of child, preceding birth interval, antenatal care visits, and cooking fuel were identified as risk factors of childhood ARI.

Anaemia prevalence was 44 per cent among children aged 0-23 months. It was found that some interactions between breastfeeding practices and other factors (age of child, wealth quintile, residence, region, size of child, and place of delivery) were independently associated with anaemia. Also, after controlling for other factors, it revealed that maternal education, wealth quintile, region, size of child, and place of delivery were significant risk factors of childhood anaemia.

The prevalence of fever among children (0-23 months) in Ghana was found to be 12 per cent. A test of heterogeneity showed that breastfeeding practices, age of child, sex of child, maternal education, maternal occupation, and residence were significantly associated with fever. Further, in a multi-level analysis conducted to ascertain the combined effect of breastfeeding and selected confounding factors - breastfeeding practices, age of child, sex of child, maternal occupation, and antenatal care visits were found to be risk factors of childhood fever.

Using geostatistical tools, hot spot districts identified for breastfeeding practices were: (i) Accra Metro (for no breastfeeding); (ii) Daffiama-Bussie-Issa, Wa Municipal, Wa West, and Bolgatanga (for exclusive breastfeeding); Gushiegu (for predominant breastfeeding); and Bawku West (for partial breastfeeding). Also, hot spot districts for childhood morbidity were: Savelugu-Nanton (for diarrhoea); Accra Metro (for ARI); Zabzugu (for anaemia); and Lawra, Jirapa, East Mamprusi (for fever).

Findings in relation to the views of mothers on breastfeeding and childhood morbidity suggest the following: mothers had adequate knowledge on breastfeeding practices; knowledge on breastfeeding practices were obtained from health personnel and media; mothers encountered breastfeeding practice challenges at home and at the workplace, within their societies, and in relation to their health. Diarrhoea was mostly noticed in children and this was perceived to be caused by primary teeth development and eating of cold foods. To manage diarrhoea cases, most mothers sent their children to a hospital or a clinic.

Conclusions

The prevalence of diarrhoea was high since one in ten children aged 0-23 months had episodes of diarrhoea. Breastfeeding practices had an effect on the occurrence of diarrhoea cases. In the midst of other individual, community, health and environmental factors, the protective effect of breastfeeding practices waned. Diarrhoea cases increased as children got older, and more prevalent among not working populations. Besides, birth spacing and type of water households use can predispose children to diarrhoea causing pathogens. Conclusion can be drawn that they are differences in the occurrence of diarrhoea among exclusively breastfed and predominantly breastfed children.

One in every ten children has ARI in Ghana. Breastfeeding practices tend to have an independent effect on the occurrence of ARI among children aged 0-23 months. Children aged more than 6 months seem to be susceptible to acute respiratory cases. Mothers within their thirties in terms of age are likely to have children experiencing acute respiratory infection. Birth interval between children, number of times mothers seek antenatal care and the type of cooking fuel they use can influence the prevalence of ARI among their children. Children who are exclusively breastfed and those predominantly breastfed are exposed to different levels of episodes of ARI.

Breastfeeding practices may have a protective effect on the occurrence of anaemia among children aged 0-23 months. However, four in every ten children in the country have anaemia. Maternal education and wealth quintile of households can be risk factors for childhood anaemia. Anaemia is common among children in the country. The size of a child at birth, place of delivery, and number of children in a household are risk factors of childhood anaemia.

There are no differences in the occurrence of anaemia in relation to exclusively breastfed and predominantly breastfed children.

One in ten children (0-23 months) have fever in the country. Breastfeeding practices can directly influence the occurrence of fever among children. All children aged 0-23 months are at risk of fever. The sex of a child, maternal occupation, and antenatal care visits are potential risk factors that can predispose children to fever. Exclusively breastfed and predominantly breastfed children experience dissimilar levels of fever.

Districts which are hot spot districts for no breastfeeding are in cities along the coast, and those for exclusive breastfeeding are common in the northern part of the country. Also, hot spot districts for predominant breastfeeding and partial breastfeeding are mainly in the northeastern corner of the country. Childhood morbidity, diarrhoea and fever hot spots are in northwestern, northeastern and middle portions of the country. For ARI, hot spots are in northeastern, middle, and along the coast. Childhood anaemia cases are common in the northeastern corner of the country.

Mothers seem to have adequate knowledge on breastfeeding practices. Health personnel commonly provide information on breastfeeding practices to mothers. Breastfeeding practices are generally below expectations. Mothers have challenges both at home and the work places, during periods of breastfeeding, within their societies, and in relation to their health. Mothers view the occurrence of childhood diarrhoea to primary teeth development and eating of cold foods and the common place they seek for management of childhood morbidity are the hospitals or clinics.

Recommendations for Policy

1. To augment childhood feeding practices in the country, various district health directorates could implement cross sectorial approaches on exclusive breastfeeding and hygienic ways of feeding infants and children to also reduce high prevalence of diarrhoea amongst children in the country.
2. Also, Ministry of Health in collaboration with its implementing unit, Ghana Health Service could create more awareness (using Community-Based Health Planning and Service compounds and the media) among mothers on the importance of breast milk, nutritious and hygienic foods for various age groups of children.
3. Children whose mothers had less or no education were found to be at risk of diarrhoea infections. It would, therefore, be appropriate for stakeholders such as Ghana Health Service and Non-Formal Education Division to develop drama programmes meant to enlighten mothers who have low or no formal education levels on child health and nutrition issues to enable them make informed decisions on child care to minimize diarrhoea cases.
4. Source of water was found to be significantly associated with diarrhoea. Hence, the provision of improved sources of drinking water for populations at risk by Community Water and Sanitation Agency is imperative in order to reduce the prevalence of diarrhoea among children. Also, in places where improved water is not available, mothers could be trained or educated on how to treat such water before

consumption. Further, mothers can be educated on how to simply sterilize containers used to fetch the treated water for children to drink.

5. Ghana Heath Service could formulate interventions meant to make antenatal care services much accessible to mothers. Nurses at these antenatal care centers could periodically educate mothers on how to better take care of children to reduce childhood ARI. Besides, Ghana Health Service could formulate programmes to educate mothers especially those who use fuel wood or charcoal on the dangers of exposing infants and young children to cooking fumes. Also, Ghana Energy Commission and local government authorities could encourage the usage of improved stoves that emit less smoke among populations at risk. Accessibility to these improved stoves and their accompanying fuel would play a key role in ensuring their usage among the target populations.
6. Interventions to further educate mothers with less education on the importance of iron supplementation and dietary diversity would be worthwhile to mitigate the prevalence of childhood anaemia in the country. Children with mothers in the middle wealth quintile were also found to be at risk of anaemia. It is therefore prudent that dietary interventions meant to prevent childhood anaemia equally consider children in middle wealth quintile households. Ghana Health Service in partnership with food processing companies could formulate highly packed nutritious foods containing iron, folate, and other essential vitamins for onward distribution to children at risk of childhood anaemia in the country.

7. Findings further indicated that children whose mothers attended antenatal centers less frequently were significantly associated with episodes of fever. Measures could be put in place by Ghana Health Service to intensify visitation of households with children by community health nurses to inoculate children, encourage mothers to use mosquito nets and feed children well, and how mothers could, on daily basis, take care of their children to minimize the occurrence of fever.

Recommendations for Further Research

The GDHS 2014 is a large set of data on, but not limited to, breastfeeding and morbidity among children. One limitation of the data was its inability to specify the inclusion and exclusion criteria for breastfeeding. This could have resulted in reverse causation bias (when breastfeeding cessation is a direct consequence of illness) or self-selection bias (when children are weaned because they became repeatedly ill or grew improperly while breastfeeding). Based on these, longitudinal cohort studies could be conducted on breastfeeding practices and childhood morbidity among children less than two years, taking note of these biases.

Usage of GPS and geostatistical approaches could be applied to get accurate locations of breastfeeding practices and childhood morbidity spots. To make it cost effective, such studies could be conducted within districts to appropriately target populations at risk when designing and implementing interventions.

Strengths and Limitations of the Study

The main strength of this study is that it used a large nationally representative data set to analyze breastfeeding practices and childhood morbidity in the country. This was done using various variables at the individual, community, health, and environmental levels. Another strength is that it applied geostatistical approaches to identify hot spots of breastfeeding practices and childhood morbidity across the country. Again, using qualitative techniques, it explored mothers' views to add deeper meanings to some of the quantitative findings. Notwithstanding all these strengths, the study has a number of limitations.

Limitations embedded in this analysis include the inability of this study to assign any causality to its findings. Also, there is likely to be a recall bias since mothers reported diarrhoea cases within the last two weeks preceding the survey. The prevalence of diarrhoea varies seasonally and data for this study were collected between September and December, hence, interpretation of results should be linked to this time period.

Another limitation is the issue of over reporting (less occurrence) or under reporting (more episodes) childhood ARI symptoms by mothers. Also, no laboratory test was used to examine ARI among children. Rather, ARI was measured by asking mothers, a proxy question on whether a child coughed within the last two weeks preceding survey.

Anaemia was diagnosed using haemoglobin levels (protein in red blood that carries iron and oxygen to cells) of children instead of serum ferritin levels which can distinguish iron deficiency anaemia and anaemia of chronic disease (anaemia of inflammatory response). This could have led to over estimation of the prevalence of anaemia among children.

The cross-sectional nature of the data for fever used for analysis is susceptible to bias due to low reporting or misclassifications due to recall bias. The prevalence of fever was measured only within the last two weeks preceding the survey. Therefore, mothers' evidence of fever was subjectively based on whether a child had high temperature.

With the spatial analysis of breastfeeding practices and childhood morbidity in the country, only a single year data was used to identify hot spots. A multiple year data could have increased the analytical power. The hot spots identified are not specific target localities within districts. They are approximations.

Limitations associated with the qualitative aspect of the study are: findings cannot be generalized; participants' views interpreted are subject to my own research lens; data was purposively collected from small sample of mothers within two regions; and views expressed by mothers are unique to their own observations and knowledge and may not represent those of other mothers in the same communities.

Contribution to knowledge

This study highlights the risk factors of childhood morbidity (diarrhoea, acute respiratory infection, anaemia and fever) among children less than two years (who are recommended to practice full breastfeeding). It thus broadens the knowledge base of ascribed causes and management of childhood morbidity among young children in Ghana. This was done by systematically applying and adapting both quantitative and qualitative research tools and methods.

Moreover, the study has simplified the identification of high prevalent areas of breastfeeding practices and childhood morbidity that could aid health planners to effective implement interventions. To the best of my knowledge, this dimension represents a first attempt to utilize spatial data to analyze nutrition (breastfeeding) and child health outcomes concurrently. It was done through the application of geo-statistical tools and procedures to ascertain clusters and hot spots of breastfeeding practices and childhood morbidity using all the districts (216) in Ghana. This therefore positions the study beyond the usual sociodemographic analysis by pinpointing the “exact” geographic locations that may require focused interventions in the country.

Furthermore, the usage of multilevel logistic modelling analytical procedures to examine the associations between breastfeeding practices (BP) and childhood morbidity (CM) is another valuable contribution to knowledge. The interactive associations between BP and CM were achieved by controlling for potential confounding factors. Almost all reviewed literature in the area of child heatlth and nutrition used simple binary logistic regression approach to analyze association two between variables. The usage of multilevel modelling aprroach extended the argument to critically examining how the interaction between breastfeeding practices and other important variables may result in child morbidity.

BIBLIOGRAPHY

Abang, C. (2013). *Association between Breastfeeding and Complementary Feeding Practices and Infant Growth in the Builsa District.* Unpublished master's thesis. University of Ghana. Accra, Ghana.

Abeshu, M. A., Lelisa, A., & Geleta, B. (2016). Complementary Feeding: Review of Recommendations, Feeding Practices, and Adequacy of Homemade Complementary Food Preparations in Developing Countries – Lessons from Ethiopia. *Frontiers in Nutrition, 3*, 41.

Abizari, A-R., Ali, Z., Essah, C. N., Agyeiwaa, P., & Amaniampong, M. (2017). Use of commercial infant cereals as complementary food in infants and young children in Ghana, *BMC Nutrition, 3*, 72.

Abubakar, A., Uriyo, J., Msuya, S. E., Swai, M., & Stray-Pedersen, B. (2012). Prevalence and risk factors for poor nutritional status among children in the Kilimanjaro region of Tanzania. *International Journal of Environmental Research and Public Health, 9*(10), 3506-18.

Adair, L.S., Fall, C.H., Osmond, C., Stein, A.D., Martorell, R., Ramirez-Zea, M., Sachdev, H.S., Dahly, D.L. et al. (2013). Associations of linear growth and relative weight gain during early life with adult health and human capital in countries of low and middle income: findings from five birth cohort studies. *The Lancet, 382*(9891), 525-534.

Adiku, T. K., Asmah, R. H., Rodrigues, O., Goka, B., Obodai, E., Adjei, A. A., Donkor, E. S., & Armah, G. (2015). Aetiology of lower respiratory infections among children under five years in Accra, Ghana. *Pathogens, 4*, 22-23.

Agho, K. E., Dibley, M. J., D'Este, C., & Gibberd, R. (2008). Factors associated with haemoglobin concentration among Timor-Leste children aged 6-59 months. *Journal of Health, Population and Nutrition, 26*(2), 200-209.

Agunbiade, O. M., & Ogunleye, O. V. (2012). Constraints to exclusive breastfeeding practice among breastfeeding mothers in Southwest Nigeria: implications for scaling up. *International Breastfeeding Journal, 7*, 5.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. *Springer, 4*, 11-39.

Ajzen, I. (2002). Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior. *Journal of Applied Social Psychology, 32*, 665-683.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Akinyinka, M. R., Olatona, F. A., & Oluwole, E. O. (2016). Breastfeeding Knowledge and Practices among Mothers of Children under 2 Years of Age Living in a Military Barrack in Southwest Nigeria. *International Journal of Maternal and Child Health and AIDS, 5*(1), 1-13.

Alamirew, M. W., Bayu, N. H., Tebeje, N. B., & Kassa, S. F. (2017). Knowledge and Attitude towards Exclusive Breast Feeding among Mothers Attending Antenatal and Immunization Clinic at Dabat Health Center, Northwest Ethiopia: A Cross-Sectional Institution Based Study. *Nursing Research and Practice, 9*, 1-9.

Alelign, T., Asegidew, W., & Abera, A. (2016). A cross sectional study on the incidence and risk factors of diarrheal illness among children under-five years of age in Debre Berhan Town, Ethiopia. *Journal of Health & Medical Economics, 2*(2), 1-6.

Alemayehu, M., Alemu, K., Sharma, H. R., Gizaw, Z., & Shibru, A. (2014). Household fuel use and acute respiratory infections in children under five years of age in Gondar city of Ethiopia. *Journal of Environment and Earth Science, 5*(2), 23-31.

Alex-Hart, B. A., & Frank-Briggs, A. I. (2011). Mothers' Perception of Fever Management in Children. *The Nigerian Health Journal*, *11* (2), 69-72.

Alnawajha, S. K., Bakry, G. A., & Aljeesh, Y. I. (2015). Predictors of acute diarrhoea among hospitalized children in Gaza Governorates: a case-control study. *Journal of Health and Population Nutrition, 33*(1), 1-8.

Al-Ruwaili, M. A., Khalil, O. M., & Selim, S. A. (2012). Viral and bacterial infections associated with camel (*Camelus dromedarius*) calf diarrhea in North Province, Saudi Arabia. *Saudi Journal of Biological Science, 19*(1), 35–41.

Al-Sharbatti, S. S., & Aljumaa, L. I. (2012). Infant feeding patterns and risk of acute respiratory infections in Bangladesh/Iraq. *Italian Journal of Public Health, 9*(3), e7534-1-9.

Amare, D., & Mullu, G. (2015). Mothers' Attitude Towards Childhood Diarrhea Management and Prevention in Under Five Children in Fenote Selam Town, West Gojjam, Amhara, Northwest Ethiopia. *Science Journal of Public Health, 3*(3), 398-403.

American Academy of Family Physicians (AAFP). (2000). *Anaemia in Children.* Retrieved from https://www.aafp.org/afp/2001/1015/p1379.html

Amir, L. H. (2011). Social theory and infant feeding. *International Breastfeeding Journal*, *6*, 7.

Amugsi, D. A., Aborigo, R. A., Oduro, A. R., Asoala, V., Awine, T., & Amenga-Etego, L. (2015). Socio-demographic and environmental determinants of infectious disease morbidity in children under 5 years in Ghana. *Global Health, 8,* 29349.

Andrews, N. C. (2008). Forging a field: The golden age of iron biology. *Blood*, *112*(2), 219–230.

Arbex, M. A., Santiago, S. L., Moyses, E. P., Pereira, L. A., Saldiva, P. H., Braga, A. L. (2011). Impact of urban air pollution on acute upper respiratory tract infections (AURTI). *European Respiratory Journal, 38*, 1048.

Arifeen, S., Black, R. E., & Antelman, G. (2001) Exclusive breastfeeding reduces acute respiratory infection and diarrhea deaths among infants in Dhaka slums. *Pediatrics 108*, E67.

Asghar, S. A., Srivastava, M. R., Srivastava, J. P., Gupta, P., Zaidi, Z. H. (2017). Prevalence of acute respiratory infections among children under five years of age attending rural health training centers of Era's Lucknow Medical College and Hospital. *International Journal of Community Medicine and Public Health, 4*(10), 3752-3756.

Aspuru, K., Villa, C., Bermejo, F., Herrero, P., & López, S. G. (2011). Optimal management of iron deficiency anemia due to poor dietary intake. *International Journal of General Medine, 4*, 741–750.

Astale, T., & Chenault, M. (2015). Help-Seeking Behavior for Children with Acute Respiratory Infection in Ethiopia: Results from 2011 Ethiopia Demographic and Health Survey. *PLoS ONE, 10*(11), e0142553.

Atieli, H. E., Zhou, G., Afrane, Y., Lee, M. C., Mwanzo, I., Githeko, A. K., & Yan G. (2011). Insecticide-treated net (ITN) ownership, usage, and malaria transmission in the highlands of western Kenya. *Parasites & Vectors*, *18*(4), 113.

Ayawine, A., & Ae-Ngibise, K. A. (2015). Determinants of exclusive breastfeeding: a study of two sub-districts in the Atwima Nwabiagya District of Ghana. *The Pan African Medical Journal, 22*, 248.

Ayele, D. G., Zewotir, T. & Mwambi, H. 2012. Prevalence and risk factors of malaria in Ethiopia. *Malaria Journal, 11*, 195.

Bado, A. R., Susuman, A. S., & Nebie, E. I. (2016). Trends and risk factors for childhood diarrhea in sub-Saharan countries (1990-2013): Assessing the neighborhood inequalities. *Global Health Action, 9*, 30166.

Balarajan, Y. S., Fawzi, W. W., & Subramanian, S. V. (2013). Changing patterns of social inequalities in anaemia among women in India: Cross-sectional study using nationally representative data. *BMJ Open, 3*(3), e002233.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Baraff, L. J. (2000). Management of fever without source in infants and children. *Annals of Emergency Medicine, 36*(6), 602-14.

Baragatti, M., Fournet, F., Henry, M-C., Assi, S., Ouedraogo, H., Rogier, C., Salem, G. (2009). Social and environmental malaria risk factors in urban areas of Ouagadougou, Burkina Faso. *Malaria Journal, 8*:13.

Barone, J. E. (2009). Fever: Fact and fiction. *The Journal of Trauma, 67*. 406-409.

Bautista, L. E., Correa, A., Baumgartner, J., Breysse, P., & Matanoski, G. M. (2009). Indoor charcoal smoke and acute respiratory infections in young children in the Dominican Republic. *American Journal of Epidemiology, 169*(5), 572-580.

Bener, A., Ehlayel, M. S., & Abdulrahman, H. M. (2011). Exclusive breastfeeding and prevention of diarrhoeal diseases: A study in Qatar. *Revista Brasileira de Saúde Materno Infantil, 11*(1), 83-87.

Berisha, M., Ramadani, N., Hoxha, R., Gashi, S., Zhjeqi, V., Zajmi, D., & Begoli, I. (2017). Knowledge, attitude and practices of mothers in Kosova about complementary feeding for infant and children 6-24 months. *Medical Archives, 71*(1), 37-41.

Bertille, N., Fournier-Charrière, E., Pons, G., & Chalumeau, M. (2013) Managing Fever in Children: A National Survey of Parents' Knowledge and Practices in France. *PLoS ONE 8*(12), e83469.

Bham, S. Q., Saeed, F., & Shah, M. A. (2016). Knowledge, Attitude and Practice of mothers on acute respiratory infection in children under five years. *Pakistan Journal of Medical Sciences, 32*(6), 1557-1561.

Binka, E., Vermund, S. H., & Armah, G. E. (2012). Rotavirus as a cause of diarrhea among children under 5 years of age in urban Ghana: Prevalence and serotypes/genotypes. *The Pediatric Infectious Disease Journal, 30*(8), 718–720.

Black, I. (2006). The presentation of interpretivist research. *Qualitative Market Research: An International Journal*, *9*(4), 319-324.

Black, R. E., Victoria, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., Ezzati, M., Grantham-McGregor, S., Katz, J., Martorell, R., Uauy, R (2013). Maternal and Child Nutrition Study Group. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*, *382*(9890), 427-451.

Boakye-Yiadom, A., Yidana, A., Sam N. B., Kolog, B., & Abotsi, A. (2016). Factors Associated with Exclusive Breastfeeding Practices among Women in the West Mamprusi District in Northern Ghana: A Cross-Sectional Study. *Public Health Research*, *6*(3), 91-98.

Boccolini, C. S., de Carvalho, M. L., de Oliveira, M. I. C., & Boccolini, P. M. M. (2011). Breastfeeding can prevent hospitalization for pneumonia among children under 1 year old. *Jornal de Padiatria, 87*(5), 399-404.

Boots, B. N., & Getis. A. (1998). *Point pattern analysis*. California, CA: Sage Publications.

Boschi-Pinto, C., Velebit, L., & Shibuya, K. (2008). Estimating child mortality due to diarrhoea in developing countries. *Bulletin of the World Health Organization, 86*, 710-717.

Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgement of Taste*. London, UK: Routledge.

Brugha, R., & Grigg, J. (2014). Urban air pollution and respiratory infections. *Paediartic Respiratory Reviews, 15*(2), 194-194.

Bryan, N. S., & Loscalzo, J. (2017). *Nitrite and Nitrate in human health and disease*. Springer International Publishing, Switzerland.

CDC. (2012). *Pathways to diarrhea*. Retrieved from https://www.cdc.gov/healthywater/global/diarrhea-pathways.html

Chandyo, R. K., Henjum, S., Ulak, M., Thorne- Lyman, L, A., Ulvik, R, J., Shrestha, P. S., Locks, P., Fawzi, W., & Strand, T. A. (2016). The prevalence of anemia and iron deficiency is more common in breastfed infants than their mothers in Bhaktapur, Nepal. *European Journal of Clinical Nutrition, 70*, 456–462.

Chaturvedi, P., Warren, C. D., Altaye, M., Morrow, A. L., Ruiz-Palacios, G., Pickering, L. K., & Newburg, D. S. (2001). Fucosylated human milk oligosaccharides vary between individuals and over the course of lactation. *Glycobiology, 11*(5), 365-372.

Chen, Y., Williams, E., & Kirk, M. (2014). Risk factors for acute respiratory infection in the Australian community. *PLoS One, 9*(7), e101440.

Cheng, K., Kelly, A. K., Renwick, D. V., & Yang, S. (2013). *Evaluating access to drinking water in Northern Ghana.* Massachusetts Institute of Technology Civil and Environmental Engineering Department, USA.

Cherop, C. E., Keverenge-Ettyang, A. G., & Mbagaya, G. M. (2009). Barriers to exclusive breastfeeding among infants aged 0–6 months in Eldoret municipality, Kenya. *East African Journal of Public Health, 6*(1), 69-72.

Cho, C-Y., Lai, C-C., Lee, M-L., Hsu, C-L., Chen, C-J., Chang, L-Y., Lo, C-W., & et. al., (2015). Clinical analysis of fever of unknown origin in children: a 10-year experience in a northern Taiwan medical center. *Journal of Microbiology, Immunology and Infection*, *50*(1), 40-45.

Cinar, N. D., Alvur, T. M., Kose, D., & Nemut, T. (2013). Breastfeeding Twins: A Qualitative Study. *Journal of Health, Population and Nutrition*, *31*(4), 504–509.

Conde-Agudelo, A., Rosas-Bermudez, A., Castano, F., & Norton, M. H. (2012). Effects of birth spacing on maternal, perinatal, infant, and child health: A systematic review of causal mechanisms. *Studies in Family Planning*, *43*(2), 93-114.

Consolini, D. M. (2017). *Fever in infants and children*. Retrieved from http://www.merckmanuals.com/en-ca/professional/pediatrics/symptoms-in-infants-and-children/fever-in-infants-and-children

Cooke, R., Dahdah, M., Norman, P., & French, D. P. (2014). How well does the theory of planned behavior predict alcohol consumption? A systematic review and meta-analysis. *Health Psychology Review*, *10*(2), 148-167.

Cox, M., Rose, L., Kalua, K., Wildt G., Bailey, R., & Hart J. (2017). The prevalence and risk factors for acute respiratory infections in children aged 0-59 months in rural Malawi: A cross-sectional study. *Influenza and Other Respiratory Viruses*, *11*(6), 489-496.

Creswell, J. W. (2012). *Educational Research: Planning, conducting, and evaluating quantitative and qualitative research*. (4th edition). Pearson Education, Inc., 501 Boylston Street, Boston, MA

Creswell, J. W. (2006). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.* (3rd edition). SAGE Publications, Inc., 2455 Teller Road, Thousand Oaks, California.

Creswell, J. W. (2013). *Qualitative Inquiry and Research Design: Choosing among five approaches.* SAGE Publications, Inc., 2455 Teller Road, Thousand Oaks, California.

Creswell, J. W., & Plano Clark, VI (2011). *Designing and conducting mixed methods research.* (2nd edition) Thousand Oaks, CA: Sage.

Crump, J. A., Morrissey, A. B., Nicholson, W. L., Massung, R. F., Stoddard, R. A., Galloway, R. L., et al. (2013) Etiology of Severe Non-malaria Febrile Illness in Northern Tanzania: A Prospective Cohort Study. *PLoS Neglected Tropical Diseases, 7*(7), e2324.

Cunha, B. A., Apostolopoulou, A., & Gian, J. (2017). Fever of unknown origin (FUO) due to miliary BCG: The diagnostic importance of morning temperature spikes and highly elevated ferritin levels. *Heart Lung, 46*(3), 205-207.

D'Acremont, V., Kilowoko, M., Kyungu, E., Philipina, S., Sangu, W., Kahama-Maro, J., Lengeler, C, Cherpillod, P., Kaiser, L., & Genton, B. (2014). *N England Journal Medicine, 370,* 809-817.

Dagvadorj, A., Ota, E., Shahrook, S., Olkhanud, P. B., Takehara, K., Hikita, N., Bavuusuren, B., Mori, R., & Nakayama, T. (2016). Hospitalization risk factors for children's lower respiratory tract infection: A population-based, cross-sectional study in Mongolia. *Scientific Reports*, *6*, 24615.

Danquah, L., Mensah, C.M., Agyemang, S., & Awuah, E. (2015). Risk factors associated with diarrhoea morbidity among children younger than five years in the Atwima Nwabiagya District, Ghana: A cross-sectional study. *Science Journal of Public Health, 3*(3), 344-352.

Dennis, C-L**.** (1999). Theoretical underpinnings of breastfeeding confidence: A self-efficacy framework. *Journal of Human Lactation*, *15*, 195-201.

Deressa, W. (2017). Individual and household factors associated with ownership of long-lasting insecticidal nets and malaria infection in south-central Ethiopia: a case-control study. *Malaria Journal*, *16*, 402.

Desmond, D., & Meaney, S. (2016). A qualitative study investigating the barriers to returning to work for breastfeeding mothers in Ireland. *International Breastfeeding Journal, 11*:16.

Diji, A. K-A., Bam, V., Asante, E., Lomotey, A. Y., Yeboah, S. & Owusu, H. A. (2017). Challenges and predictors of exclusive breastfeeding among mothers attending the child welfare clinic at a regional hospital in Ghana: A descriptive cross-sectional study. *International Breastfeeding Journal*, *12*, 13.

Domellof, M., Dewey, K. G., Lonnerdal, B., Cohen, R. J, & Hernell, O. (2002). The diagnostic criteria for iron deficiency in infants should be reevaluated. *Journal of Nutrition,132*(12), 3680–3686.

Dorle, A. S., Mannapur, B. S., & Naik, H. V. (2017). A study on prevalence and determinants of acute respiratory infection among under five children in the rural field practice area of S.N. Medical College, Bagalkot: A cross-sectional study. *Journal of Medical Sciences*, *7*(2), 51-54.

Dudovskiy, J. (2016). *Positivism - Research Methodology - Research Methodology*. Retrieved from http://research-methodology.net/research-philosophy/positivism/

Duijts, L., Jaddoe, V. W. V, Hofman, A., & Moll, H. A. (2010). Prolonged and Exclusive Breastfeeding Reduces the Risk of Infectious Diseases in Infancy. *Pediatrics*, *126*(1), 12-25.

Dun-Dery, E. J., & Laar, A. K. (2016). Exclusive breastfeeding among city-dwelling professional working mothers in Ghana. *International Breastfeeding Journal*, *11*, 23.

Edirisingha, P. A. (2013). *Interpertivism and positivism (ontological and epistemological perspectives).* Retrieved from https://prabash78.wordpress.com/2012/03/14/interpretivism-and-postivism-ontological-and-epistemological-perspectives/

El-Gilany AH, & Hammad S. (2005). Epidemiology of diarrhoeal diseases among children under age 5 years in Dakahlia, Egypt. *East Mediterranean Health Journal*, *11*(4), 762-75.

Elhassan, E. M., Abbaker, A. O., Haggaz, A. D., Abubaker, M. S., & Adam I. (2010). Anaemia and low birth weight in Medani, Hospital Sudan. *BMC Res Notes*, *3*, 181.

Elizabeth, A. M., & Raj, S. (2012). Impact of bio-social factors on morbidity among under five children in Odisha. *Health and Population – Perspectives and Issues*, *35*(4), 176-192.

Emergency Network Nutrition (2016). Nutrition. Retrieved from https://www.diet.com/g/emergency-nutrition-network

Emmanuel, A. (2015). *Breastfeeding intentions and practices of women in Plateau State, Nigeria: a cross-sectional study of women attending antenatal clinics in selected hospitals*. Unpublished master's thesis. University of Cape Town. Cape Town, South Africa.

En-obong, H. N., Iroegbu, C. U., & Uwaegbute, A. C. (2000). Perceived causes and management of diarrhoea in young children by market women in Enugu State, Nigeria. *Journal of Health, Population and Nutrition, 18*(2), 97-102.

ESRI (2017). *How spatial autocorrelation (Global Moran's I) works*. Retrieved from http://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-statistics-toolbox/h-how-spatial-autocorrelation-moran-s-i-spatial-st.htm

Etuk, E. U., Egua, M. A., & Muhammad, A. A. (2008). Prescription pattern of antimalarial drugs in children below 5 years in a tertiary health institution in Nigeria. *Annals of African Medicine, 7*(1), 24-28.

Ewusie, J. E., Ahiadeke, C., Beyene, J., & Hamid, J. S. (2014). Prevalence of anemia among uder-5 children in the Ghanaian population: estimates from the Ghana Demographic and Health Survey. *BMC Public Health, 14*, 626.

Exum, N. G. (2016). *Beyond diarrhoea: fecal-oral pathogen transmission and environmental enteropathy in Iquitos, Peru*. Unpublished doctoral thesis. Johns Hopkins University. Maryland, USA.

Fagerli, R. A., & Wandel, M. (1999) Gender differences in opinions and practices with regard to a "healthy diet". *Appetite, 32* (2), 171-190.

Fish, E. N. (2008). The X-files in immunity: sex-based differences predispose immune responses. *Nature Reviews Immunology, 8*, 737-744.

Fisk, C. M., Crozier, S. R., Inskip, H. M., Godfrey, K. M., Cooper, C., Roberts, G. C., & Robinson SM, et al. (2011). Breastfeeding and reported morbidity during infancy: findings from the Southampton Women's Survey. *Maternal & Child Nutrition, 7*(1), 61-70.

Fosu, M. O., Frimpong, F. O., & Arthur, M. O. (2014). Factors associated with haemoglobin prevalence among Ghanaian children aged 6-59 months. *Journal of Biology, Agriculture and Healthcare, 4*(2), 132-140.

Fotso, J. C., Cleland, J., Mberu, B., Mutua, M., & Elungata, P. (2013). Birth spacing and child mortality: an analysis of prospective data from the Nairobi urban health and demographic surveillance system. *Journal of Biosocial Science, 45*(6), 779-798.

Gahutu, J-B., Steininger, C., Shyirambere, C., Zeile, I., Cwinya-Ay, N., Danquah I., Larsen CH., Eggelte TA., Uwimana A., Karema C., Musemakweri A., Harms G., & Mockenhaupt FP. (2011). Prevalence and risk factors of malaria among children in southern highland Rwanda. *Malaria Journal, 10*, 134.

Gascon, J., Vargas, M., Schellenberg, D., Urassa, H., Casals, C., Kahigwa, E., Aponte, J. J., Mshinda, H., & Vila J. (2000). Diarrhea in Children under 5 Years of Age from Ifakara, Tanzania: a Case-Control Study. *Journal of Clinical Microbiology, 38*(12), 4459-4462.

Gatti, L. (2008). Maternal perceptions of insufficient milk supply in breastfeeding. *Journal of Nursing Scholarship, 40*(4), 355-363.

Geberetsadik, A., Worku A., & Berhane Y. (2015). Factors associated with acute respiratory infection in children under the age of 5 years: evidence from 2011 Ethiopia Demographic and Health Survey. *Pediatric Health, Medicine and Therapeutics, 6,* 9-13.

Gebretsadik, S., & Gabreyohannes, E. (2016). Determinants of under-five mortality in high mortality regions of Ethiopia: an analysis of the 2011 Ethiopia Demographic and Health Survey Data. *International Journal of Population Research, 2,* 23.

Gebru, T., Taha, M., & Kassahun, W. (2014). Risk factors of diarrhoeal disease in under-five children among health extention model and non-model families I Sheko district rural community, Southwest Ethiopia: comparative cross-sectional study. *BMC Public Health, 14,* 395.

Gedefaw, M., & Berhe, R. (2015). Determinates of childhood pneumonia and diarrhea with special emphasis to exclusive breastfeeding in North Achefer District, Northwest Ethiopia: A case control study. *Open Journal of Epidemiology, 5,* 107-112.

George, C. M., Perin, J., de Calani, N., Norman, W. R., Perry, H., Davis, Jr. T. P., & Lindquist, E. D. (2014). Risk Factors for Diarrhea in Children under Five Years of Age Residing in Peri-urban Communities in Cochabamba, Bolivia. *American Journal of Tropical Medicine and Hygiene, 91*(6), 1190-1196.

Ghana Legal. (2003). *Maternity, annual and sick leave*. Retrieved from http://laws.ghanalegal.com/acts/id/162/section/57/Maternity,_Annual_And_Sick_Leave

Ghosh, S., & Shah, D. (2004). Nutritional problems in urban slum children. *Indian Pediatrics, 41*(7), 682-696.

GHS. (2015). *The health sector in Ghana: Facts and figures*. Retrieved from https://www.ghanahealthservice.org/.../FINAL%20_23_06_2015%20Facts%20and%2

GHS. (2015). *2014 Annual Report: Antenatal*. GHS, Accra, Ghana: Author.

GHS. (2016). *National Child Health Policy*. Retrieved from http://www.moh.gov.gh/policy-documents/

GHS. (2017). *Newborn care programme*. Retrieved from http://ghanahealthservice.org/newborn/programme-scat.php?ghspid=3&ghsscid=94

Giugliani, E. R. J. (2004). Common problems during lactation and their management. *Journal of Pediatrics, 80*(5), 23-35.

Glover-Amengor, Agbemafle, M. I., Hagan, L. L., Mboom, F. P., Gamor, G., Larbi, A., & Hoeschle-Zeledon, I. (2016). Nutritional status of children 0–59 months in selected intervention communities in northern Ghana from the africa RISING project in 2012. *Archieves of Public Health, 74*, 12.

Godhia, M. L., & Patel, N. (2013). Colostrum – its composition, benefits as a nutraceutical – A review. *Current Research in Nutrition and Food Science, 1*(1), 37-47.

Goldmann, D. A. (2001). Epidemiology and prevention of pediatric viral respiratory infections in health-care institutions. *Emerging Infectious Diseases, 7*(2), 249-253.

Gonah, L., & Mutambara, J. (2016). Determinants of weaning practices among mothers of infants aged below 12 months in Masvingo, Zimbabwe. *Annals of Global Health, 82*(5), 875-884.

Goswmai, S., & Das, K. K. (2015). Socio-economic and demographic determinants of childhood anemia. *Jornal de Pediatria, 91*(5), 471-477.

GSS (2011). *Ghana Multiple Indicator Cluster Survey with an Enhanced Malaria Module and Biomarker, 2011, Final Report*. Accra, Ghana: Author

GSS, GHS, and ICF International (2015). *Ghana Demographic and Health Survey 2014*. Accra, Ghana: GSS, GHS, and ICF International: Author.

GSS, GHS, and ICF Macro (2009). *Ghana Demographic and Health Survey 2008*. Accra, Ghana: GSS, GHS, and ICF Macro: Author.

GSS. (2012). *Population statistics: Population and Housing Census – Ghana*. Retrieved from http://www.statsghana.gov.gh/pop_stats.html

GSS. (2013). *Children, adolescents and young people in Ghana*. GSS, Accra, Ghana: Author.

GSS. (2013). Women and men in Ghana. GSS, Accra, Ghana: Author.

GSS. (2016). *Health of children and women in Ghana. Evidence from the Demographic and Health Surveys.* GSS, Accra, Ghana: Author.

Guo, J. L., Wang, T. F., Liao, J. Y., & Huang, C. M. (2016). Efficacy of the theory of planned behavior in predicting breastfeeding: Meta-analysis and structural equation modeling. *Applied Nursing Research, 29,* 37-42.

Gupta, M. L., Aborigo, R. A., Adongo, P. B., Rominski, S., Hodgson, A., Engmann, C. M., et al. (2015). Grandmothers as gatekeepers? The role of grandmothers in influencing health-seeking for mothers and newborns in rural northern Ghana. *Global Public Health, 10*(9), 1078-91.

Hajeebhoy, N., Nguyen, P. H., Mannava, P., Nguyen, T. T., & Mai, L. T. (2014). Suboptimal breastfeeding practices are associated with infant illness in Vietnam. *International Breastfeeding Journal, 9,* 12.

Halim, N., Bohara, A. K., & Ruan, X. (2011). Healthy mothers, healthy children:
does maternal demand for antenatal care matter for child health in Nepal? *Health Policy Plan, 26*(3), 242–56.

Hamooya, B. M., Chongwe, G., Sitali, L., & Halwindi, H. (2015). Reported incidence of fever for under-5 children in Zambia: a longitudinal study. *Archives of Public Health, 73,* 46.

Hanieh, S., Ha, T. T., Simpson, J. A., Thuy, T. T., Khuong, N. C., Thoang, D. D., Tran, T. D., Tuan, T., Fisher, J., & Biggs, B-A. (2015). Exclusive breastfeeding in early infancy reduces the risk of inpatient admission for diarrhea and suspected pneumonia in rural Vietnam: a prospective cohort study. *BMC Public Health, 15,* 1166.

Hanson, L. A., Korotkova, M., Haversen, L., Mattsby-Baltzer, I., Hahn-Zoric, M., Silfverdal SA, et al. (2002). Breast-feeding, a complex support system for the offspring. *Pediatrics International*, *44*, 347–52.

Harerimana, J-M., Nyirazinyoye, L., Thomson, D. R., & Ntaganira (2016). Social, economic and environmental risk factors for acute lower respiratory infections among children under five years of age in Rwanda. *Archives of Public Health*, *74*, 19.

Hashi, A., Kumie, A., & Gasana, J. (2016). Prevalence of diarrhoea and associated factors among under-five children in Jigjiga District, Somali Region, Eastern Ethiopia. *Open Journal of Preventive Medicine, 6*, 233-246.

Hatakka, K., Piirainen, L., Pohjavuori, S., Poussa, T., Savilahti, E., & Korpela, R. (2010). Factors associated with acute respiratory illness in day care children. *Scandinavian Journal of Infectious Diseases, 42*(9), 704-711.

Hauck, Y., Hall, W. A., & Jones, C. (2007). Prevalence, self-efficacy and perceptions of conflicting advice and self-management: effects of a breastfeeding journal. *Journal of Advanced Nursing, 57*(3), 306-17.

Health Direct (2017). *Diarrhoea.* Retrieved from https://www.healthdirect .gov.au/diarrhoea

Hill, K. (2003). Frameworks for studying the determinants of child survival. *Bulletin of the World Helath Organisation, 81*(2), 138-139.

Hoddinott, P., Craig, L. C. A., Britten, J., & McInnes, R. M. (2012). A serial qualitative interview study of infant feeding experiences: idealism meets realism. *BMJ Open, 2*(2), 1-17

Horta, B. L., & Victora, C. G. (2013). *Short-term effects of breastfeeding: a systematic review on the benefits of breastfeeding on diarrhoea and pneumonia.* WHO Press, Geneva, Switzerland.

Hunter, P. R., Risebro, H., Yen, M., Lefebvre, H., Lo, C., Hartemann, P., Longuet, C., & Jaquenoud, F. (2013). Water source and diarrhoeal disease risk in children under five years old in Cambodia: a prospective diary based study. *BMC Public Health, 13*:1145.

Hviid, M. M., Skovlund, C. W., Mørch, L. S., & Lidegaard, O. (2017). Maternal age and child morbidity: A Danish national cohort study. *PLoS ONE 12*(4), e0174770.

IBFAN. (2017). *Infant and young child feeding*. Retrieved from http://www.ibfan.org/

Iddrisu, S. (2013). *Exclusive breastfeeding and family influences in rural Ghana: a qualitative study*. Unpublished master's thesis. Malmo University. Malmo, Sweden.

IFPRI. (2000). *Explaining child malnutrition in developing countries*. IFPRI Board of Trustees, Washington, D.C: Author.

Ikeda, N., Irie, Y., & Shibuya, K. (2013). Determinants of reduced child stunting in Cambodia: analysis of pooled data from three Demographic and Health Surveys. *Bull World Health Organ, 91*(5), 341-349.

Islam, R. K., Hossain, K., Khan, N., & Ali, R. (2015). An evidence of socio-demographic effects on child's diarrhoea in Bangladesh. *Journal of Health Science, 5*(1), 1-5.

Jabeen, N., Khan, SA., & Qureshi, Z. (2017). Estimated proportion and factors associated with acute respiratory infections in children under five in Islamabad, Pakistan. *Pakistan Journal of Public Health, 7*(2), 95-99.

Jalil, A., Zakar, R., & Zakar, M. Z. (2015). A Secondary analysis of maternal factors determining low birth weight in Pakistan. *Iranian Journal of Public Health, 44*, 136-137.

Janz, T. G., Johnson, R. L., & Rubenstein, S. D. (2013). "Anemia in the emergency department: evaluation and treatment". *Emergency Medicine Practice, 15* (11), 1–15.

Kalakheti, B., Panthee, K., & Jain, K. C. (2016). Risk factors of diarrhoea in children under five in urban slums: An epidemiological study. *Journal of Lumbini Medical College, 4*(2), 94-98.

Kamal, M. M., Hasan, M. M., & Davey, R. (2015). Determinants of childhood morbidity in Bangladesh: evidence from the Demographic and Health Survey 2011. *BMJ Open, 5*(10), e007538.

Kandala, N-B., Ji, C., Stallard, N., Stranges, S., & Cappuccio, F. P. (2007). Spatial analysis of risk factors for childhood morbidity in Nigeria. *American Journal of Tropical Medicine and Hygience, 77*(4), 770-778.

Kandala, N-B., Magadi, M. A., & Madise, N. J. (2006). An investigation of district spatial variations of children diarrhoea and fever morbidity in Malawi. *Social Science & Medicine, 62*(5), 1138-1152.

Karimy, M., Zareban, I., Araban, M., & Montazeri, A. (2015). An extention theory of planned behavior used to predict smoking behavior among a sample of Iranian medical students. *International Journal High Risk Behaviour and Addiction, 4*(3), e24715.

Kauchali, S., Rollins, N., Bland, R., & den Broeck, J. V. (2004). Maternal perceptions of acute respiratory infections in children under 5 in rural South Africa. *Tropical Medicine & International Health, 9*(5), 644-650.

Kaware, A. C., Kamble, N. H., & Mangulikar, S. K. (2017). Study of risk factors of acute respiratory infections in children admitted in a tertiary care hospital of Southern Maharashtra. *International Journal of Community Medicine and Public Health, 4*(9), 3129-3134.

Kazeem, A., Oshikoya, K. A., & Senbanjo, I. O. (2008). Fever in Children: Mothers' Perceptions and their Home Management. *Iran J Pediatr, 18*(3), 229-236.

Keemer, F. (2011). *Breastfeeding self-efficacy and alternative techniques to over-come maternal or infant breastfeeding challenges: a retrospective descriptive study*. Unpublished master's thesis. Queensland University of Technology. Brisbane, Australia.

Kenny, L. C., Lavender, T., McNamee, R., O'Neill, S. M., Mills, T., & Khashan AS. (2013). Advanced maternal age and adverse pregnancy outcome: Evidence from a large contemporary cohort. *PLoS ONE, 8*(2), e56583.

Kent, J. C., Ashton, E., Hardwick, C. M., Rowan, M. K., Chia, E. S., Fairclough, K.A., Menon, L. L., Scott, C., Mather-McCaw, G., Navarro, K., & Geddes, D. T. (2015). Nipple Pain in Breastfeeding Mothers: Incidence, Causes and Treatments. *International Journal of Environmental Research and Public Health, 12*(10), 23-36.

Khan, J. R., Awan, N., & Misu, F. (2016). Determinants of anemia among 6-59 months aged children in Bangladesh: evidence from nationally representative data. *BMC Pediatrics*, *16*, 3.

Kids Health. (2018). Iron: Guidelines to improve your child's intake. Retrived from http://www.aboutkidshealth.ca/En/HealthAZ/HealthandWellness /Nutrition/Pages/Iron-Guidelines-Improve-Your-Childs-Intake.aspx

Kikafunda, J. K., Lukwago, F. B., & Turyashemerwa, F. (2009). Anaemia and associated factors among under-five and their mothers in Bushenyi district, Western Uganda. *Public Health Nutrition*, *12*(12), 2302-2308.

Kilabuko, J. H., & Nakai, S. (2007). Effects of cooking fuels on acute respiratory infections in children in Tanzania. *International Journal of Environmental Research and Public Health*, *4*(4), 283-288.

Kimani-Murage, E. W., Fosto, J. C., Egondi, T., Abuya, B., Elungata, P., Ziraba, A. K., Kabiru, C. W., & Madise, N. (2014). Trends in childhood mortality in Kenya: The urban advantage has seemingly been wiped out. *Health & Place*, *29*, 95-103.

Knowledge for Health. (2017). *Anaemia prevalence, causes and consequences*. Retrieved from https://www.k4health.org/toolkits/ anemia-prevention/ anemia-causes-prevalence-impact

Koch, A., Molbak, K, Homoe, P., Sorensen, P, Hjuler, T., Olesen, M. E., Pejl, J., Pedersen, F. K., Olsen, O. R., & Melbye, M. (2003). Risk Factors for Acute Respiratory Tract Infections in Young Greenlandic Children, *American Journal of Epidemiology*, *4*(15) 374–384.

Kock, A., Molbak, K., Homoe, P., Hjuler, T., Olesen, M. E., Peji J., Pedersen FK., Olsen, O. R., & Melbye, M. (2003). Risk factors for acute respiratory tract infections in young Greenlandic children. *American Journal of Epidemiology, 158*(4), 374-384.

Kohl, K. S., Marcy, S. M., Blum, M., Jones, M. C., Dagan, R., Hansen, J., Nalin, D., Rothstein, E., & the Brighton Collaboration Fever Working Group. (2004). Fever after Immunization: Current Concepts and Improved Future Scientific Understanding. *Clinical Infectious Diseases, 39*(3), 389–394.

Konstantyner, T., Oliveira, T. C. R., & Taddei, J. A. A. C. (2012). Risk factors for anemia among Brazilian infants from the 2006 National Demographic Health Survey. *Anaemia, 850681*, 7.

Kramer, M. S., Chalmers, B., Hodnett, E. D., Sevkovskaya, Z., Dzikovich, I., Shapiro, S., et al. (2001). Promotion of breastfeeding intervention trial (PROBIT): A randomized trial in the Republic of Belarus. *JAMA, 285*(4), 413-20.

Krefis, A.C., Schwarz, N.G., Nkrumah, B., Acquah, S., Loag, W., Sarpong, N., Adu-Sarkodie, Y., Ranft, U., & May, J. (2010). Principal component analysis of socioeconomic factors and their association with malaria in children from the Ashanti Region, Ghana. *Malaria Journal, 9*: 201.

Kuchenberker, J., Jordan, I., Reinbott, A., Herrmann, J., Jeremias, T., Kenney, G., Muehlhoff, E., Mtimuni, B., & Krawinkel, M. B. (2015). Exclusive breastfeeding and its effect on growth of Malawian infants: results from a cross-sectional study. *Paediatr Int Child Health, 35*(1), 14-23.

Kumar, S. G., Majumdar, A., Kumar, V., Naik, B. N., Selvaraj, K., & Balajee K. (2015) Prevalence of acute respiratory infection among under-five children in urban and rural areas of puducherry. *Journal of Natural Science Biology and Medicine, 6*, 3-6.

Kumar, K. J., Asha, N., Murthy, D. S., Sujatha, M. S., & Manjunath, V. G. (2013). *International Journal of Preventive Medicine, 4*(2), 193-199.

Kumi-Kyereme, A., & Amo-Adjei, J. (2016). Household wealth, residential status and the incidence of diarrhoea among children under-five years in Ghana. *Journal of Epidemiology and Global Health , 6*, 131-140.

Kuziga, F., Adoke, Y., & Wanyenze, R. K. (2017). Prevalence and factors associated with anaemia among children aged 6 to 59 months in Namutumba district, Uganda: a cross-sectional study. *BMC Pediatrics, 17*(25), 1-9.

Kwofie, T. B., Anane, A. A., Nkrumah, B., Annan, A., Nguah, S. B., & Owusu, M. (2012). Respiratory viruses in children hospitalized for acute lower respiratory tract infection in Ghana. *Virology Journal*, *9*, 78.

Lakshmi, N. B. (2010). *Prevalence and factors associated with acute respiratory infections in children under five in urban slums of Bangalore city, Karnataka.* Unpublished master's thesis. Achutha Menon Centre for Health Sciences. Thiruvananthapuram, Kerala, India.

Lamberti, L. M., Walker, C. L. F., Noiman, A., Victora, C., & Black, R. E. (2011). Breastfeeding and the risk of diarrhoea morbidity and mortality. *BMC Public Health, 11*(Suppl 3), S15.

Lamerz, A., Kuepper-Nybelen, J., Wehle, C., Bruning, N., Trost-Brinkhues, G., Brenner, H., Hebebrand, J., & Herpertz-Dahlmann, B. (2005). Social class, parental education, and obesity prevalence in a study of six-year-old children in Germany. *International Journal of Obesity, 29,* 373-380.

Langbein, J. (2017) Firewood, smoke and respiratory diseases in developing countries - The neglected role of outdoor cooking. *PLoS ONE 12*(6), e0178631.

Leal, L. P., Filho, M. B., de Lira, P. I. C., Figueiroa, J. N., & Osorio, M. M. (2011). Prevalence of anemia and associated factors in children aged 6-59 months in Pernambuco Northeastern Brazil. *Rev Saude Publica, 45*(3); 1-9.

Lee, H-Y., Huy, N. V., & Choi, S. (2016). Determinants of early childhood morbidity and proper treatment responses in Vietnam: results from the Multiple Indicator Cluster Surveys, 2000-2011. *Global Health Action, 9*(10), 11-21.

Lee, S., & Kelleher, S. L. (2016). Biological underpinnings of breastfeeding challenges: the role of genetics, diet, and environment on lactation physiology. *American Journal of Physiology- Endocrinology and Metabolism, 311*(2), 405-422.

Legason, I. D., Atiku, A., Ssenyonga, R., Olupot-Olupot, P., Barugahare, J. B. (2017). Prevalence of anaemia and associated risk factors among children in north-western Uganda: A cross-sectional study. *BMC Hemtology*, 17, 10.

Lenz, E. R., & Shortridge-Baggett, L. M. (2002). *Self efficacy in nursing: research and measurement perspectives*. New York: Springer Publications.

Lepage, P., & de Perre, P. V. (2012). *The immune system of breast milk: Antimicrobial and anti-inflammatory properties.* Advances in Experimental Medicine and Biology book series (AEMB, volume 743).

Levin, D. M. (1988). *The opening of vision: Nihilism and the postmodern situation*. London: Routledge.

Levitt, E. J., Pelletier, D. L., & Pell, A. N. (2009). Revisiting the UNICEF malnutrition framework to foster agriculture and health sector collaboration to reduce malnutrition: a comparison of stakeholder priorities for action in Afghanistan. *FoodPolicy, 34*, 156–65.

Lewin, K. (1947) Lewin's change management model Understanding the three stages of change. Retrieved from http://www.mindtools.com/pages/ article/newPPM 94.htm.

Lin, H., Sun, L., Lin, J., He, J., Deng, A., Kang, M., Zeng, H., Ma, W., & Zhang, Y. (2014). Protective effect of exclusive breastfeeding against hand, foot and mouth disease. *BMC Infectious Diseases, 14*, 645.

Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). *Paradigmatic controversies, contradictions, and emerging confluences, revisited.* The SAGE handbook of qualitative research (pp. 97-128). LA: SAGE.

Lindsay, A. C., Machado, M. T., Sussner, K. M., Hardwick, C. K., & Peterson, K. E. (2008). Infant-feeding practices and beliefs about complementary feeding among low-income Brazilian mothers: a qualitative study. *Food Nutrition Bulletin, 29*(1), 15-24.

Liu, J., Ai, H., Xiong, Y., Li, F., Wen, Z., Liu, W., et al. (2015) Prevalence and Correlation of Infectious Agents in Hospitalized Children with Acute Respiratory Tract Infections in Central China. *PLoS ONE 10*(3), e0119170.

Magalhães, S. R. J., & Clements, A. C. A. (2011) Mapping the Risk of Anaemia in Preschool-Age Children: The Contribution of Malnutrition, Malaria, and Helminth Infections in West Africa. *PLoS Med 8*(6), e1000438.

Mak, H. W., & Davis, J. M. (2014). The application of the theory of planned behavior to help-seeking intention in a Chinese society. *Social Psychiatry and Psychiatric Epidemiology, 49*(9), 1501-15.

Mandell, L. A. (2005). Etiologies of acute respiratory tract infections. *Clinical Infectious Diseaeses, 41*(4), 503-506.

Mann, D. (2010). *Breastfeeding cuts fever risk after vaccines*. Retrieved from https://www.medicinenet.com/script/main/art.asp?articlekey=116372

Maponga, B. A., Chirundu, D., Gombe, N. T., Tshimanga, M., Shambira, G., & Takundwa, L. (2013). Risks factors for contracting watery diarrhoea in Kadoma city, Zimbabwe: A case control study. *BMC Infectious Diseases, 13*, 567.

Marques, R. F. S. V., Taddei, J. A. A. C., Lopez, F. A., & Braga, J. A. P. (2014). Breastfeeding exclusively and iron deficiency anemia during the first 6 months of age. *Revista da Associacao Medica Brasileira*, *60*(1), 18-22.

Marzuki, N. S., Yohmi, E., Nainggolan, E., Hegar, B., Oswari, & Partiwi, I. A. N. (2014). Breastfeeding practices in mothers: a qualitative study. *Paediatrica Indonesiana*, *54*(1), 35-41

Mathew, J. L., Singhi, S., Ray, P., Hagel, E., Saghafian-Hedengren, S., Bansal, A., Ygberg, S., Sodhi, KS., Kumar, BVR., & Nilsson, A. (2015). Etiology of community acquired pneumonia among children in India: prospective, cohort study. *Journal of Global Health*, *5*(2), 050418.

Mayo. (2017). *Oview of fever*. Retrieved from https://www.mayoclinic.org /diseases-conditions/fever/symptoms-causes/syc-20352759

Mbada, C. E., Olowookere, A. E., Faronbi, J. O., Oyinlola-Aromolaran, F. C., Faremi, F. A., Ogundele, A O., Awotidebe, T. O., Ojo, A. A., & Augustine, O. A. (2013). Knowledge, attitude and techniques of breastfeeding among Nigerian mothers from a semi-urban community. *BMC Res Notes*, *6*, 552.

McGaghie, W. C., Bordage, G., & Shea, J. A. (2001). Problem statement, conceptual framework and research question. *Academic Medicine, 76*(9), 923-924.

McGlynn, N., Wilk, P., Luginaah, I., Ryan BL., & Thind, A. (2015). Increased use of recommended maternal health care as a determinant of immunization and appropriate care for fever and diarrhoea in Ghana:

an analysis of pooling three demographic and health surveys. *Health Policy and Planning*, *30*(7), 895-905.

MedBroardcast. (2017). *Fever*. Retrieved from http://www.medbroadcast.com/condition/getcondition/fever

Meinzen-Derr, J. K., Guerrero, M. L., Altaye, M., Ortega-Gallegos, H., Ruiz-Palacios, G. M., & Morrow, A. L. (2006). Risk of Infant Anemia Is Associated with Exclusive Breast-Feeding and Maternal Anemia in a Mexican Cohort. *Journal of Nutrition, 136,* 452-458.

Mengistie, B., Berhane, Y., & Worku, A. (2013). Prevalence of diarrhea and associated risk factors among children under-five years of age in Eastern Ethiopia: A cross-sectional study. *Open Journal of Preventive Medicine*, *3*(7), 446-453

Mesfin, F., Berhane, Y., & Worku, A. (2015) Anemia among Primary School Children in Eastern Ethiopia. *PLoS ONE 10*(4), e0123615.

Messelu, Y., & Trueha, K. (2016). Application of multilevel binary logistic regressions analysis in determining risk factors of diarrheal morbidity among under five children in Ethiopia. *Public Health Research*, *6*(4), 110-118.

MFMER. (2017). Fever-Symptoms and causes. Retrieved from https://www.mayoclinic.org/diseases-conditions/fever/symptoms-causes/syc-20352759

Mihrete, T. S., Alemie, G. A., & Teferra, A. S. (2014). Determinants of children diarrhea among underfive children in Benishangul Gumuz Regional State, North West Ethiopia. *BMC Pediatrics*, *14*, 102.

Mihrshahi, S., Ichikawa, N., Shuaib, M., Oddy, W., Ampon, R., Dibley, M. J., Kabir, A. K. M. I., & Peat, J. K. (2007). Prevalence of exclusive breastfeeding in Bangladesh and its association with diarrhoea and acute respiratory infection: Results of the Multiple Indicator Cluster Survey 2003. *Journal of Health, Population and Nutrition, 25*(2), 195-204.

Mihrshahi, S., Oddy, W. H., Peat, J. K., & Kabir, I. (2008). Association between infant feeding patterns and diarrhoeal and respiratory illness: A cohort study in Chittagong, Bangladesh. *International Breastfeeding Journal, 3*; 28.

Miller, Z. D. (2017). *The enduring use of the theory of planned behaviour*. Human Dimensions of Wildlife, 22(6). Retrieved from https://doi.org/10.1080/ 10871209.2017.1347967

Mitchell, A. (2005) *The ESRI guide to GIS analysis, volume 2: spatial measurements and statistics.* ESRI Press, Redlands [CA]

Mitchodigni, I. M., Hounkpatin, W. A., Ntandou-Bouzitou, G., Termote, C., Kennedy, G., & Hounhouigan, D. J. (2017). Complementary Feeding Practices of Children Aged 6-23 Months in Rural Area, Southern-Benin: Challenges and Opportunities. *International Journal of Tropical Disease & Health, 24*(2), 1-12.

MOH. (2007). Under five’s child health policy: 2007-2015. Retrieved from https://extranet.who.int/.../GHA%202007%20Under%20Five%27s

Mogre, V., Dery, M., & Gaa, P. K. (2016). Knowledge, attitudes and determinants of exclusive breastfeeding practice among Ghanaian rural lactating mothers. *International Breastfeeding Journal, 11*, 12.

Mohammed, E. S., Ghazawy, E. R., & Hassan, E. E. (2014). Knowledge, Attitude, and Practices of Breastfeeding and Weaning Among Mothers of Children up to 2 Years Old in a Rural Area in El-Minia Governorate, Egypt. *Journal of Family Medicine and Primary Care, 3*(2), 136-140.

Momeni M., Danaei M., Kermani AJNK., Bakhshandeh M., Foroodnia S., Mahmoudabadi Z., Amirzadeh R., Safizadeh H. (2017). Prevalence and risk factors of low birth weight in the Southeast of Iran. *International Journal of Preventive Medicine, 8*, 12.

Monterrosa, E. C., Frongillo, E. A., Vasquez-Garibay, E. M., Romero-Velarde, E., Casey, L. M., & Willows, N. D. (2008). Predominant breastfeeding from birth to six months is associated with fewer gastrointestinal infections and increased risk for iron deficiency among infants. *Journal of Nutrition, 138*(8), 1499-1504.

Monto, A. (2002). Epidemiology of viral respiratory infections. *American Journal of Medicine, 112* (Suppl 6A), 4-12.

Morrow, A. L., Ruiz-Palacios, G. M., Jiang, X., & Newburg, D. S. (2001). Human-milk glycans that inhibit pathogen binding protect breastfeeding infants against infectious diarrhoea. *The Journal of Nutrition*, *135*(5), 1304-1307.

Mosley, W. H, & Chen, L. C. (2003). An analytical framework for the study of child survival in developing countries. 1984. *Bulletin of the World Health Organisation*, *81*(2), 140-145.

Muchie, K. F. (2016). Determinants of severity levels of anaemia among children aged 6-59 months in Ethiopia: Further analysis of the 2011 Ethiopian Demographic and Health Survey. *BMC Nutrition, 2,* 51.

Muenchhoff, M., & Goulder, P. J. R. (2014). Sex differences in pediatric infectious diseases. *Journal of Infectious Diseases*, *209*(Suppl 3), S120-S126.

Mukhtar, A., Izham, M. I. M., & Pathiyil, R. S. (2011). A survey of mothers' knowledge about childhood diarrhoea and its management among a marginalised community of Morang, Nepal. *Australas Medical Journal.*, *4*(9), 474-479.

Murray, C. J. L., Rosenfeld, L. C., Lim, S. S., Andrews, K. G., Foreman, K. J., Haring, D., Fullman, N., Naghavi, M., Lozano, R., Lopez, A. D. (2012). *Lancet*, *379*(9814), 413-431.

Naghashpour, M., Shakerinejad, G., Lourizadeh, M. R., Hajinajaf, S., & Jarvandi, F. (2014). Nutrition education based on health belief model improves dietry calcium intake among female students of junior high schools. *Journal of Health, Population and Nutrition, 32*(3), 420-429

Nankumbi, J., & Muliira, J. K. (2015). Barriers to Infant and Child-feeding Practices: A Qualitative Study of Primary Caregivers in Rural Uganda. *Journal of Health, Population and Nutrition, 33*(1), 106-116.

Navar-Boggan, A. M., Halsey, N. A., Golden, W. C., Escobar, G. J., Massolo, M., & Klein, N. (2010). Risk of fever and sepsis evaluation following routine immunizations in the neonatal intensive care unit. *Journal of Perinatology, 30*, 604-609.

Netzer-Tomkins, H., Rubin, L., & Ephros, M. (2016). Breastfeeding is associated with decreased hospitalization for neonatal fever. *Breastfeeding Medicine, 11*(5), 218-221.

Neuman, L. W. (2000). *Social Research Methods: Qualitative and Quantitative Approaches (4th Ed.)*, USA: Allyn and Bacon.

NICE. (2017). *Maternal and child nutrition.* Retrieved from https:// www.nice.org.uk/guidance/ph11.

Nkrumah J. (2017). Maternal work and exclusive breastfeeding practice: a community based cross-sectional study in Efutu Municipal, Ghana. *International Breastfeeding Journal*, *12*, 10.

Nonvignon, J., Aikins, M. K. S., Chinbuah, M. A., Abbey, M., Gyapong, M., Garshong, B. N. A., Fia, S., John, O., & Gyapong, J. O. (2010). Treatment choices for fevers in children under-five years in a rural Ghanaian district. *Malaria Journal*, *9*, 188.

Nonvignon J. & Nonvignon J. (2012). Socioeconomic status and the prevalence of fever in children under five: evidence from four sub-Saharan African countries. BMC Research Notes, *5*, 380.

Nyadanu, S. D., Osei, F. B., Nawumbeni, D. N., Adampah, T., & Polishuk, R. M. (2016). Spatial Analysis of Public Health Data in Ghana: a case study of exploratory spatial analysis of Diarrhoea. *Journal of Health, Medicine and Nursing*, *28,* 88- 96.

Nyarko, S. H., & Cobblah, A., (2015). Sociodemographic determinants of malaria among under-five children in Ghana. *Malaria Research and Treatment*, *304361*, 6.

O’Brien, M., & Fallon, A. (2005). The effect of breastfeeding self-efficacy on breastfeeding duration. *Births Issues*, *14*(4), 135-142.

Oddy, W. H., Sly, P. D., de Klerk, N. H., Landau, L. I., Kendall, G. E., Holt, P. G., & Stanley, F. J. (2003). Breastfeeding and respiratory morbidity in infancy: a birth cohort study. *Arch Dis Child, 88*, 224-228.

Ogbo, F. A., Eastwood, J., Page, A., Arora, A., McKenzie, A., Jalaludin, B, Tennant, E., Miller, E., Kohlhoff, J., et al. (2017). Prevalence and determinants of cessation of exclusive breastfeeding in the early postnatal period in Sydney, Australia. *International Breastfeeding Journal*, *12*:16.

Olatona, F. A., Adenihun, J. O., Aderibigbe, S. A., S., & Adeniyi, O. F. (2017). Complementary Feeding Knowledge, Practices, and Dietary Diversity among Mothers of Under-Five Children in an Urban Community in Lagos State, Nigeria. *International Journal of Maternal and Child Health*, *6*(1), 46-59.

O'Meara, W. P., Mott, J A., Laktabai, J., Wamburu, K., Fields, B., Armstrong, J., Taylor, S. M., MacIntyre, C., Sen, R, Menya, D., Pan, W, Nicholson, B. P., Woods, C W., & Holland, T. L. (2015). Etiology of Pediatric Fever in Western Kenya: A Case–Control Study of Falciparum Malaria, Respiratory Viruses, and Streptococcal Pharyngitis. *American Journal of Tropical Medicine and Hygiene, 92*(5), 1030–1037.

Osei, F. B., & Stein, A. (2017). Spatial variation and hot-spots of district level diarrhea incidences in Ghana: 2010–2014. *BMC Public Health 17*, 617.

Oshikoya, K. A., & Senbanjo, I. O. (2008). Fever in Children: Mothers' Perceptions and their Home Management. *Iranian Journal of Pediatrics, 18*(3), 229-236.

Othero, D. M., Orago, A. S., Groenewegen, T., Kaseje, D. O., & Otengah, P. A. (2008). Home management of diarrhoea among under-fives in a rural community in Kenya: Household perceptions and practices. *East African Journal of Public Health, 5*(3), 142-146

Oyekale, A. S., & Oyekale, T. O. (2010). Application of health belief model for promoting behavior change among Nigerian single youth. *African Reproductive Health, 14*(2), 63-75.

Palmeira, P., & Carneiro-Sampaio, M. (2016). Immunology of breast milk. *Revista Associacao Medica Brasileira, 62*(6), 584-593.

Paul, S. K., Roy, Islam, Q. R., Islam, Z., Akteruzzaman, Rouf, A., Kabir, L., & Afroza, S. (2015). Barriers of Appropriate Complementary Feeding Practices in under two Children. *Journal of Bangladesh College of Physicians and Surgeons, 33*(4).

Pervin, J., Moran, A., Rahman, M., Razzaque, A., Sibley, L., Streatfield, P. K., Reichenbach, L. J., Hruschka, D., & Rahman, A. (2012). Association of antenatal care with facility delivery and perinatal survival-a population-based study in Bangladesh. *BMC Pregnancy and Childbirth, 12*, 111.

Pickering, A. J., & Davis J. (2012). Freshwater availability and water fetching distance affect child health in sub-Saharan Africa. *Environmental Science & Technology, 46*(4), 2391-2397.

Pinzon-Rondon, A. M., Aguilera-Otalvaro, P., Zarate-Ardila, C., & Hoyos-Martinez, A. (2016). Acute respiratory infection in children from developing nations: a multi-level study. *Paediatric International Child Health, 36*(2); 84-90.

Pinzon-Rondon, A. M., Zarate-Ardila, C., Hoyos-Martinez, A., Ruiz-Sternberg, A., & Velez-van-Meerbeke (2015). Country characteristics and acute diarrhea in children from developing nations: a multilevel study. *BMC Public Health*, *15*, 811.

Pirincci, E., Tasdemir, R., & Oguzoncul, A. F. (2016). Knowledge of lactational amenorrhoea as a contraceptive method among mothers of infants aged 0-6 months in a district, Eastern Turkey. *International Journal of Community Medicine and Public Health, 3*(6), 1363-1370.

Pisacane, A., Continisio, P., Palma, O., Cataldo, S., De Michele, F., & Vairo, U. (2010). Breastfeeding and risk for fever after immunization. *Pediatrics, 125*(6), e1448-e1452.

Plate, D. K., Strassmann, B. I., & Wilson, M. L. (2004). Water sources are associated with children diarrhoea prevalence in rural east-central Mali. *Tropical Medicine International Health*, *9*(3), 416-25.

Power, E. M. (1999): An introduction to Pierre Bourdieu's key theoretical concepts. *Journal for the Study of Food and Society, 3*(1), 48-52.

Prajapati, B., Talsania, N., & Sonaliya, K. N. (2011). A study on prevalence of acute respiratory tract infections in under-five children in urban and rural communities of Ahmedabad District, Gujarat. *National Journal of Community Medicine, 2*(2), 255-289.

Prietsch, S. O., Fisher, G. B., Cesar, J. A., Lempek, B. S., Barbosa, L. V. Jr., Zogbi, L., Cardoso, O. C., & Santos, A. M.. (2008). Acute lower respiratory illness in under-five children in Rio Grande, Rio Grande do Sul State, Brazil: prevalence and risk factors. *Cad Saude Publica, 24*(6), 1429-38.

Pruss-Ustun, A., Bartram, J., Clasen, T., Colford, J., Cumming, O., Curtis, V., Bonjour, S., Dangour, A., De France, J., Fewtrell, L., Freeman, M. C., Gordon B, et al. (2014). Burden of disease from inadequate water, sanitation and hygiene in low- and middle-income settings: a retrospective analysis of data from 145 countries. *Tropical Medicine and International Health, 19*(8), 894-905.

Qasem, W. A., & Friel, J. K. (2015). An overview of iron in term breast-fed infants. *Clinical Medicine Insights Pediatrics, 9*, 79-84.

Quigley, M. A., Kelly, Y. J., & Sacker, A. (2007). Breastfeeding and hospitalization for diarrheal and respiratory infection in the United Kingdom Millennium Cohort study. *Pediatrics, 119*(4), e837-e842.

Raheem, R. A., Binns, C. W., & Chih, H. J. (2017). Protective effects of breastfeeding against acute respiratory tract infections and diarrhea: Findings of a cohort study. *Journal of Paediatrics and Child Health, 53*(3), 271-276.

Rahmati S., Delpishe A., Azami M., Hafezi-Ahmadi MR., & Sayehmiri K. (2017). Maternal anemia during pregnancy and infant low birth weight: A systematic review and meta-analysis. *International Journal of Reproductive Biomedicine, 15*(3), 125-134

Ramakrishnan U. (2004). Nutrition and low birth weight: from research to practice. *American Journal of Clinical Nutrition, 79*(1), 17-21.

Ramani, V. K., Pattankar, J., & Puttahonnappa, S. K. (2016). Acute respiratory infections among under five age group children at urban slums of Gulbarga City: A longitudinal study. *Journal of clinical & Disease Research, 10*(5), LC08-LC13.

Rao S., Swathi PM., Unnikrishnan B., & Hegde A. (2011). Study of complementary feeding practices among mothers of children aged six months to two years – A study from coastal south India. *Australasian Medical Journal, 4*(5), 252-257.

Rasooly, M. H., Saeed, K. M. I., Noormal, B., Aman, I., Arnold, F., Govindasamy, P., Rutstein S., & Winter R. (2013). *The effect of birth intervals on causes of under-five mortality in Afghanistan.* Calverton, MD, USA: Demographic and Health Research Division, and Macro International Inc.

Rathaur, K. V., Pathania, M., Jayara, A., & Yadav, N. (2014). Clinical study of acute children diarrhoea caused by bacterial enteropathogens. *Journal of Clinical Diagnostic Research, 8*(5), PC01–PC05.

Rebhan, B., Kohlhuber, M., Schwegler, U., Fromme, H., Abou-Dakn, M., & Koletzko, B. V. (2009). Breastfeeding duration and exclusivity associated with infants' health and growth: data from a prospective cohort study in Bavaria, Germany. *Acta Paediatrica, 98*(6), 974-80.

Reinhardt, K. & Fanzo, J. (2014). Addressing chronic malnutrition through multi-sectoral, sustainable approaches: A review of the causes and consequences. *Frontiers in Nutrition, 1*(13), 1-10.

Richards, M., Hardy, R., & Wadsworth, M. E. (2002). Long-term effects of breast-feeding in a national birth cohort: educational attainment and midlife cognitive function. *Public Health and Nutrition, 5*, 631–635.

Robert, E., Coppieters, Y., Swennen, B., & Dramaix M. (2014). The Reasons for Early Weaning, Perceived Insufficient Breast Milk, and Maternal Dissatisfaction: Comparative Studies in Two Belgian Regions. *International Scholarly Research Notices, 678564*, 11.

Roberts, D., & Matthews, G. (2016). Risk factors of malaria in children under the age of five years old in Uganda. *Malaria Journal, 15*, 246.

Rohmawati, N., Panza, A., & Lertmaharit, S. (2012). Factors associated with diarrhea among children under five years of age in Banten Province, *Indonesian Journal of Health Research, 26*(1), 31-34.

Rosa, G. L., Fratini, M., Libera, S. D., Iaconelli, M., & Muscillo, M. (2013). Viral infections acquired indoors through airborne, droplet or contact transmission. *Annali dell' Istituto Superiore di Sanita, 49*(2), 124-132.

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs, 2*(4), 328-339.

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social Learning Theory and Health Belief Model. *Health Education and Behaviour, 15*(2), 175-183.

Ruel, M. T., Brown, K. H., & Caulfield, L. E. (2003). Moving forward with complementary feeding: indicators and research priorities. *Food and Nutrition Bulletin, 24*(3), 289-290.

Rutstein, S.O. (2008). *Further Evidence of the Effects of Preceding Birth Intervals on Neonatal, Infant, and Under-Five-Years Mortality and Nutritional Status in Developing Countries: Evidence from the Demographic and Health Surveys.* Calverton, MD, USA: Demographic and Health Research Division, and Macro International Inc.

Saaka M., & Galaa Z. (2017). How is dietary diversity related to haematological status of preschool children in Ghana? *Food & Nutrition Research, 61*(1), 1333389.

Safe Water Network. (2017). *Access to safe water: Ghana*. Retrieved from http://www.safewaternetwork.org/countries-regions/ghana

Salako, L. A., Brieger, W. R., Afolabi, B. M., Umeh, R. E., Agomo, P. U., Asa, S., Adeneye, A. K., Nwankwo, B. O., & Akinlade, C. O. (2001). Treatment of childhood fevers and other illnesses in three rural Nigerian communities. *Journal of Tropical Pediatrics, 47*(4), 230-238.

Saleh, F., Ara, F., Hoque, A., & Alam, S. (2014). Complementary Feeding Practices among Mothers in Selected Slums of Dhaka City: A Descriptive Study. *Journal of Health, Population and Nutrition, 32*(1), 89-96.

Sanbata, H., Asfaw, A., & Kumie, A. (2014). Association of biomass fuel use with acute respiratory infections among under-five children in a slum urban of Addis Ababa, Ethiopia. *BMC Public Health, 14*, 1122.

Santos, R. F., Gonzalez, E. S. C., de Albuquerque, E. C., de Arruda, I. K. G., Diniz, A. S., Figueroa, J. N., & Pereira, A. P. C. (2011). Prevalence of anemia in under five-year-old children in a children's hospital in

Recife, Brazil. *Revista Brasileira de Hematologia Hemoterapia, 33*(2), 100-104.

Sanusi, R. A., Leshi, O. O., & Agada, UN (2016). Mothers' knowledge and practice of breastfeeding and complementary feeding in Enugu State, Nigeria. *Journal of Research Nursing and Midwifery, 5*(1), 21-29.

Schaffner A. (2006). Fever-useful or noxious symptom that should be treated? *Therapeutische Umschau, 63*, 185-188.

Scott, L. M., & Janikas, M. V. (2009). *Spatial statistics in ArcGIS: Handbook of applied spatial analysis*. Springer, Berlin, Heidelberg and New York.

Seema, P. A. K., & Satyanarayana L. (1997). Relactation: an effective intervention to promote exclusive breastfeeding. *Journal of Tropical Pediatrics, 43*(4), 213-216.

Setegn, T., Belachew, T., Gerbaba, M., Deribe, K., Deribew, A., & Biadgilign, S. (2012). Factors associated with exclusive breastfeeding practices among mothers in Goba district, south east Ethiopia: A cross-sectional study. *International Breastfeeding Journal, 7*(1), 17.

Shah, S., Kongre, V., Kumar, V., & Bharadwaj, R. (2016). A Study of Parasitic and Bacterial Pathogens Associated with Diarrhea in HIV-Positive Patients. *Cureus, 8*(9), e807.

Sharma, D., Kuppusamy, K., & Bhoorasamy, A. (2013). Prevalence of acute respiratory infections (ari) and their determinants in under five children in urban and rural areas of Kancheepuram district, South India. *Annals of Tropical Medicine and Public Health, 6,* 513-8

Shivaprakash, N. C., & Kutty, D. N. (2017). Magnitude of acute respiratory infections in 6 months – 6 years in a rural hospital in BG Nagara: a cross-sectional study. *International Journal of Pediatric Research, 4*(3), 226-232.

Silva, A., Atukorala, S., Weerasinghe, I., & Ahluwalia N. (2003). Iron supplementation improves iron status and reduces morbidity in children with or without upper respiratory tract infections: a randomized controlled study in Colombo, Sri Lanka, *The American Journal of Clinical Nutrition*, *77*(1), 234–241.

Simbauranga, R. H., Kamugisha, Hokororo EA, Kidenya BR and Makani J (2015). Prevalence and factors associated with severe anaemia amongst under-five children hospitalized at Bugando Medical Centre, Mwanza, Tanzania. *BMC Hematology, 15*, 13.

Simons, E. A. F., Cherian T., Chow J., Shahid-Salles, S. A., Laxminarayan, R., & John, T. J. (2006). *Disease control priorities in developing countries*. (2nd edition). The International Bank for Reconstruction and Development/The World Bank Group.

Singh, N., Chouhan, Y., Trivedi, A., Patel, S., & Sethia, S. (2016). A study to evaluate breastfeeding practices among lactating mothers: a community based study in rural anganwadi centers in field practice area of government medical college, Jabalpur, Madhya Pradesh, India. *International Journal of Community Medicine and Public Health, 3*(10), 2786-2793.

Siziya, S., Muula, A. S., & Rudatsikira, E. (2009). Diarrhoea and acute respiratory infections prevalence and risk factors among under-five children in Iraq in 2000. *Italian Journal of Pediatrics, 35*; 8.

Siziya, S., Muula, A. S., & Rudatsikira, E. (2013). Correlates of diarrhoea among children below the age of five years in Sudan. *African Health Science, 13*(2), 376-383.

Snyman, K., Mwangwa, F., Bigira, V., Kapisi, J., Clark, T. D. et al. (2015). Poor housing construction associated with increased malaria incidence in a cohort of young Ugandan children. *American Journal of Tropical Medicine Hygiene, 92,* 1207–1213.

Stanly, A. M., Sathiyasekaran, B. W. C., & Palani, G. (2009). A population based study of acute diarrhoea among children under 5 years in a rural community in South India. *Sri Ramachandra Journal of Medicine, 1*(1),1-7.

Svedahl, S., Svendsen, K., Qvenild, T., Sjaastad, A. K., & Hilt, B. (2009). Short term exposure to cooking fumes and pulmonary function. *Journal Occupational Medicine and Toxicology, 4,* 9.

Taddele, M., Abebe, L., & Fentahun, N. (2014). Exclusive breastfeeding and maternal employment in Ethiopia: A comparative cross-sectional study. *International Journal of Nutrition and Food Sciences, 3*(6), 497-503.

Tadele, N., Habta, F., Akmel, D, & Deges, E. (2016). Knowledge, attitude and practice towards exclusive breastfeeding among lactating mothers in Mizan Aman town, Southwestern Ethiopia: descriptive cross-sectional study. *International Breastfeeding Journal, 11*, 3.

Taksande, A. M., & Yeole, M. (2015). Risk factors of acute respiratory infection (ARI) in under-five in a rural hospital of Central India. *Journal of Pediatric and Neonatal Individualized Medicine, 5*(1), e050105.

Talebi, S., Shahrabadi, H., Sabzevar, AV., Talebi, S., & Siyavoshi, M. (2016). Mothers' management of fever of children in Sabzevar. *Journal of Nursing and Midwifery Sciences, 3*(2), 32-39.

Tambe, A. B., Nzefa, L. D., & Nicoline, N. A. (2015). Childhood diarrhea determinants in sub-Saharan Africa: A cross sectional study of Tiko-Cameroon. *Challenges, 6*, 229-243.

Tamura, S., Funato, H., Hirabayashi, Y., Suzuki, Y., Nagamine, T., Aizawa, C., et al. (1991). Cross-protection against influenza A virus infection by passively transferred respiratory tract IgA antibodies to different hemagglutinin molecules. *European Journal of Immunology*, *21*, 1337–44.

Taylor, E. T., & Nakai, S. (2012). Prevalence of acute respiratory infections in women and children in Western Sierra Leone due to smoke from wood and charcoal stoves. *International Journal of Environmental Research and Public Health, 9*(6), 2252-2265.

Tazinya, A. A., Halle-Ekane, G. E., Mbuagbaw, L. T., Abanda, M., Atashili, J., & Obama, M. T. (2018). Risk factors for acute respiratory infections in children under five years attending the Bamenda Regional Hospital in Cameroon. *BMC Pulmonary Medicine, 18*, 7.

Teixeira, M. L., Lira, P. I. C., Coutinho, S. B., Eickmann, S. H., & Lima, M. C. (2010). Influence of breastfeeding type and maternal anemia on hemoglobin concentration in 6-months-old infants. *Jornal de Pediatria*, *86*(1), 65-72.

Tetteh, S. (2013). *Sanitation and Diarrhoeal Disease among Children under Five Years in Ghana*. Unpublished master's thesis. University of Ghana. Accra, Ghana.

Thaim, S., Diene, A. N., Fuhrimann, S., Winkler, M. S., Sy, I., Ndione, J. A., & Schindler C., Vounatsou P., Utzinger J., Faye O., Cisse G. (2017). Prevalence of diarrhoea and risk factors among children under five years old in Mbour, Senegal: a cross-sectional study. *Infectious Diseases of Poverty, 6,* 11.

The Sphere Project (2011). *Humanitarian Charter and Minimum Standards in Humanitarian Response, Chapter 3: Minimum Standards in Food Security and Nutrition*. Geneva: The Sphere Project.

Thet, M. M., EiKhaing, E., Diamond-Smith, N., Sudhinaraset, M., Oo, S., & Aung, T. (2016). Barriers to exclusive breastfeeding in the Ayeyarwaddy Region in Myanmar: Qualitative findings from mothers, grandmothers, and husbands. *Appetite, 96*, 62-69.

Thiam, S., Diene, A. N., Fuhrimann, S., Winkler, M. S., Sy, I., Ndione, J. A., Schindler, Vounatsou P, et al. (2017). Prevalence of diarrhoea and risk factors among children under five years old in Mbour, Senegal: a cross-sectional study. *Infectious Diseases of Poverty, 6*, 109.

Torres, M. A. A., Braga, J. A. P., Taddei, J. A. A. C., & Nobrega, F. J. (2006). Anaemia in low-income exclusively breastfed infants. *Jornal de Pediatria, 82*(4), 284-288.

Tran, T. D., Fisher, J., Hanieh, S., Tran, T., Simpson, J. A., Tran, H., et al. (2015) Antenatal Iron Supplementation Regimens for Pregnant Women in Rural Vietnam and Subsequent Haemoglobin Concentration and Anaemia among Their Infants. *PLoS ONE 10*(4), e0125740.

Troeger, C., Forouzanfar, M., Rao, P., Khalil, I., Brown, A., Swartz, S., Fullman, N., Mosser, J., Thompson, R. I., et al. (2017). Estimates of the global, regional, and national morbidity, mortality and aetiologies of lower respiratory tract infections in 195 countries: a systematic analysis for the Global Burden of Diseases Study 2015. *Lancet Infectious Diseases*, *17*(11), 1133-1161.

Tromp, I., Kiefte-de, J. J., Raat, H., Jaddoe, V., Franco, O., Hofman, A., et al. (2017). Breastfeeding and the risk of respiratory tract infections after infancy: The Generation R Study. *PLoS ONE*, *12*(2), e0172763.

Tsai, P-J. (2012). Application of Moran's Test with an Empirical Bayesian Rate to Leading Health Care Problems in Taiwan in a 7-year period. Global *Journal of Health Science*, *4*(5), 63-77.

Udoh, E. E., & Amodu, O. K. (2016). Complementary feeding practices among mothers and nutritional status of infants in Akpabuyo Area, Cross River State Nigeria. *Springerplus*, *5*(1), 2073.

Ujunwa, F. A., & Ezeonu, C. T. (2014). Risk factors for acute respiratory tract infections in under-five children in Enugu Southern Nigeria. *Annals of Medical & Health Sciences Research*, *4*(1), 95-99.

UN. (2016). *Sustainable Development Goals: Goal 3 – Ensure healthy lives and promote well-being for all at all ages*. Retrieved from http://www. un.org/sustainabledevelopment/health/

UN. (2016). *Sustainable Development Goals: Good health and well-being.* Retrieved from https://www.un.org/development/desa/ disabilities/envision2030-goal3.html

UNICEF. (2005). *International Code of Marketing of Breast-milk Substitutes.* Retrieved from https://www.unicef.org/nutrition/index_24805.html

UNICEF. (2010). *WASH in communities.* Retrieved from https://www. unicef.org/ghana/wes.html

UNICEF (2015). *Basic sanitation. UNICEF GHANA Internal statistical bulletin. Beyond Malaria.* Retrieved from https://data.unicef.org/ resources/progress-drinking-water-sanitation-hygiene-update-sdg-baselines/

UNICEF (2015). *Breastfeeding: Impact on child survival and global situation.* Retrieved from http://www.unicef.org/nutrition/index_24824 .html

UNICEF. (2013). *Improving child nutrition: The achievable imperative for global progress. Division of Communication, UNICEF, New York*. Retrieved from https://www.unicef.org/nutrition/index_68661.html

UNICEF. (2017). *Acute respiratory infection (pneumonia).* Retrieved from https://data.unicef.org/topic/child-health/pneumonia/

UNICEF. (2017). *Diarrhoea remains a leading killer of young children, despite the availability of a simple treatment solution.* Retrieved from https://data.unicef.org/topic/child-health/diarrhoeal-disease/

UNICEF/WHO. (1991). *The Baby-Friendly Hospital Initiative.* Retrieved from https://www.unicef.org/programme/breastfeeding/baby.htm

Valizadeh, S., Hosseinzadeh, M., Mohammadi, E., Hassankhani, H., Fooladi, M. M., & Schmied, V. (2017). Addressing barriers to health: Experiences of breastfeeding mothers after returning to work. *Nursing and Health Sciences, 19,* 105–111

VanBuskirk, K. M., Ofosu, A., Kennedy, A., & Denno, D. M. (2014). Pediatric anemia in rural Ghana: a cross-sectional study of prevalence and risk factors. *Journal of Tropical Pediatrics*, *60*(4), 308-17.

Walke, S. P., Das, R., Acharya, A. S., & Pemde, H. K. (2014). Incidence, pattern, and severity of acute respiratory infections among infants and tollers of a Peru-Urban area of Delhi: A 12 months prospective study. *International Scholarly Research Notices, 14,* 165152.

Walker, C., Rudan, I., Liu, L., Nair, H., & Theodoratou, E. (2013). Global burden of childhood pneumonia and diarrhoea. *Lancet*, *381*, 1405-1416.

Wangdi, K. & Clements, A. C. A. (2017). Spatial and temporal patterns of diarrhoea in Bhutan 2003–2013. *BMC Infectious Diseases, 17,* 507.

WaterAid. (2017). *Ghana: water*. Retrieved from https://www.wateraid.org/us/where-we-work/ghana

WHO. (1981). *International Code of Marketing of Breast-milk Substitutes.* WHO Press, Geneva, Switzerland. Retrieved from http://www.who.int/nutrition/publications/infantfeeding/924154 1601/en/

WHO. (1991). *Indicators for assessing breastfeeding practices*. Division of Child Health and Development, WHO Press, Geneva, Switzerland. Retrieved from http://www.who.int/maternal_child_adolescent/documents/cdd_ser_ 91_14/en/

WHO. (2001). *Iron deficiency anaemia: Assessment, prevention, and control – A guide for programme managers*. WHO Press, Geneva, Switzerland: Author.

WHO. (2001). *The World Health Organization's infant feeding recommendation*. Retrieved from http://www.who.int/nutrition/topics/infantfeeding_recommendation/en/

WHO. (2005). *Report of a technical consultation on birth spacing*. WHO Press, Geneva, Switzerland: Author.

WHO. (2008). *Indicators for assessing infant and young child feeding practices.* WHO Press, Geneva, Switzerland: Author.

WHO. (2008). *Worldwide prevalence of anaemia 1993-2005*. WHO Press, Geneva, Switzerland: Author.

WHO. (2013). *Hospital care for children: Guidelines for the management of common childhood illness.* WHO Press Geneva, Switzerland: Author

WHO. (2015). *Global Health Observation (GHO) data: Causes of child mortality*. Retrieved from http://www.who.int/gho/child_health/mortality/causes/en/

WHO. (2016). *WHO recommendation on antenatal care for a positive pregnancy experience*. WHO Press, Geneva, Switzerland: Author.

WHO. (2017). *Global Strategy for Infant and Young Child Feeding*. WHO Press, Geneva, Switzerland: Author.

WHO. (2017). *Health topics: Anemia*. Retrieved from http://www.who.int/ topics/anaemia/en/

WHO. (2017). *Health topics: Diarrhoea*. Retrieved http://www. who.int/topics/ diarrhoea/en/

WHO. (2017). *Nutrition: Complementary feeding*. Retrieved http://www. who.int/ nutrition/topics/complementary_feeding/en/

WHO/UNICEF. (2003). *Global strategy for infant and young child feeding*. WHO Press, Geneva, Switzerland: Author.

Wilunda, C., & Panza, A. (2009). Factors association with diarrhoea among children less than 5 years old in Thailand: A secondary analysis of Thailand Multiple Indicator Cluster Survey 2006. *Journal of Health Research, 23*, 17-22.

Woldie, H., Kebede, Y., & Tariku, A. (2015). Factors associated with anemia among children aged 6-23 months attending growth monitoring at Tsisika Health Center, Wag-Himra Zone, Northeast Ethiopia. *Journal of Nutrition and Metabolism, 10,* 1-9.

Wong, L. P., & Abubakar, S. (2013) Health Beliefs and Practices Related to Dengue Fever: A Focus Group Study. *PLoS Negleted Tropical Diseases, 7*(7), e2310.

Wood, K. M. & Qureshi, K. (2017). Facilitators and Barriers for Successful Breastfeeding among Migrant Chuukese Mothers on Guam. *SAGE Open Nursing, 3,* 1-9.

Yalcin, S. S., Berde, A. S., & Yalcin, S. (2016). Determinants of exclusive breastfeeding in sub-Saharan Africa: A multilevel approach. *Paediatric and Perinatal Epidemiology, 30*(5), 439-49.

Yalew, E. (2014). A qualitative study of community perceptions about childhood diarrhea and its management in Assosa District, West Ethiopia. *BMC Public Health, 14,* 975.

Yarnoff, B. O., Allaire, B. T., & Detzel, P. (2013). Associations between infant feeding practices and length, weight and disease in developing countries. *Frontiers in Pediatrics, 1*(21), 1-7.

Zahiruddin, Q. S., Gaidhane, A., Kogade, P., Kawalkar, U., Khatib, N., & Gaidhane S. (2016). Challenges and Patterns of Complementary Feeding for Women in Employment: A Qualitative Study from Rural India. *Current Research in Nutrition and Food Science, 4*(1), 25-31.

Zhao, G., Xu, G., Zhou, M., Jiang, Y., Richards, B., Clark, K. M., Kaciroti, N., Georgieff, M. K., Zhang, Z., Tardif, T., Li, M., & Lozoff, B. (2015). Parental iron supplementation reduces maternal anaemia, iron deficiency, and iron deficiency anaemia in a randomized clinical trial in rural China, but iron deficiency remains widespread in mothers and neonates. *The Journal of Nutrition, 145,* 1916-1923.

Zhao, A., Zhang, I., Peng, Y., Li, J., Yang, T., Liu, Z., Lv, Y., & Wang, A. (2012). Prevalence of Anemia and Its Risk Factors Among Children 6–36 Months Old in Burma. *American Journal of Tropical Medicine and Hygiene, 87*(2), 306–311.

Zuffo, C. R., Osório, M. M., Taconeli, C. A., Schmidt, S. T., da Silva, B. H. C., & Almeida, C. C. (2016). Prevalence and risk factors of anemia in children. *Jornal de Pediatria, 92*(4), 353-360.

Zyoud, S. H., Al-Jabi, S. W., Sweileh, W. M., Nabulsi, M. M., Tubaila, M. F., Awang, R., & Sawalha, A. F. (2013). A study to identify parents' beliefs and practices regarding childhood fever management. *BMC Pediatrics, 13*, 66.

APPENDICES

Appendix A – Interview Guide

<u>INTERVIEW GUIDE</u>
IN-DEPTH INTERVIEW TOPICS TO BE DISCUSSED WITH MOTHERS ON BREASTFEEDING PRACTICES AND CHILDHOOD MORBIDITY

Introduction
Thank you for agreeing to participate in the study. We shall have a short discussion to obtain your views on breastfeeding practices and related childhood health outcomes. We want to assure you that anything you say in this discussion will be confidential and that no identifying information will be recorded. Nothing that is discussed in this interview will be provided to anyone outside of the research. Do you have any question?

This interview is meant for mothers with infants and children aged 0-23 months

(a) Introductory questions (warm up)

- Number of children
- Plans to have more children

(b) Background characteristics of participant

1. Age of mother
2. Educational level attained
3. Marital status
4. Occupation
5. Age of child
6. Sex of child
7. Region/Town

<u>MAIN ISSUES TO DISCUSS WITH PARTICIPANT</u>

1.0 Knowledge about breastfeeding practices

1.1 What is your understanding of exclusive breastfeeding?

Probe more on: Sources of information, and reasons for exclusive breastfeeding
What else does she know about exclusive breastfeeding?

1.2 What is your understanding of complementary breastfeeding?

Probe more on: Complementary foods to be given to a child
How a mother is supposed to start complementary feeding?
What more do you know about complementary feeding?

2.0. Putting knowledge of breastfeeding practices into practice

2.1 How did you put or how are you putting exclusive breastfeeding into practice?

Probe more on: practice of exclusive breastfeeding (start time and end time)
Why she did or did not exclusive breastfeed for six months.
Anything else on how you have been exclusively breastfeeding your child?

2.2 How have you been feeding your child with other foods?

Probe more on: Kinds of foods she gives to her child
Make-up of each food
Why she gave each of these foods to her child
Ask her whether she has anything else to say on the foods she gives to her child

3.0. Challenges of breastfeeding practices (exclusive and complementary)

3.1. What kind of challenges do you face at home when practicing exclusive breastfeeding?

Probe more on: Her home duties
How each duty interferes with exclusive breastfeeding
Societal pressure(s) interfering her exclusively breastfeeding her child
Any other challenges in relation to exclusively breastfeeding your child at home?

3.2 With complementary feeding, what kind of challenges do you face at home?

Probe more on: Availability of child foods at home
Time available for her to prepare food for her child at home
Any other child feeding challenges at home

3.3 At your work place, do you face challenges in relation to exclusive breastfeeding?

Probe more on: Enough time to exclusively breastfeed her child
Privacy to exclusively breastfeed her child at work
Any challenge(s) at her workplace that affects the way she exclusively breastfeeds

3.3 At your work place, do you face challenges in relation to complementary feeding?

Probe more on: Enough time to her child with other foods
Kinds of foods she feeds her child at work place
Why she feeds her child with each of the foods mentioned at work
Any challenge(s) at her workplace that affect the way she feeds her child

4.0. Health conditions noticed in child

4.1 Has your child experienced any disease(s)?

Probe more on: Diarrhea (loose and frequent stools)
Coughing (short and rapid breathing, nasal congestion, and runny nose)
Fever (high body temperature)
Anaemia (pale looks or weak or mostly crying, low blood levels)
Any other conditions such as rashes, malaria, etc.

5.0. Mother's views on the possible cause of conditions noticed in her child

5.1 In your view how can exclusive breastfeeding contribute to any of the diseases noticed in your child?

Probe: Ask mother on each specific condition she might have mentioned in her child.

5.2 How has feeding your child with other foods account for disease(s) noticed?

Probe: Ask mother on each specific condition she might have mentioned in her child.

6.0. Management of health conditions of child

6.1 How did you manage the condition(s) noticed in your child?

Probe more on: Each specific condition she mentioned in her child.
Medicine(s) used to treat child
Why she gave her child the medicine(s)
Visit to a clinic or a hospital to manage disease
Anything else she did to manage each disease/condition

7.0 Closing key comments

Is there anything more you would like to add?

Thank you

Appendix B – Informed Consent Form

Title: Childhood Breastfeeding Practices and Risks of Morbidity in Ghana
Principal Investigator: Anthony Mwinilanaa Tampah-Naah
Address: Department of Population and Health, University of Cape Coast

General Information about Research
I am gathering information on breastfeeding practices (not breastfeeding, exclusive breastfeeding, predominant breastfeeding, and partial breastfeeding) and risk of morbidity among children (0 – 23 months). I hope that the results of this study will inform the public as well as health policy makers and programme managers so that they can design and implement appropriated interventions to improve upon breastfeeding practices and drastically minimize related childhood morbidity (diarrhoea, acute respiratory infection, anaemia, and fever).

Procedures
I will be talking with you in order to obtain their views about how they perceive breastfeeding practices and related health outcomes in their children. Interview will be conducted with you at a place of your choice. You can demand that I do not record the interview and in that case I will take notes of our conversation.

Possible Risks and Discomforts
You are free to decline answering any question or not to participate in the study altogether. The information you provide us today will be useful for understanding of mothers perceptions on breastfeeding practices and related childhood health outcomes. There is no direct benefit to you, but I hope the results from the study will inform policy makers and programme managers to design and implement appropriate health strategies to improve child health. I foresee no risks due to your participation in the study; however, you are free not to answer or to stop the interview.

Confidentiality
The information that you share with me will be kept confidentially; it will be used strictly for research only. The report will use the collective responses and will not reveal names or any identifiers that can be linked with you. Persons who are not directly involved in this research will not be allowed to access the information that I obtain from you. Your response will be recorded but no identifying information will be collected on the recording. The study's consent form will have your name on it but will be kept separate from information that you provide and will be destroyed in three years by the investigator.

Compensation
There will be an amount of GH₵ 10 as a compensation for your time.
Voluntary Participation and Right to Leave the Research
Your participation in this interview is voluntary. You can stop and withdraw from the discussion at any point without any effects on you. The discussion will take about 40 minutes of your time.
Contacts for Additional Information

Should you need clarifications at a later date, you may contact the researcher, Anthony Tampah-Naah (0208073196) of the Department of Population and Health, University of Cape Coast.
If the information I give you is unclear or if you have questions about this research, you may ask me now. Do you want to ask me any question?
Interviewer: Wait to see if the respondent has any question to ask. Answer those questions as clearly as possible. Begin interview only when the participant has a clear understanding of what she is asked to do and she has given consent for interview.

Your rights as a Participant
This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phones lines 0332133172 and 0244207814 or email address: irb@ucc.edu.gh.

VOLUNTEER AGREEMENT
The above document describing the benefits, risks and procedures for the research title **"Childhood Breastfeeding Practices and risks of breastfeeding in Ghana"** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

_________ ____________________________

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:
I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

__________ ________________________

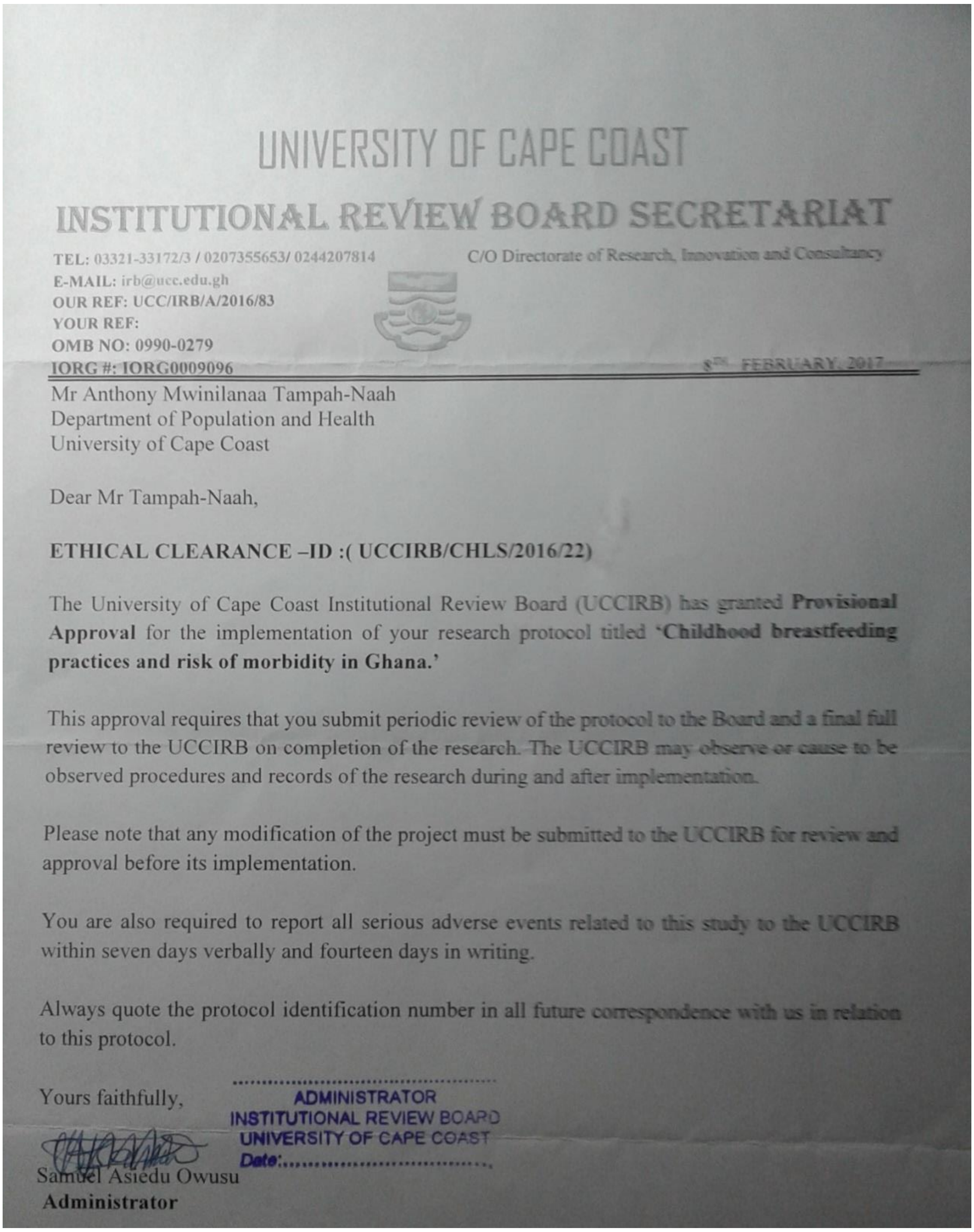
Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

___________ ______________________

Date Anthony Mwinilanaa Tampah-Naah

Appendix C – Ethical Clearance Letter



UNIVERSITY OF CAPE COAST

INSTITUTIONAL REVIEW BOARD SECRETARIAT

TEL: 03321-33172/3 / 0207355653/ 0244207814 C/O Directorate of Research, Innovation and Consultancy
E-MAIL: irb@ucc.edu.gh
OUR REF: UCC/IRB/A/2016/83
YOUR REF:
OMB NO: 0990-0279
IORG #: IORG0009096

8TH FEBRUARY, 2017

Mr Anthony Mwinilanaa Tampah-Naah
Department of Population and Health
University of Cape Coast

Dear Mr Tampah-Naah,

ETHICAL CLEARANCE –ID :(UCCIRB/CHLS/2016/22)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted **Provisional Approval** for the implementation of your research protocol titled **'Childhood breastfeeding practices and risk of morbidity in Ghana.'**

This approval requires that you submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

Please note that any modification of the project must be submitted to the UCCIRB for review and approval before its implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

ADMINISTRATOR
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST
Date:..............................

Samuel Asiedu Owusu
Administrator

Appendix D – Background Characteristics of Respondents

Variable	Frequency	Percentage
Outcome variable		
Diarrhoea (N=2202)		
No	1908	86.67
Yes	294	13.33
Acute Respiratory Infection* (N=2201)		
No	1867	84.83
Yes	334	15.17
Anaemia (N=1129)**		
No	631	55.88
Yes	498	44.12
Fever		
No	1918	87.10
Yes	284	12.90
Exposure variable		
Breastfeeding practices		
No breastfeeding	265	12.06
Exclusive breastfeeding	317	14.40
Predominant breastfeeding	249	11.29
Partial breastfeeding	1371	62.25
Individual level variables		
Age of child *(months) [mean = 11.21; SD = 6.73]*		
0-5	561	25.49
6-11	579	26.31
12-23	1062	48.20
Sex of child		
Male	1138	51.70
Female	1064	48.30
Maternal age *(years) [mean = 29.48; SD = 6.91]*		
15-19	139	6.29
20-24	429	19.48
25-29	597	27.11
30-34	504	22.91
35-39	366	16.63
40-44	135	6.13
45-49	32	1.45
Maternal education		
No education	593	26.90
Primary	418	18.99
Secondary	1088	49.40
Higher	103	4.71
Occupation*		
Not working	481	21.88
Professional worker	97	4.42
Sales/services	813	36.99
Agricultural worker	561	25.52
Manual worker	246	11.18
Community level variables		
Residence		
Urban	981	44.54
Rural	1221	55.46
Region		
Western	211	9.58

Central	255	11.56
Greater Accra	324	14.71
Volta	171	7.76
Eastern	203	9.24
Ashanti	382	17.33
Brong Ahafo	205	9.33
Northern	296	13.45
Upper East	92	4.19
Upper West	63	2.85
Health level variables		
Preceding birth interval*		
Less than 24 months	212	12.40
24 months or more	1498	87.60
Preceding birth interval*		
Less than 24 months	212	12.40
24 months or more	1498	87.60
Antenatal care visits*		
0 visit	64	2.92
1-3 visits	245	11.17
4 visits or more	1883	85.91
Environmental level variables		
Source of drinking water		
Improved	1386	62.95
unimproved	816	37.05
Type of toilet		
Improved	1380	62.67
Unimproved	822	37.33
Floor material		
Improved	1728	78.49
Unimproved	474	21.51
Cooking fuel*		
Gas/electricity	418	19.60
Coal/charcoal	642	30.14
Wood/straw/grass	1071	50.26
Number of children in household		
1	885	41.11
2-3	1210	56.21
4 or more	58	2.68

Appendix E - Multilevel logistic regression modelling for breastfeeding practices and risk of diarrhoea

Covariates	Interactive Models	
	OR	95% CI
Maternal education		
NoBF & no education	1	
NoBF & primary	3.567**	1.057-12.033
NoBF & secondary	1.375	0.459-4.123
NoBF & higher	0.108**	0.042-0.279
ExBF & no education	1	
ExBF & primary	0.649	0.172-1.620
ExBF & secondary	0.528	0.172-1.620
ExBF & higher	*omitted+*	--------------
PreBF & no education	1	
PreBF & primary	0.749	2.424-2.316
PreBF & secondary	1.589	0.592-4.261
PreBF & higher	1.047	0.100-10.879
ParBF & no education	1	
ParBF & primary	0.577**	0.362-0.920
ParBF & secondary	0.451***	0.302-0.674
ParBF & higher	0.268***	0.901-0.800
Maternal occupation		
NoBF & not working	1	
NoBF & professional	0.021***	0.002-0.190
NoBF & sales/services	0.224***	0.084-0.595
NoBF & agriculture	0.526	0.165-1.677
NoBF & manual	0.125**	0.026-0.604
ExBF & not working	1	
ExBF & professional	*omitted+*	---------------
ExBF & sales/services	1.294	0.307-5.443
ExBF & agriculture	2.321	0.650-8.277
ExBF & manual	*omitted+*	---------------
PreBF & not working	1	
PreBF & professional	3.131	0.244-40.032
PreBF & sales/services	0.692	0.186-2.575
PreBF & agriculture	0.779	0.266-2.278
PreBF & manual	2.377	0.510-11.076
ParBF & not working	1	
ParBF & professional	0.306**	0.095-0.980
ParBF & sales/services	0.645*	0.391-1.063
ParBF & agriculture	1.155	0.712-1.874
ParBF & manual	0.962	0.502-1.841
Residence		
NoBF & urban	1	
NoBF & rural	1.225	0.539-2.784
ExBF & urban	1	
ExBF & rural	1.926	0.599-6.187
PreBF & urban	1	
PreBF & rural	1.153	0.472-2.812
ParBF & urban	1	
ParBF & rural	1.733***	1.212-2.477
Preceding birth interval		
NoBF & less than 24 months	1	
NoBF & 24 months or more	7.495**	0.935-60.047
ExBF & less than 24 months	1	
ExBF & 24 months or more	1.551	0.270-8.903

PreBF & less than 24 months	1	
PreBF & 24 months or more	12.854**	1.576-104.801
ParBF & less than 24 months	1	
ParBF & 24 months or more	1.702	0.811-3.575
Source of drinking water		
NoBF & improved	1	
NoBF & unimproved	0.534	0.226-1.264
ExBF & improved	1	
ExBF & unimproved	1.151	0.402-3.298
PreBF & improved	1	
PreBF & unimproved	0.575	0.223-1.477
ParBF & improved	1	
ParBF & unimproved	0.558***	0.379-0.821
Type of toilet facility		
NoBF & improved	1	
NoBF & unimproved	1.452	0.594-3.545
ExBF & improved	1	
ExBF & unimproved	2.954*	0.895-9.748
PreBF & improved	1	
PreBF & unimproved	1.718	0.719-4.105
ParBF & improved	1	
ParBF & unimproved	2.026***	1.428-2.875
Floor material		
NoBF & improved	1	
NoBF & unimproved	0.674	0.226-2.010
ExBF & improved	1	
ExBF & unimproved	0.739	0.183-2.990
PreBF & improved	1	
PreBF & unimproved	1.220	0.434-3.431
ParBF & improved	1	
ParBF & unimproved	0.928	0.603-1.427

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; + *omitted due to prediction failure*

Appendix F – Multilevel logistic regression modelling for breastfeeding practices and risk of ARI

Covariates Interactions	Interactive Models	
	OR	95% CI
Maternal age		
NoBF & 15-19	1	
NoBF & 20-24	1.778	0.288-10.984
NoBF & 25-29	1.562	0.249-9.787
NoBF & 30-34	1.043	0.160-6.782
NoBF & 35-39	0.323	0.041-2.542
NoBF & 40-44	3.516	0.435-28.418
NoBF & 45-49	2.302	0.127-41.482
ExBF & 15-19	1	
ExBF & 20-24	0.483	0.050-4.648
ExBF & 25-29	0.767	0.097-6.042
ExBF & 30-34	0.352	0.043-2.829
ExBF & 35-39	0.356	0.042-2.981
ExBF & 40-44	0.836	0.079-8.805
ExBF & 45-49	5.107	0.406-64.131
PreBF & 15-19	1	
PreBF & 20-24	6.558*	0.734-58.589
PreBF & 25-29	7.450*	0.843-65.833
PreBF & 30-34	3.783	0.411-34.760
PreBF & 35-39	5.079	0.537-47.970
PreBF & 40-44	3.967	0.274-57.394
PreBF & 45-49	*omitted+*	
ParBF & 15-19	1	
ParBF & 20-24	0.469**	0.227-0.968
ParBF & 25-29	0.553	0.270-1.130
ParBF & 30-34	0.583	0.288-1.180
ParBF & 35-39	0.376***	0.180-0.786
ParBF & 40-44	0.568	0.243-1.326
ParBF & 45-49	0.581	0.136-2.472
Maternal occupation		
NoBF & not working	1	
NoBF & professional	0.024***	0.002-0.220
NoBF & sales/services	0.738	0.286-1.903
NoBF & agriculture	0.430	0.127-1.453
NoBF & manual	0.367	0.095-1.415
ExBF & not working	1	
ExBF & professional	0.967	0.100-9.325
ExBF & sales/services	2.479	0.694-8.848
ExBF & agriculture	1.749	0.455-6.714
ExBF & manual	*omitted+*	
PreBF & not working	1	
PreBF & professional	3.449	0.279-42.515
PreBF & sales/services	1.324	0.456-3.848
PreBF & agriculture	0.885	0.287-2.725
PreBF & manual	1.827	0.353-9.441
ParBF & not working	1	
ParBF & professional	0.790	0.293-2.128
ParBF & sales/services	0.983	0.604-1.599
ParBF & agriculture	0.920	0.540-1.565
ParBF & manual	0.857	0.463-1.586
Residence		
NoBF & urban	1	

NoBF & rural	0.568	0.258-1.249
ExBF & urban	1	
ExBF & rural	0.823	0.276-2.449
PreBF & urban	1	
PreBF & rural	1.405	0.589-3.350
ParBF & urban	1	
ParBF & rural	0.831	0.582-1.185
Preceding birth interval		
NoBF & less than 24 months	1	
NoBF & 24 months or more	1.370	0.322-5.825
ExBF & less than 24 months	1	
ExBF & 24 months or more	*omitted+*	
PreBF & less than 24 months	1	
PreBF & 24 months or more	7.950**	0.976-64.747
ParBF & less than 24 months	1	
ParBF & 24 months or more	2.108***	0.976-64.747
Antenatal care visits		
NoBF & 0 visits	1	
NoBF & 1-3 visits	0.188	0.022-1.545
NoBF & 4 visits or more	0.121**	0.019-0.748
ExBF & 0 visits	1	
ExBF & 1-3 visits	0.137**	0.023-0.824
ExBF & 4 visits or more	0.241*	0.055-1.063
PreBF & 0 visits	1	
PreBF & 1-3 visits	2.519	0.218-29.016
PreBF & 4 visits or more	2.683	0.330-21.800
ParBF & 0 visits	1	
ParBF & 1-3 visits	0.406*	0.154-1.071
ParBF & 4 visits or more	0.676	0.299-1.529
Cooking fuel		
NoBF & gas/electricity	1	
NoBF & Coal/charcoal	1.281	0.451-3.638
NoBF & Wood/straw/grass	0.998	0.361-2.760
ExBF & gas/electricity	1	
ExBF & Coal/charcoal	6.279**	1.185-33.263
ExBF & Wood/straw/grass	2.627	0.506-13.619
PreBF & gas/electricity	1	
PreBF & Coal/charcoal	0.430	0.099-1.859
PreBF & Wood/straw/grass	0.558	0.169-1.839
ParBF & gas/electricity	1	
ParBF & Coal/charcoal	1.397	0.780-2.501
ParBF & Wood/straw/grass	1.117	0.663-1.882

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; + *omitted due to prediction failure*

Appendix G - Multilevel logistic regression modelling for breastfeeding practices and risk of anaemia

Covariates Interactions	Interactive Models	
	OR	95% CI
Sex of child		
NoBF & male	1	
NoBF & female	1.776	0.757-4.166
ExBF & male	1	
ExBF & female	1.095	0.507-2.365
PreBF & male	1	
PreBF & female	0.931	0.400-2.167
ParBF & male	1	
ParBF & female	1.228	0.839-1.795
Maternal education		
NoBF & no education	1	
NoBF & primary	0.432	0.121-1.542
NoBF & secondary	0.550	0.187-1.615
NoBF & higher	0.597	0.098-3.644
ExBF & no education	1	
ExBF & primary	3.157**	1.200-8.302
ExBF & secondary	0.692	0.267-1.794
ExBF & higher	0.961	0.250-3.684
PreBF & no education	1	
PreBF & primary	1.612	0.559-4.644
PreBF & secondary	1.102	0.403-3.010
PreBF & higher	0.159	0.011-2.230
ParBF & no education	1	
ParBF & primary	0.730	0.442-1.206
ParBF & secondary	0.674*	0.441-1.030
ParBF & higher	0.556	0.157-1.971
Marital status		
NoBF & never married	1	
NoBF & married	4.731*	0.792-28.26
NoBF & living together	5.057*	0.786-32.522
NoBF & ever married	4.658	0.394-55.023
ExBF & never married	1	
ExBF & married	0.913	0.199-4.184
ExBF & living together	1.127	0.214-5.912
ExBF & ever married	*omitted+*	
PreBF & never married	1	
PreBF & married	0.242**	0.065-0.904
PreBF & living together	0.399	0.958-1.665
PreBF & ever married	*omitted+*	
ParBF & never married	1	
ParBF & married	0.654	0.337-1.268
ParBF & living together	0.631	0.299-1.329
ParBF & ever married	0.622	0.220-1.757
Wealth quintile		
NoBF & lowest	1	
NoBF & second	0.808	0.211-3.095
NoBF & middle	0.773	0.205-2.910
NoBF & fourth	0.147***	0.036-0.599
NoBF & highest	0.595	0.154-2.289
ExBF & lowest	1	

ExBF & second	2.085	0.718-6.052
ExBF & middle	2.058	0.733-5.779
ExBF & fourth	1.385	0.473-4.051
ExBF & highest	0.841	0.255-2.772
PreBF & lowest	1	
PreBF & second	2.622*	0.901-7.627
PreBF & middle	2.339	0.798-6.855
PreBF & fourth	1.290	0.347-4.793
PreBF & highest	1.330	0.216-8.163
ParBF & lowest	1	
ParBF & second	0.987	0.596-1.634
ParBF & middle	1.335	0.804-2.219
ParBF & fourth	0.848	0.475-1.510
ParBF & highest	0.585*	0.312-1.095
Residence		
NoBF & urban	1	
NoBF & rural	1.508	0.642-3.543
ExBF & urban	1	
ExBF & rural	1.358	0.620-2.974
PreBF & urban	1	
PreBF & rural	0.710	0.306-1.645
ParBF & urban	1	
ParBF & rural	1.096	0.747-1.609
Size of child		
NoBF & small	1	
NoBF & average	0.536	0.150-1.910
NoBF & large	0.660	0.208-2.096
ExBF & small	1	
ExBF & average	0.411	0.126-1.338
ExBF & large	0.360*	0.113-1.142
PreBF & small	1	
PreBF & average	0.329**	0.109-0.995
PreBF & large	0.562	0.192-1.637
ParBF & small	1	
ParBF & average	0.922	0.544-1.561
ParBF & large	0.723	0.447-1.171
Place of delivery		
NoBF & public	1	
NoBF & private/other	0.514	0.131-2.007
NoBF & home	2.294	0.820-6.415
ExBF & public	1	
ExBF & private/other	1.252	0.307-5.104
ExBF & home	1.609	0.699-3.701
PreBF & public	1	
PreBF & private/other	0.632	0.131-3.052
PreBF & home	1.970	0.800-4.853
ParBF & public	1	
ParBF & private/other	0.659	0.310-1.398
ParBF & home	1.566**	1.0362.366
Children in household		
NoBF & 1	1	
NoBF & 2 or more	1.296	0.561-2.992
ExBF & 1	1	
ExBF & 2 or more	2.150*	0.950-4.864
PreBF & 1	1	

PreBF & 2 or more	0.886	0.373-2.107
ParBF & 1	1	
ParBF & 2 or more	1.895***	1.284-2.798

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; + *omitted due to prediction failure*

Appendix H - Multilevel logistic regression modelling for breastfeeding practices and risk of fever

Covariates Interactions	Interactive Models	
	OR	95% CI
Sex of child		
NoBF & male	1	
NoBF & female	0.859	0.375-1.965
ExBF & male	1	
ExBF & female	0.637	0.185-2.187
PreBF & male	1	
PreBF & female	1.209	0.446-3.274
ParBF & male	1	
ParBF & female	0.682**	0.477-0.977
Maternal education		
NoBF & no education	1	
NoBF & primary	0.513	0.165-1.590
NoBF & secondary	0.278***	0.105-0.736
NoBF & higher	0.376	0.041-3.387
ExBF & no education	1	
ExBF & primary	0.313	0.033-2.910
ExBF & secondary	0.409	0.092-1.808
ExBF & higher	1.402	0.021-0.166
PreBF & no education	1	
PreBF & primary	1.212	0.371-3.957
PreBF & secondary	1.284	0.389-4.233
PreBF & higher	1.591	0.149-0.208
ParBF & no education	1	
ParBF & primary	0.745	0.457-1.217
ParBF & secondary	0.719*	0.487-1.068
ParBF & higher	0.491	0.127-0.291
Maternal occupation		
NoBF & not working	1	
NoBF & professional	*omitted+*	
NoBF & sales/services	1.840	0.539-6.275
NoBF & agriculture	4.378**	1.191-16.083
NoBF & manual	1.067	0.222-5.113
ExBF & not working	1	
ExBF & professional	1.520	0.150-15.352
ExBF & sales/services	1.464	0.295-7.268
ExBF & agriculture	0.834	0.196-3.543
ExBF & manual	0.186	0.019-1.767
PreBF & not working	1	
PreBF & professional	3.766	0.283-49.956
PreBF & sales/services	0.811	0.225-2.923
PreBF & agriculture	0.581	0.158-2.134
PreBF & manual	*omitted+*	
ParBF & not working	1	
ParBF & professional	0.227**	0.051-1.011
ParBF & sales/services	1.280	0.741-2.208
ParBF & agriculture	2.172***	1.293-3.648
ParBF & manual	1.242	0.641-2.407
Residence		
NoBF & urban	1	
NoBF & rural	0.959	0.425-2.161
ExBF & urban	1	

ExBF & rural	0.609	0.175-2.113
PreBF & urban	1	
PreBF & rural	1.351	0.475-3.844
ParBF & urban	1	
ParBF & rural	1.395*	0.968-2.011
Mode of delivery		
NoBF & normal	1	
NoBF & caesarean	1.919	0.676-5.448
ExBF & normal	1	
ExBF & caesarean	4.615**	0.956-22.261
PreBF & normal	1	
PreBF & caesarean	1.477	0.322-6.764
ParBF & normal	1	
ParBF & caesarean	0.831	0.461-1.498
Antenatal care visits		
NoBF & 0 visits	1	
NoBF & 1-3 visits	0.101*	0.009-1.133
NoBF & 4 visits or more	0.173*	0.024-1.221
ExBF & 0 visits	1	
ExBF & 1-3 visits	*omitted+*	
ExBF & 4 visits or more	*omitted+*	
PreBF & 0 visits	1	
PreBF & 1-3 visits	1.133	0.114-11.213
PreBF & 4 visits or more	1.607	0.192-13.419
ParBF & 0 visits	1	
ParBF & 1-3 visits	0.295***	0.106-0.818
ParBF & 4 visits or more	0.567	0.248-1.293
Source of drinking water		
NoBF & improved	1	
NoBF & unimproved	0.915	0.399-2.097
ExBF & improved	1	
ExBF & unimproved	1.519	0.403-5.718
PreBF & improved	1	
PreBF & unimproved	0.395*	0.142-1.097
ParBF & improved	1	
ParBF & unimproved	0.917	0.630-1.333

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; + *omitted due to prediction failure*

Appendix I – Map of Ghana showing district boundaries

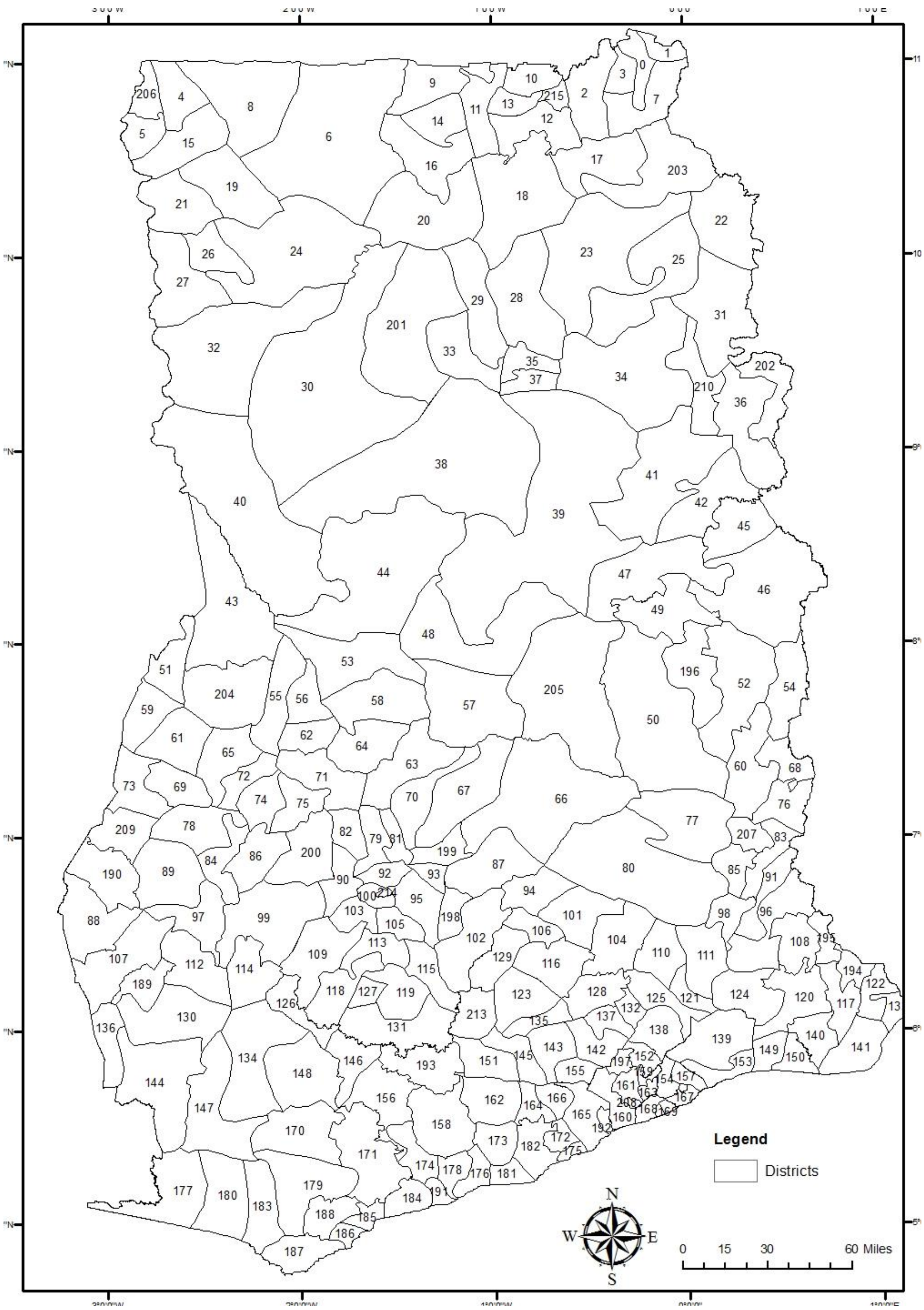


Figure 1: Map of Ghana showing district boundaries

Appendix J - Spatial Cluster Analysis (Local Moran's *I*) Output - Not Breastfeeding

OBJECT ID	District	Region	Not breast-feeding	Cluster Type
161	Ga South Municipal	Greater Accra	4	High High
162	Ga West Municipal	Greater Accra	4	High High
164	Ga East Municipal	Greater Accra	3	High High
166	Awutu Senya	Greater Accra	5	High High
169	Accra Metro	Greater Accra	13	High High
187	Secondi Takoradi Metro	Western	5	High High
193	Awutu Senya East	Central	4	High High
209	Ga Central	Greater Accra	2	High High
212	La Dade Kotopon Municipal	Greater Accra	2	High High
63	Techiman Municipal	Brong Ahafo	6	High Low
70	Dormaa East	Brong Ahafo	5	High Low
101	Kumasi Metropolitan	Ashanti	12	High Low
118	Akatsi South	Volta	3	High Low
143	Ayensuano	Eastern	0	Low High
160	La Nkwantanang/Madina	Greater Accra	0	Low High

Appendix K - Spatial Cluster Analysis (Local Moran's *I*) Output – Exclusive Breastfeeding

OBJECTID	District	Region	Exclusive	Cluster Type
1	Bawku Municipal	Upper East	8	High High
6	Lawra	Upper West	7	High High
9	Sissala West	Upper West	6	High High
11	Bongo	Upper East	8	High High
12	Kassena Nankana West	Upper East	3	High High
13	Talensi	Upper East	4	High High
14	Bolgatanga Municipal	Upper East	10	High High
15	Builsa North	Upper East	4	High High
16	Jirapa	Upper West	4	High High
20	Nadowli	Upper West	3	High High
22	Daffiama Bussie Issa	Upper West	10	High High
27	Wa Municipal	Upper West	10	High High
28	Wa West	Upper West	10	High High
43	Nanumba South	Northern	6	High High
101	Kumasi Metropolitan	Ashanti	7	High Low
115	Bibiani Anhwiaso Bekwai	Western	4	High Low
159	Assin South	Central	5	High Low
209	Ga Central	Greater Accra	0	Low High
216	Nabdam	Upper East	0	Low High

Appendix L - Spatial Cluster Analysis (Local Moran's *I*) Output - Predominant Breastfeeding

Object ID	District	Region	Predominant Breastfeeding	Cluster Type
1	Bawku Municipal	Upper East	4	High High
3	Bawku West	Upper East	4	High High
4	Binduri	Upper East	4	High High
11	Bongo	Upper East	3	High High
12	Kassena Nankana East	Upper East	3	High High
13	Talensi	Upper East	4	High High
14	Bolgatanga Municipal	Upper East	9	High High
18	East Mamprusi	Northern	5	High High
19	West Mamprusi	Northern	9	High High
23	Chereponi	Northern	3	High High
26	Gushiegu	Northern	11	High High
29	Savelugu Nanton	Northern	10	High High
34	Tolon	Northern	4	High High
37	Zabzugu	Upper East	8	High High
38	Tamale Metro	Northern	5	High High
42	Nanumba North	Northern	4	High High
211	Yendi Municipal	Northern	4	High High
101	Kumasi Metropolitan	Ashanti	8	High Low
113	Sefwi Wiawso	Western	4	High Low
30	Kumbungu	Northern	0	Low High
32	Saboba	Northern	0	Low High
203	Tatale Sangule	Northern	0	Low High
216	Nabdam	Upper East	0	Low High

Appendix M - Spatial Cluster Analysis (Local Moran's *I*) Output – Partial Breastfeeding

OBJECTID	District	Region	Partial	Cluster Type
1	Bawku Municipal	Upper East	20	High High
3	Bawku West	Upper East	21	High High
8	Garu-Tempane	Upper East	13	High High
13	Talensi	Upper East	11	High High
14	Bolgatanga Municipal	Upper East	15	High High
18	East Mamprusi	Northern	19	High High
204	Bunkurugu Yunyoo	Northern	12	High High
215	Asokore Mampong Municipal	Ashanti	9	High High
101	Kumasi Metropolitan	Ashanti	44	High Low
169	Accra Metropolitan	Greater	33	High Low
203	Tatale Sangule	Northern	0	Low High
67	Sekyere Afram Plains	Ashanti	0	Low Low
68	Sekyere Central	Ashanti	0	Low Low

Appendix N - Spatial Cluster Analysis (Local Moran's *I*) Output – Diarrhoea

OBJECTID	District	Region	Diarrhoea	Cluster Type
1	Bawku Municipal	Upper East	4	High High
3	Bawku West	Upper East	3	High High
4	Binduri	Upper East	3	High High
6	Lawra	Upper East	4	High High
8	Garu-Tempane	Upper East	3	High High
9	Sissala West	Upper West	4	High High
11	Bongo	Upper East	3	High High
13	Talensi	Upper East	5	High High
14	Bolgatanga Municipal	Upper East	4	High High
16	Jirapa	Upper West	4	High High
18	East Mamprusi	Northern	11	High High
19	West Mamprusi	Northern	6	High High
20	Nadowli	Upper West	4	High High
24	Karaga	Northern	5	High High
29	Savelugu Nanton	Northern	12	High High
49	Pru	Brong Ahafo	8	High High
63	Techiman Municipal	Brong Ahafo	9	High Low
101	Kumasi Metropolitan	Ashanti	6	High Low
169	Accra Metropolitan	Greater Accra	5	High Low
30	Kumbungu	Northern	0	Low High
204	Bunkurugu Yunyoo	Northern	0	Low High

Appendix O - Spatial Cluster Analysis (Local Moran's *I*) Output – Acute Respiratory Infection

OBJECTID	District	Region	ARI	Cluster Type
13	Talensi	Upper East	6	High High
14	Bolgatanga Municipal	Upper East	6	High High
18	East Mamprusi	Upper East	8	High High
19	West Mamprusi	Upper East	5	High High
49	Pru	Brong Ahafo	5	High High
156	Upper West Akim	Eastern	4	High High
161	Ga South Municipal	Greaster Accra	6	High High
166	Awutu Senya	Central	3	High High
169	Accra Metropolitan	Central	13	High High
176	Effutu Municipal	Central	3	High High
183	Gomoa West	Central	10	High High
193	Awutu Senya East	Central	4	High High
212	La Dade Kotopon Municipal	Greater Accra	3	High High
44	Banda	Brong Ahafo	4	High Low
101	Kumasi Metropolitan	Ashanti	10	High Low
118	Akatsi South	Volta	5	High Low
162	Ga West Municipal	Greater Accra	0	Low High
215	Asokore Mampong Municipal	Ashanti	0	Low High
216	Namdam	Upper East	0	Low High

Appendix P - Spatial Cluster Analysis (Local Moran's *I*) Output – Anaemia

OBJECTID	District	Region	Anemia	Cluster Type
13	Talensi	Upper East	5	High High
14	Bolgatanga Municipa	Upper East	10	High High
26	Gushiegu	Northern	9	High High
37	Zabzugu	Northern	10	High High
43	Nanumba South	Northern	9	High High
211	Yendi Municipal	Northern	9	High High
212	La Dade Kotopon Municipal	Greater Accra	5	High High
49	Pru	Brong Ahafo	10	High Low
63	Techiman Municipal	Brong Ahafo	7	High Low
101	Kumasi Metropolitan	Ashanti	10	High Low
115	Bibiani Anhwiaso Bekwai	Western	6	High Low
142	Keta Municipal	Volta	5	High Low
42	Nanumba North	Northern	0	Low High
203	Tatale Sangule	Northern	0	Low High
216	Nabdam	Upper East	0	Low High

Appendix Q - Spatial Cluster Analysis (Local Moran's *I*) Output – Fever

OBJECT ID	District	Region	Fever	Cluster Type
6	Lawra	Upper West	10	High High
8	Garu-Tempane	Upper East	6	High High
9	Sissala West	Upper West	4	High High
13	Talensi	Upper East	5	High High
16	Jirapa	Upper West	10	High High
18	East Mamprusi	Northern	10	High High
19	West Mamprusi	Northern	3	High High
22	Daffiama Bussie Issa	Upper West	3	High High
24	Karaga	Northern	6	High High
29	Savelugu Nanton	Northern	7	High High
49	Pru	Brong Ahafo	6	High High
60	Jaman South	Brong Ahafo	4	High Low
101	Kumasi Metroplitan	Ashanti	12	High Low
118	Akatsi South	Volta	4	High Low
169	Accra Metropolitan	Greater Accra	6	High Low
194	Assin North	Central	4	High Low
204	Bunkpurugu Yunyoo	Northern	0	Low High
215	Asokore Mampong Municipal	Ashanti	0	Low High

Appendix R - Hop Spot Output - Diarrhoea

OBJECT ID	District	Region	Diarrhoea	GiZScore Fixed	GiPValue Fixed	Gi_Bin Fixed
24	Karaga	Northern	5	5.58768	0	3
18	East Mamprusi	Northern	11	4.807127	0.000002	3
19	Ewest Mamprusi	Northern	6	4.414492	0.00001	3
216	Nabdam	Upper East	2	4.195619	0.000027	3
11	Bongo	Upper East	3	3.97277	0.000071	3
13	Talensi	Upper East	5	3.629636	0.000284	3
29	Savelugu Nanton	Northern	12	3.578035	0.000346	3
4	Binduri	Upper East	3	3.489515	0.000484	3
3	Bawku West	Upper East	3	3.278358	0.001044	3
14	Bolgatanga Municipal	Upper East	4	3.278358	0.001044	3
1	Bawku Municipal	Upper East	4	3.228135	0.001246	3
8	Garu-Tempane	Upper East	3	3.228135	0.001246	3
9	Sissala West	Upper West	4	3.116456	0.00183	3
204	Bunkpurugu Yunyoo	Northern	0	2.949925	0.003179	3
36	Sagnarigu	Northern	2	2.817517	0.00484	3
38	Tamale Metropolitan	Northern	3	2.817517	0.00484	3
20	Nadowli	Upper West	4	2.728175	0.006369	3
30	Kumbungu	Northern	0	2.650905	0.008028	3
49	Pru	Brong Ahafo	8	2.635944	0.00839	3
5	Lambussie Karni	Upper West	3	2.523194	0.011629	2
6	Lawra	Upper West	4	2.523194	0.011629	2
42	Nanumba North	Northern	3	2.32544	0.020048	2
147	Upper Denkyira East Municipal	Central	1	-2.32397	0.020127	-2
41	Bole	Northern	1	2.22078	0.026366	2
157	Twifu Ati-Morkwa	Central	0	-2.20591	0.02739	-2
149	Wassa Amenfi East	Western	0	-2.20201	0.027664	-2
207	Nandom	Upper West	2	2.178248	0.029388	2
125	North Tongo	Volta	2	-2.1295	0.033213	-2
34	Tolon	Northern	3	2.127686	0.033363	2
123	Ketu North	Volta	0	-2.10477	0.035311	-2
16	Jirapa	Upper West	4	2.094627	0.036204	2

43	Nanumba South	Northern	3	2.094627	0.036204	2
121	Central Tongu	Volta	0	-2.07659	0.037839	-2
151	Dangme East	Greater	0	-2.06017	0.039383	-2
150	Ada East	Greater	1	-1.96429	0.049497	-2
134	Ketu South Municipal	Volta	0	-1.95688	0.050361	-1
109	Adaklu	Volta	0	-1.94274	0.052047	-1
172	Mporhor Wassa East	Western	1	-1.94274	0.052047	-1
93	Kwabre	Ashanti	1	-1.94111	0.052246	-1
154	Ningo Prampram	Greater Accra	0	-1.94111	0.052246	-1
142	Keta Municipal	Volta	1	-1.93812	0.052609	-1
104	Atwima Kwanwoma	Ashanti	2	-1.92368	0.054395	-1
115	Bosome Freho	Ashanti	0	-1.9209	0.054744	-1
141	South Tongu	Volta	0	-1.9209	0.054744	-1
196	Agotime Ziope	Volta	0	-1.9209	0.054744	-1
98	Asunafo South	Brong Ahafo	1	-1.91754	0.055169	-1
127	Upper Denkyira West	Central	0	-1.91754	0.055169	-1
118	Akatsi South	Volta	1	-1.91686	0.055256	-1
22	Daffiama Bussie Issa	Upper West	2	1.909201	0.056236	1

Appendix S - Hot Spot Analysis Output – Acute Respiratory Infection (ARI)

OBJECTID *	District	Region	ARI	GiZScore Fixed	GiPValue Fixed	Gi_Bin Fixed
144	West Akim Municipal	Eastern	1	3.653782	0.000258	3
183	Gomoa West	Central	10	3.469988	0.00052	3
167	Agona East	Central	2	3.373115	0.000743	3
165	Agona West Municipal	Central	1	3.246155	0.00117	3
146	Birim Central Municipal	Eastern	1	3.236205	0.001211	3
11	Bongo	Upper East	1	3.156957	0.001594	3
13	Talensi	Upper East	6	2.981263	0.002871	3
166	Awutu Senya	Central	3	2.979978	0.002883	3
24	Karaga	Northern	2	2.967824	0.002999	3
156	Upper West Akim	Eastern	4	2.942585	0.003255	3
14	Bolgatanga Municipal	Upper East	6	2.897736	0.003759	3
19	West Mamprusi	Northern	5	2.865732	0.00416	3
18	East Mamprusi	Northern	8	2.74655	0.006023	3
216	Nabdam	Upper East	0	2.74655	0.006023	3
173	Gomoa East	Central	2	2.732721	0.006281	3
176	Effutu Municipal	Central	3	2.709477	0.006739	3
17	Builsa Sorth	Upper East	1	2.707893	0.006771	3
193	Awutu Senya East	Central	4	2.675399	0.007464	3
209	Ga Central	Greater Accra	2	2.660091	0.007812	3
15	Builsa North	Upper East	1	2.495045	0.012594	2
169	Accra Metropolitan	Greater Accra	13	2.445047	0.014483	2
162	Ga West Municipla	Greater Accra	0	2.422198	0.015427	2
210	Dormaa Municipal	Brong Ahafo	0	-2.41754	0.015626	-2
10	Kassena Nankana East	Upper East	4	2.404256	0.016205	2
161	Ga South Municipal	Greater Accra	6	2.402432	0.016286	2
98	Asunafo South	Brong Ahafo	0	-2.36391	0.018083	-2
191	Bia East	Western	0	-2.26002	0.02382	-2
87	Ahafo Ano North	Ashanti	0	-2.22967	0.025769	-2
70	Dormaa East	Brong Ahafo	0	-2.22325	0.026199	-2
90	Asunafo North Municipal	Central	0	-2.21942	0.026458	-2
143	Ayensuano	Eastern	0	2.207258	0.027296	2
3	Bawku West	Upper East	1	2.141805	0.032209	2

75	Tano North	Brong Ahafo	1	-2.12844	0.033301	-2
79	Asutifi	Brong Ahafo	0	-2.08636	0.036946	-2
49	Pru	Brong Ahafo	5	2.069262	0.038521	2
4	Binduri	Upper East	1	1.993107	0.04625	2
85	Asutifi South	Brong Ahafo	0	-1.97347	0.048442	-2
66	Sunyani West	Brong Ahafo	0	-1.96305	0.04964	-2
74	Dormaa West	Brong Ahafo	1	-1.94498	0.051778	-1
62	Berekum Municipal	Ashanti	0	-1.94022	0.052353	-1
136	Denkyembour	Western	0	1.8959	0.057973	1

Appendix T - Hop Spot Analysis Output - Anaemia

ID	District	Region	Anaemia	GiZScore Fixed	GiPValue Fixed	Gi_Bin Fixed
211	Yendi Municipal	Northern	9	3.834224	0.000126	3
42	Nanumba North	Northern	0	3.658118	0.000254	3
43	Nanumba South	Northern	9	2.932708	0.00336	3
203	Tatale Sangule	Northern	0	2.895981	0.00378	3
18	East Mamprusi	Northern	2	2.883596	0.003932	3
125	North Tongu	Volta	1	-2.65856	0.007848	-3
216	Nabdam	Upper East	0	2.635841	0.008393	3
11	Bongo	Upper East	3	2.620966	0.008768	3
37	Zabzugu	Northern	10	2.614011	0.008949	3
26	Gushiegu	Northern	9	2.536424	0.011199	2
13	Talensi	Upper East	5	2.49612	0.012556	2
122	Lower Manya Krobo	Eastern	4	-2.33877	0.019347	-2
204	Bunkpurugu Yunyoo	Northern	1	2.301604	0.021358	2
32	Saboba	Northern	4	2.268674	0.023288	2
35	Sagnarigu	Northern	3	2.21594	0.026696	2
87	Ahafo Ano North	Ashanti	0	-2.19333	0.028283	-2
102	Kwahu South	Eastern	0	-2.16296	0.030544	-2
4	Binduri	Upper East	3	2.141009	0.032273	2
105	Fanteakwa	Eastern	3	-2.09315	0.036336	-2
183	Gomoa West	Central	5	2.080502	0.037479	2
75	Tano North	Brong Ahafo	4	-2.06059	0.039343	-2

46	Nkwanta North	Volta	1	2.055698	0.039812	2
79	Asutifi	Brong Ahafo	0	-2.05461	0.039916	-2
151	Dangme East	Greater Accra	0	-2.05461	0.039916	-2
112	Asuogyaman	Eastern	2	-2.04749	0.04061	-2
14	Bolgatanga Municipal	Upper East	10	2.016453	0.043753	2
150	Ada East	Greater Accra	1	-1.97782	0.047949	-2
115	Bibiani Anhwiaso Bekwai	Western	6	-1.97046	0.048785	-2
68	Sekyere Central	Ashanti	0	-1.94763	0.051459	-1
117	Atiwa	Eastern	0	-1.94421	0.05187	-1
93	Kwabre	Ashanti	3	-1.92414	0.054338	-1
24	Karaga	Northern	4	1.923336	0.054438	1

Appendix U - Hot Spot Analysis Output - Fever

OBJECT ID	District	Region	Fever	GiZScore Fixed 68689	GiPValue Fixed 68689	Gi_Bin Fixed 68689
207	Nandom	Upper West	1	4.462228	0.000008	3
5	Lambussie Karni	Upper West	1	4.070328	0.000047	3
6	Lawra	Upper West	10	4.070328	0.000047	3
24	Karaga	Northern	6	4.034425	0.000055	3
9	Sissala West	Upper West	4	3.87182	0.000108	3
18	East Mamprusi	Northern	10	3.793861	0.000148	3
20	Nadowli	Upper West	1	3.753148	0.000175	3
16	Jirapa	Upper West	10	3.564099	0.000365	3
22	Daffiama Bussie Issa	Upper West	3	3.377966	0.00073	3
204	Bunkpurugu Yunyoo	Northern	0	3.129751	0.00175	3
11	Bongo	Upper East	1	3.010094	0.002612	3
216	Nabdam	Upper East	1	2.873104	0.004065	3
19	West Mamprusi	Northern	3	2.862293	0.004206	3
13	Talensi	Upper East	5	2.856873	0.004278	3
1	Bawku Municipal	Upper East	4	2.749417	0.00597	3
8	Garu-Tempane	Upper East	6	2.749417	0.00597	3
4	Binduri	Upper East	1	2.730746	0.006319	3
3	Bawku West	Upper East	2	2.412725	0.015834	2
29	Savelugu Nanton	Northern	7	2.261169	0.023749	2
186	Shama	Western	0	-2.140341	0.032327	-2
147	Upper Denkyira East Municipal	Central	1	-2.096521	0.036036	-2
39	Central Gonja	Northern	3	2.081696	0.03737	2

157	Twifu Ati-Morkwa	Central	0	-2.077325	0.037772	-2
45	Kintampo North Municipal	Brong Ahafo	4	1.974837	0.048287	2
49	Pru	Brong Ahafo	6	1.974837	0.048287	2
14	Bolgatanga Municipal	Upper East	2	1.952346	0.050897	1
27	Wa Municipal	Upper West	0	1.886743	0.059195	1

Appendix V - Hot Spot Analysis Output – Not Breastfeeding

Object ID	District	Region	Not Breast-feeding	GiZScore Fixed 68689	GiPValue Fixed 68689	Gi_Bin Fixed
165	Agona West Municipal	Central	1	4.314958	0.000016	2
167	Agona East	Central	2	4.263912	0.00002	2
183	Gomoa West	Central	0	3.741281	0.000183	2
144	West Akim	Eastern	2	3.663937	0.000248	2
156	Upper West Akim	Eastern	2	3.553598	0.00038	2
176	Effutu Municipal	Central	1	3.348894	0.000811	2
143	Ayensuano	Eastern	0	3.341736	0.000833	2
173	Gomoa East	Central	1	3.220403	0.00128	2
138	Suhum	Eastern	2	3.177111	0.001488	2
193	Awutu Senya East	Central	4	3.162402	0.001565	2
166	Awutu Senya	Central	5	3.109262	0.001876	2
160	La Nkwantanan/Madina	Greater Accra	0	3.104173	0.001908	2
164	Ga East Municipal	Greater Accra	3	3.104173	0.001908	2
133	New Juaben	Eastern	2	3.070017	0.00214	2
198	Nsawam	Eastern	1	3.070017	0.00214	2
209	Kpando	Volta	2	2.990336	0.002787	2
212	La Dade Kotopon	Greater	2	2.986851	0.002819	2
146	Birim Central	Eastern	0	2.926517	0.003428	2
155	Ningo Prampram	Greater Accra	1	2.876499	0.004021	2
153	Akwapim South	Eastern	0	2.839226	0.004522	2
169	Accra Metro	Greater Accra	13	2.814661	0.004883	2
170	Ledzokuku Krowor	Greater Accra	1	2.752138	0.005921	2
139	Akwapin North	Eastern	1	2.713008	0.006668	2
161	Ga South	Greater Accra	4	2.665522	0.007687	2
162	Ga West	Greater Accra	4	2.620043	0.008792	2

158	Kpone Katamanso	Greater Accra	0	2.451233	0.014237	2
168	Tema Metro	Greater Accra	3	2.451233	0.014237	2
213	Ashaiman	Greater Accra	0	2.451233	0.014237	2
136	Denkyembour	Eastern	0	2.332412	0.019679	2
175	Heman Lower Denkyira	Central	1	2.214111	0.026821	2
185	Komenda Edina Eguafo Abirem	Central	4	2.158473	0.030891	2

Appendix W - Hot Spot Analysis Output – Exclusive Breastfeeding

OBJECT ID	District	Region	Exclusive	GiZScore Fixed	GiPValue Fixed	Gi_Bin Fixed
20	Nadowli	Upper West	3	6.521135	0	2
22	Daffiama Bussie Issa	Upper West	10	6.085752	0	2
27	Wa Municipal	Upper West	10	5.491643	0	2
28	Wa West	Upper West	10	5.447215	0	2
16	Jirapa	Upper West	4	5.382799	0	2
207	Nandom	Upper West	1	4.235476	0.000023	2
5	Lambussie Karni	Upper West	3	4.179688	0.000029	2
6	Lawra	Upper West	7	4.179688	0.000029	2
25	Wa East	Upper West	2	4.114762	0.000039	2
33	Sawla Tuna Kalba	Northern	2	4.114762	0.000039	2
10	Kassena Nankena West	Upper East	1	3.625416	0.000288	2
11	Bongo	Upper East	8	3.526815	0.000421	2
3	Bawku West	Upper East	2	3.469302	0.000522	2
216	Nabdam	Upper East	0	3.469302	0.000522	2
4	Binduri	Upper East	2	3.414135	0.00064	2
13	Talensi	Upper East	4	3.316433	0.000912	2
18	East Mamprusi	Northern	1	3.179523	0.001475	2
15	Builsa North	Upper East	4	2.88837	0.003872	2
9	Sissala West	Upper West	6	2.867732	0.004134	2
42	Nanumba North	Northern	3	2.492888	0.012671	2
14	Bolgatanga	Upper East	10	2.455075	0.014086	2

	Municipal					
211	Yendi	Northern	3	2.395248	0.016609	2
12	Kassena Nankana East	Upper East	3	2.357395	0.018404	2
1	Bawku Municipal	Upper East	8	2.256585	0.024034	2
8	Garu-Tempane	Upper East	3	2.256585	0.024034	2
19	West Mamprusi	Northern	1	2.131336	0.033061	2
17	Builsa South	Upper East	1	1.986128	0.047019	2
40	East Gonja	Northern	4	1.960373	0.049952	2

Appendix X - Hot Spot Analysis Output – Predominant Breastfeeding

OBJECT ID	District	Region	Predo-minant	GiZScore Fixed	GiPValue Fixed	Gi_Bin Fixed
24	Karaga	Northern	1	6.695669	0	2
216	Nabdam	Upper East	0	4.924775	0.000001	2
18	East Mamprusi	Northern	5	4.763307	0.000002	2
11	Bongo	Upper East	3	4.710812	0.000002	2
14	Bolgatanga	Upper East	9	4.440371	0.000009	2
19	West Mamprusi	Northern	9	4.399782	0.000011	2
13	Talensi	Upper East	4	4.369148	0.000012	2
29	Savelugu Nanton	Northern	10	4.178057	0.000029	2
211	Yendi	Northern	4	4.178057	0.000029	2
204	Bunkprurugu Yunyoo	Northern	1	4.095144	0.000042	2
35	Mion	Northern	2	4.081612	0.000045	2
30	Kumbungu	Northern	0	3.982211	0.000068	2
3	Bawku West	Upper East	4	3.633031	0.00028	2
36	Sagnarigu	Northern	2	3.544766	0.000393	2
38	Tamale Metro	Northern	5	3.544766	0.000393	2
4	Binduri	Upper East	4	3.483888	0.000494	2
12	Kassena Nankana East	Upper East	3	3.315652	0.000914	2
42	Nanumba North	Northern	4	3.246144	0.00117	2
15	Builsa North	Upper East	0	2.977649	0.002905	2
32	Saboba	Northern	0	2.869573	0.00411	2
26	Gushiegu	Northern	11	2.828409	0.004678	2
34	Tolon	Northern	4	2.828409	0.004678	2
43	Nanumba South	Northern	2	2.807132	0.004998	2
17	Builsa South	Upper East	0	2.799505	0.005118	2

23	Chereponi	Northern	3	2.789157	0.005285	2
37	Zabzugu	Upper East	8	2.419444	0.015544	2
46	Nkwata North	Volta	0	2.410675	0.015923	2
1	Bawku Municipal	Upper East	4	2.273574	0.022992	2
8	Garu-Tempane	Upper East	0	2.273574	0.022992	2
10	Kassena Nankana West	Upper East	1	2.023746	0.042996	2
203	Tatale Sangule	Northern	0	1.966127	0.049284	2

Appendix Y - Hot Spot Analysis Output – Partial Breastfeeding

OBJECTID	District	Region	Partial	GiZScore Fixed	GiPValue Fixed	Gi_Bin Fixed
3	Bawku West	Upper East	21	3.926396	0.000086	2
204	Bunkpurugu Yunyoo	Northern	12	3.825379	0.000131	2
18	East Mamprusi	Northern	19	3.769457	0.000164	2
216	Nabdam	Upper East	7	3.66483	0.000248	2
4	Binduri	Upper East	5	3.613793	0.000302	2
1	Bawku Municipal	Upper East	20	3.281714	0.001032	2
8	Garu-Tempane	Upper East	13	3.281714	0.001032	2
11	Bongo	Upper East	8	3.164662	0.001553	2
13	Talensi	Upper East	11	2.850454	0.004366	2
2	Pusiga	Upper East	4	2.371844	0.0177	2
24	Karaga	Northern	9	2.007256	0.044722	2
14	Bolgatanga	Upper East	15	1.990808	0.046502	2
26	Gushiegu	Northern	11	1.981534	0.047531	2
183	Gomoa West	Central	28	1.925562	0.054159	2
42	Nanumba South	Northern	7	1.913864	0.055637	2

Appendix Z – Stata commands used to sample mother-child pairs

```
gen age = v008-b3

keep if age<24 & b5==1

recode age(0/1=1 "0-5")(2/3=1 "0-5")(4/5=1 "0-5")(6/8=2 "6-11")(9/11=2 "6-
11")(12/17=3 "12-23")(18/23=3 "12-23")(24/59=.), gen(child_age_2)

tab child_age_2

gen peso=v005/1000000

tab child_age_2[iw=peso]

keep if b9==0

drop if _n > 0 & caseid == caseid[_n-1]

tab child_age_2[iw=peso]
```