DISPARITIES IN WOMEN'S REPRODUCTIVE HEALTH IN WEST AND CENTRAL AFRICA: EXPLORING CONTEXTUAL DETERMINANTS OF ACCESS, USE AND QUALITY OF CARE

by

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A dissertation submitted to the faculty of
The University of North Carolina at Charlotte
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in
Health Services Research

Charlotte

2015

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ABSTRACT

COMFORT Z. OLORUNSAIYE. Contextual determinants of women's reproductive health in West and Central Africa: Exploring inequities in access, use, and quality of care.
(Under the direction of DR. LARISSA R. BRUNNER HUBER)

Background: The West and Central African region bears the highest burden of maternal mortality globally. Objectives: The aims of this study were to: examine the association between women's perception of domestic violence (DV) and choice of contraceptive method; and assess the relationship between individual and community socioeconomic status (SES) and the quality of prenatal care and the location of childbirth.
Methods: I used data from the fourth round of the UNICEF Multiple Indicators Cluster Surveys for seven West and Central African countries (Central African Republic [CAR], Chad, Democratic Republic of Congo [DRC], Ghana, Nigeria, Sierra Leone, and Togo). For my first objective, the sample included 80,055 reproductive aged women. Perception of DV was measured as no, low, or high tolerance of wife beating. Contraceptive method was coded as none, traditional (e.g., periodic abstinence/rhythm), or modern (e.g., birth control pills). I used multinomial logistic regression to estimate odds ratios (ORs) and 95% confidence intervals (CIs) of the odds of using traditional or modern methods versus none. For my second and third objectives, the sample included 24,718 and 32,487 women, respectively, who gave birth within the last two years preceding the survey. Community SES was defined as low or high poverty index, and individual SES variables included women's education and wealth. Quality of prenatal care was coded as low or high, and the location of childbirth was coded as home or health institution. I used

multilevel logistic regression to estimate the fixed and random effects of individual and community SES on the quality of prenatal care (objective 2) and the place of childbirth (objective 3). Findings: After accounting for socio-demographic characteristics, women with low DV tolerance had lower odds of using traditional or modern methods compared to those with no tolerance (OR=0.87; 95% CI: 0.78, 0.98 and OR=0.86; 95% CI: 0.78, 0.95, respectively). Women with high DV tolerance had 28% lower odds of traditional method use and 38% lower odds of modern method use compared to women with no tolerance (95% CI: 0.60, 0.90 and 95% CI: 0.59, 0.88, respectively). Furthermore, after adjusting for individual and contextual characteristics, residence in a poor community was associated with reduced odds of a woman receiving high quality prenatal care in six countries (CAR: OR=0.76; 95% CI: 0.58, 0.98; Chad: OR=0.48; 95% CI: 0.32, 0.74; Ghana: OR=0.86; 95% CI: 0.61, 0.97; Nigeria: OR=0.74; 95% CI: 0.61, 0.92; Sierra Leone: OR=0.71; 95% CI: 0.57, 0.91; and Togo: OR=0.80; 95% CI: 0.47, 0.91). In DRC, however, the association was not statistically significant (OR=0.92, 95% CI: 0.63, 1.33). In addition, residence in a poor community was associated with reduced odds of having an institutional delivery in five countries (CAR: OR=0.69; 95% CI: 0.54, 0.89; Chad: OR=0.85; 95% CI: 0.65, 0.99; DRC: OR=0.82; 95% CI: 0.71, 0.83; Ghana: OR=0.88; 95% CI: 0.56, 0.99; and Nigeria: OR=0.87; 95% CI: 0.68, 0.98). In Sierra Leone and Togo, the associations were not statistically significant (OR=0.93, 95% CI: 0.69, 1.12; and OR=0.92, 95% CI: 0.39, 1.61, respectively). There were significant community-level variations in the quality of prenatal care and the use of institutional delivery in the seven countries. Conclusion: My findings suggest that women's tolerance of DV is associated with decreased odds of any contraceptive method use.

Policies that seek to increase the prevalence of modern contraceptive use need to consider perceptions about DV that may affect women's use of contraception. These results also highlight marked socioeconomic inequalities in the quality of prenatal care that women receive, and the use of institutional delivery services. Living in close proximity to other poor households appears to decrease the likelihood of receiving the recommended quality of prenatal care, and giving birth in a health facility. My findings suggest that greater attention should be paid to efforts to ameliorate not only individual but also contextual barriers to access to reproductive health care. It is especially important to remove economic and social barriers to the use of maternal health services among women in West and Central Africa.

DEDICATION

To the memory of the two most influential men in my life: my late father, *Pa Michael Babakudu Yakubu*, and my late husband, *Victor Olusoji Olorunsaiye*.

- *Papa, you laid the foundation for this work by giving me the best educational opportunities you could afford, and teaching me, by example, the virtue of hard work!*

- *Victor, you inspired and encouraged me to keep going. You made numerous selfless sacrifices so that I could run with this vision!*

And finally, in honor of my mother, Mrs. Clara Yakubu.

- *Nene, your selfless sacrifice made it possible for me to complete this degree and dissertation work. When catastrophe struck, and I would have dropped out, you left all that was familiar and came all the way from Nigeria to live with me, and nurture me and my children, just to see me through this PhD program!*

ACKNOWLEDGEMENTS

First, I thank God for His faithfulness to me and my family throughout the journey of this PhD program. I also express my sincere gratitude to Dr. Larissa R. Brunner Huber, the Chair of my Doctoral Committee, for her tireless guidance, knowledge and patience during my academic program and dissertation. Dr. Huber, your profound mentorship throughout my program at The University of North Carolina at Charlotte provided me the well-rounded experience to grow as a researcher, and to think independently. I am truly grateful for the time and rapt attention you gave me during my frequent stops at your office, and for always responding to my unending emails and several phone calls.

My gratitude also goes to Dr. Sarah B. Laditka for mentoring me through the course of my training and dissertation. I appreciate your constant attention to my work and prompt feedback. You encouraged me at the lowest points of my doctoral journey, and for that I am very thankful. I would also like to thank all of the members of my committee: Drs. A. Suzanne Boyd, Shanti Kulkarni, and Akinwumi Ogundiran. I truly appreciate your feedback and comments, and the insights you added to my dissertation. I am thankful for your support, time and expertise. I am honored to have such an outstanding committee. I gratefully acknowledge the support, scholarships and various professional development opportunities I received from the College of Health and Human Services and the Graduate School at UNC Charlotte.

I would also like to express my sincere appreciation to Drs. L. Michele Issel and James N. Laditka for taking the time to talk with me about my analytic approach during the early stages of my proposal development. I thank you for your insights. Special thanks to my peer reviewers: Chinelo C. Okigbo, Korede K. Adegoke, and my sister,

Larai N. Musa, for proofreading my dissertation chapters. I am very thankful for your friendship through thick and thin.

Finally, I remain indebted to my family for their tireless support, understanding and patience through this academic journey. David, Joshua, Richard and Donald, you are all amazing children, and I am grateful to you all for making this journey possible because you chose to understand my need to be away from home when you wanted me to be there with you. For persevering with me through this tiring but rewarding journey, I say "Thank you and I love you." I only hope that this experience fosters your commitment to academic excellence and hard work. I am very grateful to my sister, Larai, her husband, Henry, and children. Thank you for your selfless moral, spiritual and financial support. Just knowing that you are only a phone call away, and I could call you any time- day or night- kept me strong and focused. To all my other siblings, family, and friends, I appreciate your love, friendship, and support in every form.

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CHAPTER ONE: INTRODUCTION

1.1. Background

For the past several decades, the discourse on reproductive health has grown in scope and focus from family planning and HIV/AIDS related issues to encompass a wider range of concerns that include maternal and child health issues such as safe pregnancy and delivery care; maternal morbidity and mortality; and neonatal, infant, and child mortality. The United Nations (UN), at the 1994 International Conference on Population and Development (ICPD, otherwise known as the Cairo Agenda), described reproductive health as "a state of complete physical, social and mental wellbeing and not merely the absence of disease or infirmity, in all matters relating to the reproductive processes, functions and system at all stages of life" (UN, 1995: paragraph 7.2).

Other international collaborations have also focused on improving reproductive health care for women globally. The 1987 Safe Motherhood Initiative, the 1995 UN Fourth World Conference on Women (known as the Beijing Declaration of 1995), and the Millennium Development Goals (MDGs) 4 and 5 all focus on the reproductive health of women and families (Mahler, 1987; United Nations, 1996; United Nations, 2000). These declarations seek to enhance the wellbeing and rights of women in the areas of reproductive health including family planning, prenatal care, institutional delivery, and post-natal care, as well as improve the health of neonates, infants, and children. More

recently in 2007, borne out of the understanding that it would be very difficult to achieve the MDGs without a renewed commitment to reproductive health, universal access to reproductive health by 2015 was added to the MDG-5 target (Table 1.1) (United Nations, 2010). The addition of this goal was aimed at improving maternal and child health, and accelerating progress towards the attainment of the MDGs.

It is well documented that improvements in reproductive health and access to contraception can offer important benefits for individuals, families, communities, and countries by improving general health and wellbeing, and reducing unwanted fertility and the total number of children a woman may have over her reproductive years (Canning, 2012; Cleland, 2012; Friberg, 2010; Kinney, 2010). Access to contraception not only reduces total fertility, but also reduces the number of high-risk pregnancies and births among younger and older women, and multiparous women (Canning & Schultz, 2012; Cleland, Conde-Agudelo, Peterson, Ross, & Tsui, 2012). Moreover, contraception can improve birth spacing, which further improves maternal and child health, and reduces mortality (Canning & Schultz, 2012; Cleland et al., 2012; Friberg et al., 2010). Contraceptive use also helps adolescent girls complete school, promotes gender equality, and reduces poverty (United Nations Population Fund- UNFPA, 2013).

Prenatal care, skilled birth assistance, and postnatal care work in conjunction to improve pregnancy outcomes and the health of women and children. Prenatal care helps to reduce maternal and infant morbidity and mortality by addressing risk factors for adverse outcomes. Prenatal care creates a valuable opportunity for early detection and prompt treatment of conditions that may threaten the health of a mother and her unborn child. During prenatal care, women are able to receive preventive health care services

including immunization against neonatal tetanus, prophylactic treatment of malaria through the use of intermittent presumptive treatment approach, and HIV counseling and testing, as well as weight, blood pressure, and glucose monitoring. Furthermore, it is an important forum for delivering educational interventions that may increase the use of other maternal and child health services such as institutional delivery (childbirth in a health facility), skilled birth attendance, early childhood immunizations, and disease prevention interventions (Kogan et al., 1998). Thus, prenatal care provides useful benefits in resource-poor countries where access to health services is limited, and most women are illiterate and poor, and live in rural areas.

Since most maternal complications arise during labor, delivery, and the immediate post-partum period, institutional delivery (and skilled birth attendance) is instrumental in reducing maternal mortality (Singh, et al., 2012). Births that take place in a health facility are usually attended by skilled personnel and provide a critical opportunity for postnatal follow-up of mothers and their infants. These factors contribute to further reductions in maternal and neonatal morbidity and mortality (Starrs, 1997). Moreover, institutional delivery provides useful opportunities for interventions in the early neonatal period that reduce infant morbidity and mortality, including early initiation of breastfeeding, childhood immunizations, and management of preterm and low birth weight infants.

1.2. Sub-Saharan Africa in Context

Sub-Saharan Africa is composed of forty-eight countries, including South Sudan, that lie south of the Sahara Desert in Africa. According to recent World Bank estimates, the region has a population of 937 million, with an annual growth rate of 2.6% (World Bank,

2014). Whereas sub-Saharan Africa accounts for less than 15% of the world's population, the region accounts for disproportionately high burdens of global maternal morbidity and mortality, as well as the highest rates of poverty in concurrence with the lowest basic education rates (Lewin, 2009). Life expectancy at birth is 57 years. Furthermore, the World Bank (2013) reports a regional health expenditure per capita of $93.7, with about 48% of this being public expenditure (World Bank, 2013). Nearly half of the region's population lives below the international poverty line (less than $1.25 per day), and about two-thirds of the population lives in rural areas. In addition, the adult literacy rate for persons aged 25-64 years is 60%, while the youth literacy rate for persons aged 15-24 years is 70% (World Bank, 2014). Despite these challenges, this region has seen overall improvement in social and economic conditions since 1990; however, there are substantial variations within and between countries in the levels of progress.

1.2.1. The West and Central African context

The West and Central Africa sub-region of sub-Saharan Africa comprises 24 countries including: Benin; Burkina Faso; Cameroon; Cape Verde; Central African Republic (CAR); Chad; Congo; Côte d'Ivoire; DRC; Equatorial Guinea; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Liberia; Mali; Mauritania; Niger; Nigeria; Sao Tome and Principe; Senegal; Sierra Leone; and Togo (figure 1.1). According to recent UN data, the sub-region had a total population of 445 million, with an annual growth rate of 2.6% (UNICEF, 2014). With a life expectancy at birth of 54 years, nearly half the population is under 18 years old, and 61% lives below the international poverty level (<$1.25/day). The total adult literacy rate is 50% and the youth literacy rate is 63% compared to 60% and 70% respectively for sub-Saharan Africa. The rate of urbanization is slightly higher:

44% of the West and Central African population lives in urban areas compared to 37% for sub-Saharan Africa (UNICEF, 2014).

While some countries in West and Central Africa were English colonies (e.g. Sierra Leone, Nigeria, Ghana), others were French (e.g. CAR, DRC, and Chad), or Portuguese (e.g. Cape Verde). A few countries, initially started out as German colonies, but were later split between the British and French (e.g. parts of Togoland became a British colony and later joined Ghana, while the French part is present-day Togo; Cameroon has a similar history, with the north becoming a British colony, and the south a French colony) (Griffiths, 1986). In addition to colonial influences, many countries in the region have diverse cultures and norms, which influence other aspects of livelihoods. Furthermore, some countries have recently experienced complex civil conflicts (e.g. DRC and CAR), while others are recovering and rebuilding after extended periods of armed conflicts (e.g. Sierra Leone), which led to the destruction of health care and social infrastructure (Kinney et al., 2010). Thus, the countries of West and Central Africa are quite diverse in size, population, economic development, social capital, culture, and health outcomes. Reproductive health indices are particularly poor in most West and Central African countries, and many countries are not likely to achieve MDG5.

Figure 1.1: Map of West and Central Africa showing countries
Source: UNICEF: West and Central African Regional Office (UNICEF, 2011).

1.3. Reproductive Health in sub-Saharan Africa, including West and Central Africa

The sub-Saharan Africa region had a neonatal mortality rate of 34 per 1,000 live births compared with an estimate of 22 per 1,000 live births for developing countries in the same year (UNICEF, 2014). Sub-Saharan Africa also accounts for two-thirds of the global estimate of people living with HIV (UNICEF, 2014). Acceptance and initiation of contraception is low, with a female contraceptive prevalence rate of 24%. Prenatal care coverage with at least one visit in the region increased slightly from 72% between 2000 and 2007 to 78% in 2012. Coverage with at least four visits also increased slightly from 42% to 46% during the same period (UNICEF, 2010; UNICEF, 2013). However, only 49% of all births were attended by skilled health professionals; only 47% of births occurred in health facilities between 2007 and 2012 (UNICEF, 2014). A few countries in sub-Saharan Africa are projected to achieve MDGs 4 and 5. However, the region as a

whole has been reported to have made the least progress toward achieving the MDGs, and is not on track towards achieving the maternal and child health-related MDGs (Zere, Kirigia, Duale, & Akazili, 2012).

The West and Central African sub-region fares even worse than sub-Saharan Africa in regards to most reproductive health outcomes (UNICEF, 2010; WHO, 2012). For a region that accounts for 10% of the world's population, West and Central Africa bears a disproportionate burden of 30% of global maternal deaths (UNICEF, 2014). About 20% of global maternal deaths occur in only three countries in West and Central Africa: Niger, Nigeria and DRC (WHO, 2014). Similarly, neonatal, infant and under-five mortality rates in West and Central Africa are higher than in sub-Saharan Africa: 39 vs. 34 deaths per 1,000 live births, 83 vs. 69 deaths per 1,000 live births, and 132 vs. 109 deaths per 1,000 live births, respectively (UNICEF, 2014).

Furthermore, Nigeria, Africa's most populous country, accounted for about 14% of the global burden of maternal mortality in 2013, ranking second after India among countries with the highest burden of maternal deaths. The estimated lifetime risk of maternal death in West and Central Africa is 1:32 compared to 1:39 for sub-Saharan Africa (WHO, 2014). The total fertility rate for West and Central Africa is higher than that for sub-Saharan Africa, at 5.3 compared to 4.9 in sub-Saharan Africa (UNICEF 2014). Whereas sub-Saharan Africa had a contraceptive prevalence of 24% between 2007 and 2012, West and Central Africa reported 17% in the same period. Similarly, prenatal care coverage with at least one visit is 77% in sub-Saharan Africa but 74% in West and Central Africa. Remarkably, the proportion of women with at least four prenatal care visits is slightly higher in West and Central Africa compared to sub-Saharan

Africa (50% vs. 46%) (UNICEF, 2014). Similarly, the 2013 institutional delivery rate of 51% was slightly higher in West and Central Africa than the 46% in sub-Saharan Africa (UNICEF, 2014). The countries of West and Central Africa have made remarkable but slow progress towards achieving the maternal and child health MDGs, and at the current rate of progress, most countries in the region are not likely to attain the MDGs 4 and 5 (Zere et al., 2012).Maternal and Child Health Care Financing

Investment in maternal health care has immense benefits for the health and wellbeing of women and children by reducing morbidity and mortality. In addition, adequate financing of maternal and child health care reduces disparities between the rich and poor in access to health care and social development (Graham, 2002). The provision of basic maternal and child health services requires deliberate investments of money for drugs and medical supplies, staff, and infrastructure (Borghi, Ensor, Neupane, & Tiwari, 2006). There are also non-monetary costs, such as time and transportation costs, associated with maternal health care seeking (Hjortsberg, 2003). However, in many resource-limited settings, the level of public spending on health is generally lower than is required to provide basic health care services (Akin, Birdsall, & De Ferranti, 1987). As a result, the cost of maternal and child health care is borne by both government (e.g., national health insurance, where available) and individual families and households (e.g., through out-of-pocket formal user fees or informal fees) (Jo Borghi et al., 2006; Perkins et al., 2009).

Specifically, in West and Central Africa, approximately two-thirds of health care expenditure are from private sources (UNICEF, 2009). Thus, there is a widespread policy of user fees as a way of recouping private investments in health care provision (Witter, 2005). Indeed, more than 90% of household health care expenses are out-of-

pocket (UNICEF, 2009), with important implications for the use of maternal health care services in a region where greater than half the population is poor (UNICEF, 2014). Consequently, the poorest women are more vulnerable to the added financial burden of formal user fees and informal fees for maternal health care utilization, and face more barriers to care-seeking for reproductive health services (Jo Borghi et al., 2006).

1.3.2. Social Determinants of Reproductive Health Access and Use

From the extant literature on reproductive health in sub-Saharan Africa, a wide range of factors have been identified and described by researchers as being associated with access to, and use of reproductive health services. Some of these factors include individual socioeconomic and demographic characteristics such as wealth, education and literacy levels, area of residence, maternal age, age at first marriage, parity, and employment status (Ezeh & Oronje, 2008; Fotso, Ezeh, Madise, Ziraba, & Ogollah, 2009; Magadi, Zulu, & Brockerhoff, 2003; Greenaway, 2012; Gyimah, 2006; De Allegri et al., 2011; Corroon et al., 2013).

The literature also supports the premise that formally educated women are more likely to have access to health services, and to use health information effectively (Addai, 1999; Rowe, Thapa, Levine et al., 2005). Women who are literate are more likely to be exposed to public service announcements and other information and educational materials that can influence their demand for reproductive health services. Barriers to care-seeking, including cultural barriers such as gender-biased norms, tolerant attitudes towards domestic violence, domestic violence, religion, lack of household decision making autonomy, and poverty have been shown to be associated with reduced access to and use of reproductive health services (Addai, 1999; Magadi, Agwanda, & Obare, 2007;

Stephenson, Baschieri, Clements, Hennink, & Madise, 2006, Corroon et al., 2013). While several individual factors are amenable to public health interventions, contextual barriers are less so, and require a more strategic, multidisciplinary approach to address.

1.3.3. Contextual Determinants of Reproductive Health Access and Use

Attitudes towards domestic violence are an important contextual factor in reproductive health care; these attitudes are embedded in cultural norms. There have been few studies that have examined domestic violence in sub-Saharan Africa. Even less research has examined attitudes towards domestic violence. However, studies have found that a considerable percentage of women and men in sub-Saharan Africa find domestic violence justifiable if women deviate from culturally acceptable behavioral norms (Alio, 2009; Rani, 2004; Koenig, 2003; Uthman et al., 2009). With the culture of patriarchy in West and Central Africa, it is useful to consider attitudes towards domestic violence in program efforts aimed at reducing domestic violence against women. A better understanding of tolerance (and intolerance) toward domestic violence among women can help to improve the effectiveness of interventions to end violence against women. Researchers have found mixed results on contraception use among women who experience physical, sexual, and or verbal abuse. While some researchers found less likelihood of contraceptive use (Miller, 2010; Heise, 2002), others have found the opposite (Alio, 2009; Fanslow, 2008). A possible explanation for the mixed findings may be the differences in the local context of these studies, and the acceptability of domestic violence and contraceptive use are in those settings. In addition, victims of domestic violence have reported discordance between their preferred and actual methods of contraception. Thus, it is reasonable to assume that the experience and acceptance of

domestic violence will be negatively associated with contraceptive use and method choice (Williams, Larsen, and McCloskey, 2008).

Despite the evidence of the benefits of prenatal care and presence of trained personnel during delivery, access to prenatal care and skilled care during childbirth not all women benefit equally from these services. Women with more education and greater wealth are often more likely to use maternal health services than those with less resources (Abel, Françoise, Dramaix-Wilmet, & Donnen, 2012; Arthur, 2012; Babalola, 2014; De Allegri et al., 2011; Fotso, Ezeh, Madise, Ziraba, & Ogollah, 2009; Friberg et al., 2010). Some of the deterrents of maternal health service utilization also include the context in which individuals seek care, and the health services provided. Neighborhood characteristics such as socioeconomic status, poverty, occupation of heads of households, literacy levels, and cultural beliefs and norms play an important role in determining access to health services generally, especially with regard to chronic disease outcomes (Diez-Roux, 2001; Diez-Roux, 2010; Anderson R et al., 1997; Oakes & Rossi, 2003). Socioeconomic status is a measure of individual's access to resources, such as material goods, money, health care, education, and power (Okaes & Rossi, 2003). The concept of community or contextual determinants has been applied to a few studies in sub-Saharan Africa that seek to identify women who are able to access maternal and child health services in the community. Findings from these studies suggest that pregnant women who live in more socioeconomically disadvantaged settings face greater barriers to access and use of maternal health services than women who live in less disadvantaged (Stephenson, 2006; Bablola & Fatusi, 2009; Parkhurst et al., 2005; Aremu et al., 2011).

1.4. Innovation and Significance

Given the relatively low use of prenatal and skilled delivery care, and the high burden of maternal morbidity in West and Central Africa, together with the slow progress of most countries towards achieving MDGs 4 and 5, it is useful to gain a better understanding of the determinants of reproductive health care access, use and quality. Furthermore, many West and Central Africa countries continue to experience civil and armed conflicts, while others are recovering from substantial conflicts. Indeed, approximately two-thirds of the countries in this region are classified as having a fragile or humanitarian situation (UNICEF, 2009). Women are often more vulnerable in conflict and humanitarian situations. Thus, it is important to evaluate the proximate and contextual determinants of reproductive health in this region. It is, therefore, useful to determine if there are context-specific determinants that may be amenable to targeted interventions in this sub-region.

Recent research that has assessed disparities and inequities in reproductive health services access and use have been country-specific (Addai, 1999; Aremu et al., 2011; Babalola & Fatusi, 2009; De Allegri et al., 2011; Zere, Kirigia, Duale, & Akazili, 2012), and may have limited generalizability to West and Central Africa. Several studies in the sub-region have typically addressed specific indicators of reproductive health such as contraceptive use, antenatal care, or facility delivery (Addai, 1999; Aremu et al., 2011; De Allegri et al., 2011; Hubacher et al., 2008; Monjok, Smesny, Ekabua, & Essien, 2010; Ozumba & Ibekwe, 2001). However, apart from systematic reviews and multilateral organizations' meta-analyses, very few studies have simultaneously examined multiple measures of the continuum of reproductive health care: from pre-pregnancy (e.g.

contraception use) through pregnancy (e.g. prenatal care) to delivery care (e.g. institutional deliveries) in West and Central Africa. Stephenson et al. (2007) combined Demographic and Health Survey data with adminstrative data to study contextual influences on the use of facility delivery in three West African and three East African countries (Stephenson, Baschieri, Clements, Hennink, & Madise, 2007). While this study provided useful insights across the sub-Saharan Africa region, the data were from 1998-2000. Babalola and Fatusi (2009) studied the contextual determinants of the use of maternal health services, including antenatal care, skilled delivery assistance, and postnatal care. However, their analysis was limited to Nigeria and used data from 2005 (Babalola & Fatusi, 2009). With the level of progress that has been made in countries and the region as a whole, there is a need for comparative transnational studies in West and Central Africa that use more recent data to identify barriers to reproductive health care and the achievement of population health goals.

Most studies have examined individual determinants of access to maternal health services; however, fewer have investigated the context of care seeking. The importance of the role of contextual determinants of access to reproductive health services in sub-Saharan Africa is increasingly recognized (Stephenson et al., 2006; Aremu et al., 2011; Babalola & Fatusi, 2009; Fotso & Kuate-Defo, 2005; Fotso, Ezeh, Madise, Ziraba, & Ogollah, 2009). People are social and tend to belong to groups and be influenced by group norms. Thus, examining contextual determinants of access to reproductive health services in West and Central Africa can provide further insights into what drives the observed trends of realized access to reproductive health services. There is also growing interest in assessing the content and quality of these services. However, due to a lack of

clearly defined and adaptable measures of adequacy and satisfaction, it has been challenging to assess quality on a large scale (Beeckman, 2011; Babalola & Fatusi, 2009).

My dissertation research seeks to address some of the gaps in our knowledge of the contextual determinants of access to, and use of reproductive health services among women in West and Central Africa. My research is relevant to the field of health services research as it seeks to extend the existing knowledge about contextual barriers to reproductive health among some of the most vulnerable women who are largely poor, rural and, to a large extent, living in fragile countries. My research focused on a region that has remained largely understudied in spite of pervasive poverty and low literacy levels and poor reproductive health outcomes.

With greater need to assess achievement of the MDGs and adopt the Post-2015 Sustainable Development Goals, my study can contribute by analyzing recent data from several low-performing countries, with some of the highest burdens of maternal deaths globally. My aims are to understand the factors that enhance or hinder access to, and use of, and the quality of reproductive health services in West and Central Africa. Identifying factors that are amenable to public health and social policy interventions can help to inform policy and program initiatives for the post-2015 Sustainable Development Goals. Results of my study may help provide useful insights to the United Nations West and Central Africa Region, WHO Africa Region, the Pan African Health Organization, the African Union, and bilateral organizations and country agencies for planning and policy development in the area of reproductive health care.

1.5. Research Aims and Hypotheses

The overarching goal of this dissertation research was to explore the continuum of reproductive health care from contraception through pregnancy and delivery services for women in West and Central Africa. The specific aims of the study were to:

I. Describe the relationships between women's perceptions of domestic violence and contraceptive method choice. This study is presented in Chapter 2.
   a. Hypothesis I.a: Women who are tolerant of domestic violence are less likely to use contraception, compared to women who do not tolerate domestic violence
   b. Hypothesis I.b: The association between tolerance of domestic violence and contraceptive use will differ by country

II. Examine the associations of individual and community socioeconomic status with the quality of prenatal care. This is presented in Chapter 3.
   a. Hypothesis II.a: Residence in a poor community is negatively associated with receiving all recommended prenatal services
   b. Hypothesis II.b: Individual education and wealth are positively associated with receiving all recommended prenatal services among women, even when they live in poor communities

III. Explore community and individual effects of socioeconomic status on institutional delivery (childbirth in a health facility). This analysis is presented in Chapter 4.
   a. Hypothesis III.a: Residence in poor communities is negatively associated with institutional delivery.

My research used pooled, recent data from the fourth phase of the UNICEF Multiple Indicator Cluster Surveys (MICS) for seven West and Central African countries: Central African Republic, Chad, Democratic Republic of Congo, Ghana, Nigeria, Sierra Leone, and Togo. I chose these seven countries because they participated in the fourth round of the MICS surveys, and had available data. The surveys in these countries were conducted in 2010, except in Ghana and Nigeria where surveys were conducted in 2011. Following the discussion of each specific aim in the chapters indicated above, a general conclusion is presented in Chapter 5.

Table 1.1: The United Nations Millennium Development Goals and targets

MDG	DESCRIPTION	TARGETS
Goal 1	Eradicate extreme poverty and hunger	Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day
		Target 1.B: Achieve full and productive employment and decent work for all, including women and young people
		Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger
Goal 2	Achieve universal primary education	Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling
Goal 3	Promote gender equality and empower women	Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015
Goal 4	Reduce child mortality	Target 4.A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate
Goal 5	Improve maternal health	Target 5.A: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio
		Target 5.B: Achieve, by 2015, universal access to reproductive health
Goal 6	Combat HIV/AIDS, malaria and other diseases	Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS
		Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it
		Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
Goal 7	Ensure environmental sustainability	Target 7.A: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources
		Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss
		Target 7.C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation
		Target 7.D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers
Goal 8	Develop a global partnership for development	Target 8.A: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system
		Target 8.B: Address the special needs of the least developed countries
		Target 8.C: Address the special needs of landlocked developing countries and small island developing States (through the Program of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly)
		Target 8.D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term

Source: United Nations (United Nations, 2008)

CHAPTER TWO: THE RELATIONSHIP BETWEEN WOMEN'S PERCEPTIONS OF DOMESTIC VIOLENCE AND CHOICE OF CONTRACEPTIVE METHOD

2.1. Background

The 1994 International Conference on Population and Development (ICPD) marked an important paradigm shift in the discourse on reproductive health and population development (UN, 1995). Since the ICPD, the status of women in terms of empowerment and autonomy has gained more recognition as an important determinant of access to reproductive health care, including family planning (UN, 1995; Do & Kurimoto, 2012). Further, the 1995 United Nations (UN) Fourth World Conference on Women (otherwise known as The Beijing Declaration) and the 2000 United Nations Millennium Development Goals have also laid increasing emphasis on women's empowerment and gender equality as important factors in improving access to reproductive health care, including family planning (UN, 1996; UN, 2000).

It is well documented that improvements in reproductive health and access to contraception offer important benefits for individuals, families, and communities by reducing unwanted pregnancies and the number of children a woman has, and improving general health and wellbeing (Canning, 2012; Cleland, 2012; Friberg, 2010; Kinney, 2010). Access to contraception also reduces the number of high-risk pregnancies and births among younger and older women, and multiparous women (Canning & Schultz, 2012; Cleland, Conde Agudelo, Peterson, Ross, & Tsui, 2012). Moreover, contraception can improve birth spacing, which can also improve maternal and child health, and reduce

maternal and child mortality (Canning & Schultz, 2012; Cleland et al., 2012; Friberg et al., 2010). Contraceptive use also helps adolescent girls complete school, promotes gender equality, and reduces poverty (United Nations Population Fund [UNFPA], 2013).

The West and Central Africa sub-region comprises 24 of the 47 countries in sub-Saharan Africa (SSA) and includes: Benin; Burkina Faso; Cameroon; Cape Verde; Central African Republic (CAR); Chad; Congo; Côte d'Ivoire; Democratic Republic of Congo (DRC); Equatorial Guinea; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Liberia; Mali; Mauritania; Niger; Nigeria; Sao Tome and Principe; Senegal; Sierra Leone; and Togo. Compared to SSA, countries in West and Central Africa have poorer indices of social and health outcomes, including reproductive health. According to recent UN data, the sub-region has a total population of 412 million, and an annual growth rate of 2.6% (UNICEF, 2013). The life expectancy at birth is 53 years (vs. 56 years in SSA), and about half of the population is under 18 years old. Whereas the adult literacy rate (age 25 years and older) in SSA is 57%, the rate in West and Central Africa is 46%. Similarly, the youth literacy rate (ages 15-24 years) is 70% in SSA compared to 64% in West and Central Africa. Nearly half (46%) of the population lives below the international poverty level ($1.25 per day), underscoring the high rate of poverty in the region. However, the rate of urbanization is slightly higher, with 44% urban population compared to 37% for SSA (UNICEF, 2013).

With a total fertility rate of 5.6, the West and Central African region has the highest regional fertility and population growth rates globally (UNICEF 2013). In addition, the prevalence of any contraceptive use is lower for the region than for SSA (18% vs. 24%). Not surprisingly, the maternal mortality ratio is higher in the West and Central African

region than for SSA (570 vs. 500 maternal deaths per 100,000 live births). The lifetime risk of maternal death is 1 in 30; thus, for every 30 women of reproductive age in West and Central Africa, 1 is likely to die from pregnancy-related causes given the fertility and mortality rates in the region; for SSA the estimate is 1 in 38 (UNICEF, 2014a).

The role of individual socioeconomic determinants of contraceptive use has been studied extensively; however, substantial gaps remain in our understanding of the socio-cultural determinants of contraceptive use. Gender roles are norms and values that govern interpersonal communication and relationships within families and communities. In SSA, including West and Central Africa, patriarchal gender norms and power dynamics within families and marital relationships are an important focus of research on women's reproductive health. Gender norms are culturally acceptable definitions of roles, behaviors, rights, and opportunities for women and men in any society, and have the potential to limit women's access to and use of health services, including reproductive health care (Blanc, 2001; Rottach et al, 2009). Some gender-related norms include women's decision-making autonomy, freedom of mobility, household decision making, and spousal communication (Gage, 1995; Kritz & Makinwa-Adebusoye, 1999; Malhotra et al., 1995; Ezeh, 1993; Caldwell et al., 1991). In addition, patriarchal norms promote male dominance because of the lower status of women. Some examples of patriarchal norms include restrictions in education, health care, employment, and decision making related to marital relationships and reproductive choices, and also domestic violence (also referred to as intimate partner violence, referred to hereafter as domestic violence [DV]) (United Nations Population Fund, 2011; Kumar, 2010; Kishor, 2005).

While some studies have found an inverse relationship between exposure to domestic violence and contraceptive use (Do & Kurimoto, 2012; Nanda et al., 2013; Govindasamy & Malhotra, 1996; Alio et al., 2009), others have found a positive relationship (Williams et al., 2008). Thus, it is both useful and timely to investigate this relationship further, addressing this research gap. This research is particularly important in the high fertility countries of West and Central Africa, which are characterized by cultures of male dominance and gender inequality. Findings from this study may inform policies and programs to reduce violence against women and to improve women's reproductive health care, including modern contraceptive initiation and use.

2.2. Literature Review

2.2.1. Study Setting

The West and Central Africa sub-region of SSA comprises 24 countries. According to recent UN data, the sub-region has a total population of 412 million, with an annual growth rate of 2.6% (UNICEF, 2013). While some countries in West and Central Africa were English colonies (Anglophone) (e.g. Sierra Leone, Nigeria, Ghana), others were French colonies (Francophone) (e.g. CAR, DRC, and Chad), or Portuguese colonies (e.g. Cape Verde). A few countries, initially started out as German colonies, but were later divided between the British and French (e.g. parts of Togoland later became a British colony and later joined Ghana, while the French part is present-day Togo; Cameroon has a similar history, with the north becoming a British colony, and the south a French colony) (Griffiths, 1986).

Historical research has shown that the colonial influences largely define present-day political and socioeconomic development in West and Central Africa and other parts of

the world (Griffiths, 1986; Ichoku, Mooney, & Ataguba, 2013). For example, the historical patterns of colonial settlement and activities determined the patterns of urbanization and rapid development in the post-colonial era (Ichoku et al., 2013). Similarly, investments in health care infrastructure and human resources have typically followed the patterns of colonial settlement and development, thus fostering systemic socioeconomic inequities within countries. Differences in the administrative styles during colonial rule in these countries provide further support for the variations in the social and economic development of countries within the West and Central African region. While the decentralized, indirect British administrative style fostered ethnic and cultural diversity, the centralized, direct French rule led to the abolition of most traditional institutions and the imposition of French beliefs and practices in most French colonies (Firmin-Sellers, 2001).

Furthermore, several countries in the region have experienced complex civil conflicts, and some are emerging from extended periods of armed conflicts. Conflicts affect almost every aspect of socioeconomic and cultural life, for example, people lose their land and other sources of income, resulting in widespread poverty, which in turn has been cited as a cause of violence in many countries (Horn, 2010; Horn, 2014). In addition, conflicts generally lead to the destruction of health care and social infrastructure and manpower (Kinney et al., 2010), which affect the availability and quality of health services.

Many countries have retained strong cultural values and norms, some of which create conditions that that foster DV. Some of these include the belief that a man is superior to a woman and has the right to control her; that a woman, like a child should have limited freedom; that violence is an acceptable way of settling disagreements; and that a woman

should be punished if she deviated from expected gender roles (Mann, 2009; Organization, 2009). Other studies have reported that men are prone to perpetrate violence against women if they felt unable to attain the social standard of a successful man (Gelles, 1972; Olayanju, 2013). The level of contraceptive use is generally low and variable among countries in the sub-region, due to a complex mix of factors. Some of these factors include levels of economic development (Diez-Roux, 1998), female autonomy (Kennedy, 1999), education (Al Riyami, 2004; Konje, 1999; Ozumba, 2001; Stanfors, 2014; Emina, 2014), and social norms regarding fertility {Bongaarts, 1995). It is, therefore, not surprising that the countries of West and Central Africa are quite diverse in size, economic development, social capital, culture, and health outcomes. Reproductive health indices are particularly poor in most West and Central African countries, and many countries are not likely to achieve MDG5 targets.

2.2.2. Domestic Violence and Contraceptive Use

Research on DV globally and in SSA continues to document the importance of DV as a public health issue. DV impacts the health of women and families (Garcia et al., 2006; Afifi et al., 2008; Emenike, et al., 2008; Alio, et al., 2009; Stephenson, 2008; Uthman, et al., 2009; Williams, et al., 2008; Sarkar, 2008; Heise, 1998; Fronck et al., 2005). Exposure to DV places women at increased risk for poorer physical health (Plichta, 2004; Coker et al., 2002), mental health (Afifi, 2008; Ratner, 1992; Bawah et al., 1999), and reproductive health outcomes (Alio, 2009; Emenike, 2008; Williams, 2008; Fronck, 2005; Cripe et al., 2008). Although DV is associated with an increased risk of unintended pregnancy, the relationship between DV and contraceptive use appears to vary across contexts (Pallitto, 2005; Rahman et al., 2013). Several studies from North

America and parts of Asia have found that women who experienced DV were less likely to use contraception (Williams et al., 2008; Heise et al., 2002; Martin et al., 1999). However, research in other regions, including SSA, has found that women who experienced DV were more likely to use contraception (Fanslow et al., 2008; Okenwa, Lawoko, & Jansson, 2011).

Stephenson et al. (2008) used a prospective, cohort study design to assess the contraceptive use and unwanted pregnancy pattern in four Indian states. The study sample included 3,234 rural, married women, who had experienced DV within 12 months prior to the study. The researchers found that women who had experienced DV at baseline had 15% lower odds of adopting contraception (odds ratio [OR] = 0.85, p-value ≤ 0.05). They also had 28% higher odds of prospectively reporting a pregnancy as unwanted (OR=1.28, p-value≤ 0.05). In a case-control study in Boston, Massachusetts, Williams, Larsen, and McCloskey (2008) found no significant difference in the likelihood of contraceptive use by women's experience of DV. However, among women who had experienced recent physical and emotional abuse, they found a significant two-fold difference in preferred and actual methods of contraceptives used. This finding suggests discordance between preferred and actual methods of contraception (Williams, Larsen, and McCloskey, 2008).

Alio et al. (2009) used data from six SSA countries (Cameroon, Kenya, Rwanda, Malawi, Uganda, and Zimbabwe) to assess the relationship between DV and contraceptive use among women. They hypothesized that women who experienced DV would be less likely to use modern contraception compared with women who did not experience DV. In contrast with their hypothesis, the researchers found that women who

reported any experience of DV had significantly higher odds of using modern and traditional methods of contraception, after accounting for socioeconomic and demographic factors (OR=1.30; 95% confidence interval [CI]: 1.22, 1.38). Emenike, Lawoko, & Dalal (2008) used data from Kenya, and found similar results. Their findings suggest that women who experienced sexual, emotional, or physical violence had significantly higher odds of contraceptive use (OR= 1.24; 95% CI: 1.09, 1.41), infant mortality (OR= 1.65; 95% CI: 1.43, 1.91) and terminated pregnancy (OR= 1.24; 95% CI: 1.04, 1.48) than those who did not experience DV, after accounting for other factors.

2.2.3. Attitude towards Domestic Violence and Contraceptive Use

Studies from SSA and elsewhere suggest that attitudes that are accepting of DV are highly correlated with the experience of DV (Rahman, et al., 2013; Abramsky et al., 2011; Faramarzi et al., 2005; Koenig et al., 2003). Research has also established a strong positive association between a society's tolerance for wife beating and more traditional gender values and ideals of male dominance, which could make DV appear normative (Oyediran & Isiugo-Abanihe, 2005; Rani et al., 2004). However, the relationship between attitudes towards DV and contraceptive use is not as clear. A large proportion of women are tolerant of violence by an intimate partner in some circumstances (Antai & Antai, 2008; Oyediran & Isiugo-Abanihe, 2005; Koenig, 2003). Additionally, studies from SSA suggest that women have more tolerant attitudes toward DV than men (Koenig, 2003; Speizer, 2010). Further, accepting values of male dominance (for example tolerance of, or perpetration of DV against women) is associated with higher desired fertility among women (Upadhyay & Karasek, 2010) and men in SSA (Isiugo-Abanihe, 1994; Snow, Winter, & Harlow, 2013).

In a transnational study using pooled data from five East African countries (Ethiopia, Rwanda, Tanzania, Uganda, and Zambia) Snow et al., (2013) examined young men's (15-24 years) attitudes towards wife beating as a determinant of men's desired family size. After adjusting for social and demographic factors in the pooled data, they found a significant, positive association between justification of wife beating and a mean increase of 0.4 children in men's desired fertility in all five countries ($\beta = 0.404$; p-value< 0.001). This suggests a possible relationship between justification of DV and an increase in the number of children a man desires to have. It is reasonable to rationalize that men with high desired fertility may be opposed to their wives or partners using contraceptives in order to achieve their desired fertility.

Upadhyay and Karasek (2010) used Demographic and Health Survey data to explore the relationship between women's empowerment and their desired fertility and achievement of their desired fertility. They pooled data from four SSA countries, Guinea, Mali, Namibia, and Zambia. Women's empowerment measures used in this analysis included a measure of justification of wife beating for any of the five following reasons: going out without permission, arguing, neglecting the children, refusing sex, and burning the food. After adjusting for possible confounders, they found that women in Guinea and Zambia who did not justify wife beating for any of these five reasons had a significantly smaller number of children they thought was ideal ($\beta = -0.56$, 95% CI: -0.88, -0.24 and $\beta = -0.23$, 95% CI: -0.38, -0.09 respectively). However, among women in Mali, they found the reverse: women who did not justify wife beating for any of the five reasons had significantly higher desired fertility than women who justified wife beating ($\beta = 0.43$, 95% CI: 0.18, 0.68). There was no significant difference among women in

Namibia (β=0.60, 95% CI: -0.91, 0.29). The estimate for achieved fertility was significant in only one country, Mali: women 35 years and older who did not justify wife beating were less likely to have more children than their ideal number (OR= 0.35, 95% CI: 0.18, 0.71).

Do and Kurimoto (2012) used recent data from Ghana, Namibia, Uganda, and Zambia to examine the association between contraceptive use and six measures of women's empowerment. One of the measures of women's empowerment was an index of women's attitude towards DV for any of the five reasons described earlier (going out without permission, arguing with spouse, neglecting the children, refusing sex, and burning the food). They defined contraceptive use as nonuse, female methods (the pill, IUD, injectable, and implant), and couple methods (male and female condoms, the diaphragm, foam, jelly, withdrawal, lactational amenorrhea method and periodic abstinence). The results suggest that after adjusting for individual and community characteristics, women with non-tolerant attitudes towards DV were more likely to use couple methods of contraception than no method (relative risk ratio [RRR]=1.11, standard error [SE]= 0.05). There was no significant difference in female methods and contraceptive nonuse (RRR= 0.99, SE= 0.03). This finding has important implications for contraceptive use because couple methods require male cooperation (e.g. for effective and consistent use of condoms or periodic abstinence, both partners have to agree). Thus, it is plausible to infer that non-tolerant attitudes for DV could contribute to women's ability to negotiate contraceptive use with their spouses. However, in country-stratified analyses, the association between women's attitude towards DV and contraceptive method choice was not statistically significant in all countries.

2.3. Conceptual Framework

The Health Belief Model (HBM) is a social-cognitive framework, developed in the 1950s as a way to explain why screening programs provided by the US Public Health Service were not very successful (Hochbaum, 1958). The model was later expanded to study adherence to treatment regimens (Becker, 1974). The HBM views people as rational beings who use a multidimensional approach to decision making regarding health behavior (Rosenstock, 1974a). The original HBM has four main constructs: perceived seriousness, perceived susceptibility, perceived benefits, and perceived barriers. More recently, in the course of its application, other constructs have been added to the model: cues to action, perceived self-efficacy, and modifying factors (Glanz, 2008).

Perceived seriousness refers to an individual's perception of the seriousness or severity of an unintended pregnancy. Perception of the seriousness of a pregnancy could come from a woman's personal beliefs about the challenges a pregnancy could pose for her life, or from medical information or knowledge. Perceived susceptibility is one of the more salient prompts for people to take preventive action, and refers to beliefs about the likelihood of getting pregnant. For example, in applying this model, the assumption is that a woman must believe there is a possibility of getting pregnant before she feels motivated to use contraception. A combination of perceived seriousness and susceptibility produces perceived threat (Glanz, 2008). Perceived benefit is woman's opinion of the usefulness of using contraceptives to decrease the perceived threat (seriousness and susceptibility) of getting pregnant. Non-health benefits like financial and social benefits may also motivate contraceptive use. Thus, in spite of the perceived threat of an unintended pregnancy, a woman will adopt contraception if she believes that

it is potentially beneficial in reducing the threat of an unintended pregnancy. Perceived barriers are the potential negative consequences of contraceptive use, and may inhibit contraceptive uptake. These barriers may include factors such as side effects, inconvenience, limited access, partner opposition and or violence, and cost of contraceptive methods. It is therefore implicit in the assumptions of the HBM that for contraceptive adoption to occur, the utility or perceived benefits of contraceptive use should outweigh perceived barriers (CDC, 2004). This process is comparable to a personal decision balance. Some researchers have compared this assessment of perceived barriers to non-conscious cost-benefit analysis on an individual scale (Glanz, 2008; Redding et al., 2000).

Cues to action refer to internal or external factors that may motivate contraceptive use. Interaction of HBM factors can also trigger action. For example, a missed menstrual period or a new sexual relationship could heighten the perception of the threat of pregnancy (susceptibility and seriousness). Similarly, external cues can trigger contraceptive action. For example, contraceptive information from the media or health worker, and partner concern about pregnancy could serve as external cues for contraceptive adoption. The intensity of the cue required to trigger an action will vary with the degree of perceived threat. Self-efficacy was added to the original HBM in 1988 (Rosentock, Strecher, & Becker, 1988) and refers to the confidence in one's ability to use contraceptives effectively (Bandura, 1977). Bandura (1977) identified self-efficacy as a crucial determinant to initiate and maintain behavior change (e.g. contraception) because people generally will not try to do something new unless they believe they can do it (Bandura, 1977). Modifying or enabling factors interact with an individual's perceptions

and decision-making, and indirectly influence behavior. Modifying factors include demographic, structural, biological, social, and psychological factors.

The HBM offers a useful conceptual framework for studying women's contraceptive behavior (see figure 2.2). The constructs of the HBM stress the importance of examining contraceptive behavior from diverse perspectives against the background of individual reproductive goals. Moreover, individual attitudes are highly subject to interactions with other individuals and events within families, and community norms and values. Thus, while perceptions of individual women are some of the main considerations, internal and external cues to action arising from societal norms and gender roles also have very important implications for perceived self-efficacy, and ultimate contraceptive behavior. Attitudes and beliefs about contraception are important determinants of contraceptive intention and behavior. Women are considered more likely to use contraception if they: believe that they have control over their fertility; feel they are susceptible to pregnancy; believe that pregnancy, especially if unintended, is a serious matter; and or feel that contraception is beneficial in preventing an unintended pregnancy. Conversely, if they do not have the above-mentioned perceptions, but rather believe that there are several barriers to adopting contraceptive behavior, then they may be less likely to use contraception. Constructs of the HBM can be used to understand context-specific determinants of the complex and dynamic systems of contraceptive decision-making and method choice. In particular, the adaptability of the HBM makes it applicable among diverse populations and settings.

2.4. Study Objectives and Hypothesis

2.4.1. Study Objectives

The objective of this study was to examine associations between women's perception of DV and contraceptive method choice in seven West and Central African countries. The seven countries are: Central African Republic (CAR), Chad, Democratic Republic of Congo (DRC), Ghana, Nigeria, Sierra Leone, and Togo. These countries had available data from the most recently completed round of the Multiple Indicators Cluster Surveys (MICS). I defined the perception of DV as women's attitudes towards wife beating. Contraceptive method choice was defined as contraceptive nonuse (nonusers), traditional methods (withdrawal, periodic abstinence or rhythm, and lactational amenorrhea method), or modern methods (the pill, injectable, intrauterine device [IUD], diaphragm, foam/jelly, female/male sterilization, female/male condoms, and implants) (UN, 2008).

2.4.2. Study Hypotheses

My hypothesis was that women who are tolerant of DV are less likely to use any method of contraception compared to women who are not tolerant of DV. Given the historical, political, socioeconomic, and cultural differences between these countries, I also hypothesized that the association between attitudes towards DV and contraceptive use will differ among the seven countries included in this study.

2.5. Methods

2.5.1. Data Source and Study Sample

Data were obtained from the fourth phase of the UNICEF Multiple Indicator Cluster Survey (MICS) conducted between 2009 and 2011. MICS is an international household survey, developed by UNICEF to monitor the situation of women and children. Trained

interviewers collect the data using a face-to-face, paper and pencil method. UNICEF launched the first MICS surveys in the mid-1990s to support countries in assessing progress towards the achievement of population and international development goals (UNICEF, n.d.).

More than 60 countries participated in the first round of the surveys, and to date over 100 countries have participated in MICS surveys. The surveys were previously conducted at five-year intervals, until the fourth (2009) round when the frequency of data collection was changed to every three years. Data are collected from nationally representative samples of households using a multiple stage, stratified cluster sampling approach for the selection of the survey sample. Clusters are selected from the most recent census enumeration areas, and are representative at state and regional levels, while also allowing for rural-urban stratification. An equal number of households are selected from each cluster on a systematic random basis. MICS surveys are weighted for over- or under-sampling and non-response (UNICEF, 2009). The surveys are conducted by national government agencies, with technical support and financial assistance from UNICEF and partner agencies. UNICEF develops standard sets of core questionnaire modules which are adapted to suit country contexts for data collection. Thus, the design and standardized core modules allow for local, regional, or transnational comparison of the data. The questionnaire modules are available at: http://www.childinfo.org/mics4_manual.html.

Eleven countries in West and Central Africa participated in the fourth round of the MICS surveys, but complete datasets were available for seven countries: Central African Republic, Chad, Democratic Republic of Congo, Ghana, Nigeria, Sierra Leone, and

Togo. The following questionnaires were developed for use by participating countries: household, women, children, and men questionnaires. Two additional questionnaire modules, child disability and facility vaccination, were included in MICS 4. I used data from the household and women's questionnaires for this study.

Of 100,088 eligible households among the seven countries, 98,154 were successfully interviewed, yielding a response rate of 98.1%. A total of 101,457 women were successfully interviewed out of 109,575 women, representing a response rate of 92.6%. For the purpose of this study, women were excluded from the sample if they were pregnant at the time of the interviews (n= 16,012), trying to get pregnant (n= 1,143), or if they had missing information or "don't know" on contraceptive use (n= 91) or attitudes towards domestic violence (n= 4,156). Thus, the analytic sample for this study was 80,055 women aged 15-49 years.

2.5.2. Study Variables

The exposure variable, attitude towards DV, was constructed using women's responses to the questions in the DV module: "Sometimes a husband is annoyed or angered by the things his wife does. In your opinion, is hitting or beating his wife justified in the following situations: (1) if she goes out without telling him, (2) if she neglects the children, (3) if she argues with him, (4) if she refuses to have sex with him, (5) if she burns the food." For each item, response options included yes, no, and don't know. The exposure variable, attitude towards DV, was constructed as a categorical variable. To construct this variable, first a count variable was computed to include the number of reasons for DV endorsed by each respondent, ranging from 0 to 5. Next, based on the distribution of this count variable, I constructed a three-category variable

measuring the degree of tolerance of DV: none if no reason was endorsed, low if 1-4 reasons were endorsed, and high if all five reasons were endorsed. As previously indicated, all missing and "don't know" data responses were excluded.

The outcome variable was contraceptive method choice. Among women who were not pregnant or trying to get pregnant during the interviews, two survey items on contraceptive use were used to compute the outcome variable. The first was any contraceptive use, referring to self-report of any method of contraception currently used. The core women's questionnaire collected this information using the question: "Some people use various ways or methods to delay or avoid a pregnancy. Are you currently doing something to avoid a pregnancy?" Two response options were provided: yes and no. Thus, women who answered "no" formed the first category of the outcome variable, contraceptive nonuse. For those who answered "yes", the questionnaire further inquired about contraceptive methods: "What are you doing to delay or avoid a pregnancy?" Response options were female sterilization, male sterilization, intrauterine device, injectables, implants, the pill, male condom, female condom, diaphragm, foam or jelly, lactational amenorrhea method, periodic abstinence or rhythm, withdrawal, and "others". These response options were then grouped as traditional and modern contraceptive methods for analysis (UN, 2008). Modern methods were male condom, female condom, diaphragm, foam or jelly, female sterilization, male sterilization, intrauterine device, injectables, implants, and the pill. Traditional methods were lactational amenorrhea method, periodic abstinence or rhythm, withdrawal, and "others."

Based on the literature and conceptual framework, potential confounding variables were selected for inclusion in this study (Ezeh & Oronje, 2008; Fotso, Ezeh, Madise,

Ziraba, & Ogollah, 2009; Magadi, Zulu, & Brockerhoff, 2003; Greenaway, 2012; Gyimah, 2006; De Allegri et al., 2011; Corroon et al., 2013; Addai, 1999; Magadi, Agwanda, & Obare, 2007; Stephenson, Baschieri, Clements, Hennink, & Madise, 2006; Rowe, Thapa, Levine et al., 2005). Among individual modifying characteristics, the following covariates were included: maternal age, parity, marital status, husband's/partner's age, and education. Wealth index (in quintiles), and religion were also included. Perceived threat (perceptions of pregnancy susceptibility) was collected using the question: "Do you think you are physically able to get pregnant?" Response categories were yes, no, and don't know. The desire for future birth (yes, no, or don't know) was considered an internal cue to action. In addition, area of residence (rural or urban) and marital structure (monogamy or polygamy) were included as structural factors.

2.5.3. Statistical Analysis

Descriptive statistics including means and frequencies were calculated for the entire sample. Bivariate analysis using Pearson's Chi-square tests for categorical variables and t-tests for continuous variables were used to test for potential differences by contraceptive use. Multinomial logistic regression was used to obtain odds ratios (ORs) and 95% confidence intervals (CIs) for the association between attitudes towards DV and contraceptive use. The model was adjusted for maternal age, women's education, wealth, area of residence, marital structure, religion, parity, and spousal age difference. The adjusted model was also stratified by country to determine if there were country-specific differences in contraceptive behavior. To account for the complex sampling design used

by MICS, the analyses were conducted using SAS-Callable SUDAAN (Research Triangle Institute, 2008).

2.5.4. Ethical Considerations

The UC Charlotte Institutional Review Board approved this study. Following the submission of a brief proposal of research objectives, UNICEF granted me access to the datasets. The MICS data are publicly available, and access to download datasets is via a user name and password granted by UNICEF's ChildInfo, the administrator of MICS data.

2.6. Results

2.6.1. Descriptive Characteristics

Almost 20% of the women in the sample were using contraception, with the majority of contraceptive users reporting using a modern method (Table 2.1). Overall, approximately 60% of women approved of wife beating for any of the five reasons. The reason for wife beating most commonly supported was for neglecting the children (44.1%), and the least supported reason was for burning the food (27.2%). Nearly 15% of women supported all five reasons for wife beating by a spouse. Most women in the sample were 15-24 years old (36%), married (68%), Christian (52%), and resided in rural areas (61%) (data not shown). About 36% of the women had no education, and the average number of children born was 3.2. About 17% of the women were in the poorest wealth quintile. Most women were first married before age 18 (mean age at first marriage= 17.8 years).

Among modern contraceptive method users, most (48%) had no tolerance for DV, compared to traditional method users and nonusers, most of whom had low tolerance for

DV (46% and 44% respectively). About 33% of modern contraceptive method users were aged 15-24 years, and 38% were aged 25-34 years old. The majority of women who were modern method users was married (64%), had secondary or higher education (53%), resided in urban areas (58%), and was in the highest wealth quintile (39%). Similar to modern method users, most traditional method users were married (79%), had secondary or higher education (43%), and were in the highest wealth quintile (28%). However, contrary to modern method users, traditional contraceptive method users resided in rural areas (59%), and many had more than four children (33%). Further, most modern method users were from Nigeria (35%), and Ghana (21%), while the lowest proportion of modern method users was from Chad (2.5%). Approximately 35% of traditional method users were from Nigeria followed by women from DRC (24%), while the lowest proportion were Togolese women comprising only 2% of traditional method users. Nigeria had the highest proportion of contraceptive nonusers (31%); Ghana had the lowest proportion of nonusers (9.7%).

2.6.2. Unadjusted associations between women's tolerance of DV and contraceptive method

There was no association between low levels of tolerance of DV and traditional method use (OR= 0.95; 95% CI: 0.85, 1.05). However, women with low levels of DV tolerance had 22% lower odds of modern method use compared to women who were intolerant of DV (OR= 0.78; 95% CI: 0.73, 0.84; Table 2.2). Women with high levels of tolerance of DV had even lower odds of traditional or modern method use compared to women with no tolerance of DV (OR= 0.68; 95% CI: 0.56, 0.82; OR= 0.48; 95% CI: 0.42, 0.54 respectively).

Women aged 25-34 years had significantly greater odds of using contraception than women in any other age group (OR= 1.66; 95% CI: 1.50, 1.83 for traditional methods, and OR= 1.42; 95% CI: 1.32, 1.53 for modern methods). There was a gradient response between women's education and contraceptive use. Compared to women with no education, those with secondary or higher education had nearly three times the odds of traditional method use, and over four times the odds of modern method use (OR= 2.71; 95% CI: 2.38, 3.09, and OR=4.67; 95% CI: 4.25, 5.14 respectively). Compared to women with no children, the odds of traditional method use increased among women with 1 to 2 children (OR=1.81; 95% CI: 1.59, 2.06), and 3 to 4 children (OR= 2.01; 95% CI: 1.74, 2.31). There was no association between parity and modern method use among women with 1 to 2 children (OR= 1.04; 95% CI: 0.95, 1.14) and 3-4 children (OR= 1.10; 95% CI: 0.99, 1.22). However, among women with more than four live births, the odds of contraceptive use significantly decreased to 1.74 for traditional methods (95% CI: 1.53, 1.98), and 0.79 for modern methods (95% CI: 0.72, 0.87) compared to women with no live birth. Women living in rural areas had 20% lower odds of using traditional methods (OR= 0.80; 95% CI: 0.70, 0.91), and 60% decreased odds of using modern methods (OR= 0.41; 95% CI: 0.37, 0.45) compared to women living in urban areas. There was evidence of a dose-response relationship between contraceptive use and wealth. Compared to the poorest women, women who were most affluent had 1.63 times the odds of using traditional methods (OR= 1.63; 95% CI: 1.38, 1.94), and 5 times the odds of using modern methods (OR= 5.02; 95% CI: 4.39, 5.73).

2.6.3. Adjusted Associations between Women's Tolerance of DV and Contraceptive Use

After adjusting for maternal age, women's education, wealth, area of residence, marital structure, religion, parity, and spousal age difference, the association between low tolerance of DV and traditional method use was attenuated (OR= 0.87; 95% CI: 0.78, 0.98) (table 2.3). However, the association between high tolerance of DV and traditional contraceptive method use slightly increased in magnitude (OR= 0.72; 95% CI: 0.60, 0.90). The association between low tolerance for DV and modern contraceptive use also slightly increased in magnitude (OR= 0.86; 95% CI: 0.78, 0.95).

2.6.4. Country-Stratified Adjusted Associations between Women's Tolerance of DV and Contraceptive Use

The association between attitudes towards DV and contraceptive method choice differed by country after adjusting for maternal age, women's education, wealth, area of residence, marital structure, religion, parity, and spousal age difference (table 2.4). Among six countries (CAR, Chad, DRC, Ghana, Nigeria and Togo), there was no strong association between low tolerance of DV and traditional method choice. In Sierra Leone, women with low tolerance of DV were nearly 40% more likely to use traditional methods of contraception, compared to women with no tolerance (OR=1.38; 95% CI: 0.83, 2.28). However, this association was not statistically significant. Similarly, among women in three countries (CAR, Chad, and Ghana), there was no association between high tolerance of DV and traditional method use: OR= 1.02; 95% CI: 0.67, 1.55; OR= 0.87; 95% CI: 0.50, 1.53; and OR= 0.97; 95% CI: 0.55, 1.70, respectively). Among women in DRC, high level of DV tolerance was associated with increased odds of traditional

method use (OR=1.36; 95% CI: 0.92, 2.10). However, among three countries (Nigeria, Sierra Leone, and Togo), high tolerance of DV was associated with decreased odds of traditional method use, although the only statistically significant association was observed among Nigerian women (OR= 0.40; 95% CI: 0.28, 0.57; OR= 0.51; 95% CI: 0.20, 1.31; and OR= 0.64; 95% CI: 0.13, 3.29, respectively).

Among all seven countries, there was either no difference or slight increases in odds when the low DV tolerance and modern contraceptive use association was considered. All observed estimates were not statistically significant, and the confidence intervals overlapped. However, among two countries (CAR and Chad), women with high tolerance of DV had 50% and 24% increased odds of modern contraceptive use, respectively, compared to women with no tolerance of DV. Nonetheless, these associations were not statistically significant (OR= 1.50; 95% CI: 0.99, 2.29, and OR= 1.24; 95% CI: 0.76, 2.04 respectively). Among the other five countries (DRC, Ghana, Nigeria, Sierra Leone and Togo), there was no association between high DV tolerance and modern contraceptive use.

2.7. Discussion

This study examined the association between women's perception of DV and contraceptive use in a sample of women from seven West and Central African countries. The findings indicate low levels of contraceptive use generally, and differences in levels of contraceptive use and method choice among countries. Consistent with my hypotheses, in pooled, adjusted multinomial regression models, women who were more tolerant of DV had lower odds of using traditional or modern contraceptive methods compared to women who were intolerant of DV. As the degree of tolerance of DV

increased from none to low, and low to high, the odds of using traditional or modern contraceptive methods decreased. The magnitude of the differences between low and high degrees of tolerance of DV was larger for modern contraceptive methods than traditional methods. The results also indicate that the largest differences in contraceptive method choice were among women with high tolerance of DV, whereas women with low tolerance did not differ much in terms of contraceptive method choice. Among modern contraceptive method users, nearly 10% had high tolerance of DV, compared to 42% and 48% for low and no tolerance respectively. My findings did not support my hypothesis, that women's attitudes toward DV and contraceptive method differed by country. The only exception was in Nigeria, where women with high DV tolerance were significantly less likely to use traditional contraceptive methods compared to women with no DV tolerance. Results from this study contribute to the literature on contraceptive use in West and Central Africa by suggesting that women's tolerance of DV may be associated with a reduced likelihood of contraceptive use. These findings suggest that women with high levels of DV tolerance are less likely to use any traditional or modern methods of contraception compared with women with low levels or no tolerance of DV.

Consistent with previous studies, in unadjusted results, women with no tolerance of DV were more likely to use contraception than those who were tolerant of DV (Do & Kurimoto, 2012; Crissman, 2012). Higher levels of education and increased wealth were also associated with higher likelihoods of contraceptive use (Crissman, 2012; Al Riyami et al., 2004; Stephenson et al., 2007; Gakidou and Effy, 2007). Also consistent with prior studies, women living in urban areas and women who reported being Christian were more likely to use traditional or modern contraception compared to those living in rural areas

and those who were not Christian (Dodoo & Tempenis, 2002; Guillaume & Loû, 2002). I also found that higher parity was associated with an increased likelihood of using traditional methods, but not modern methods of contraception.

Consistent with previous studies, women with younger spouses were more likely to use contraception than those with older spouses; this result may be related to spousal communication about contraception (Gage, 1995). In contrast to several studies in SSA, formerly and never married women were less likely to use traditional contraception, but more likely to use modern methods compared to currently married women (Magadi & Curtis, 2003; Williamson et al., 2009). The latter result is consistent with a previous study from Cote d'Ivoire, which found that never married and formerly married women were more likely to use any method, including modern methods of contraception and abortions for fertility regulation, compared to married women (Guillaume & Loû, 2002). Nevertheless, this finding could indicate a possible shift in the acceptability of non-marital sexual relationships, and the need to prevent unwanted childbearing among unmarried women. Additionally, barrier methods, possibly attributable to the prevention of sexually transmitted infections, and injectable contraceptives have become increasingly common contraceptive methods among unmarried women (Waithaka and Bessinger 2001; Westoff, 2006; Magadi & Curtis, 2003).

After adjusting for age, education, wealth, area of residence, marital arrangement, religion, parity, and spousal age difference, the association between tolerance of DV and contraceptive use persisted. The adjusted association between low tolerance for DV and traditional contraceptive use increased slightly in magnitude, and became statistically significant. For high levels of tolerance, the adjusted association with traditional method

use was slightly attenuated, but remained statistically significant. Similarly, the adjusted odds of modern contraceptive use were slightly attenuated, and remained significant for both low and high levels of DV tolerance. These findings are consistent with previous studies in SSA and South Asia where women's tolerance of wife beating was associated with decreased odds of contraceptive use (Woldemicael, 2009). Although Woldemicael (2009) used a dichotomous measure of attitude towards DV, and considered contraceptive use as any method use, women who disapproved of DV had between 20-40% higher odds of any contraceptive use than those who approved of DV. Compared with women in West and Central Africa, the women in the study conducted by Woldemicael (2009) had higher levels of tolerance of DV: 27% disapproved of wife beating for any reason (Woldemicael, 2009) compared with 40% in my study.

The results of the present study are also consistent with those of a recent study out of Tanzania, which used an index measure of women's attitudes towards wife beating in conjunction with other measures of gender equity. The researchers found that for every one-unit increase in the number of DV reasons a woman did not endorse, there was a corresponding 29% increase in the odds of contraceptive use (OR= 1.29; 95% CI: 1.02, 1.64) (Nanda et al., 2013). Two other studies of women's autonomy and empowerment, using a dichotomous measure of attitudes towards wife beating as a determinant of maternal health care, have reported similar findings with regards to contraceptive use, antenatal care, skilled delivery assistance, and facility delivery (Namasivayam et al., 2012; Corroon et al., 2014).

Lower levels of contraceptive use among women who are more tolerant of DV may be related to the lower socioeconomic status of women, lower levels of education, and

lower levels of perceived self-efficacy. These factors may make it difficult for women with these characteristics to access reproductive health care (Jensen & Thornton, 2003), and contribute to lower likelihood of using any method of contraception. It is possible that women with higher levels of tolerance of DV may have very low perceptions of self-efficacy to use modern contraception, and thus may be more likely to choose traditional methods of contraception as observed in the adjusted regression model of the pooled data.

The results from the present study suggest a number of consistent patterns. First, the descriptive characteristics of women in this study suggest that there were more nonusers than contraception users in all seven countries, which is consistent with the very low prevalence of contraceptive use in the region. Second, among the Francophone countries, except Togo, traditional method use was more prevalent than modern method use among contraceptive users. Among contraceptive users in Anglophone countries and Togo, the reverse was the case: there were more modern method users than traditional method users. Third, in pooled analysis, the association between women's attitude towards DV and contraceptive method choice differed after accounting for the contribution of social and demographic characteristics. Fourth, although there were no significant country differences between low levels of DV tolerance and traditional or modern contraceptive use among all seven countries, there was a difference between high DV tolerance and traditional method use in Nigeria. These findings highlight the importance of context-specific relationships between gender issues and women's reproductive health behaviors in West and Central Africa. Specifically, the similarities observed between Togo and Anglophone countries in the sample may be related to the relatively longer period of British rule in Togo compared to French rule (Wolf, 1973).

The lack of country differences between low DV tolerance and contraceptive method choice suggests that, within countries, women with low tolerance may not be very different from those with no tolerance for DV; thus, there is a need to identify other factors that influence women's contraceptive choices. In CAR and Chad (Francophone), positive associations were observed between high DV tolerance and modern contraceptive use. Although not statistically significant, these findings are not consistent with my hypothesis and previous studies that have examined modern contraceptive use as the outcome (Do and Kurimoto, 2012). Do and Kurimoto (2012) in a transnational study using data from Ghana, Namibia, Uganda and Zambia found statistically higher odds of couple-method use among Namibian women who were accepting of DV (RRR=1.11; SE: 0.05), but found no significant associations with female only methods, or among the other three countries. As discussed earlier, couple methods include male and female condoms, the diaphragm, foam, jelly, withdrawal, lactational amenorrhea method, and periodic abstinence (Do & Kurimoto, 2012). The authors' definition of couple methods consists of a combination of traditional and some barrier (modern) methods in my study. This difference may possibly contribute to some of the discrepancy between the study and my study.

Similarly, in terms of traditional contraceptive use, women in DRC with high DV tolerance had 36% increased odds of use compared to women with no DV tolerance. This finding could indicate the predominant methods of contraception in the country (24% traditional methods vs. 6% modern methods), which may be related to the 1920's Anti-Contraception Laws of France and her colonies. These laws favored traditional methods of contraception (Wolf, 1973). Traditional contraceptive methods require the

cooperation of both partners, especially the male partner (for example, periodic abstinence and withdrawal). For women with high tolerance of DV, and possibly lower levels of perceived self-efficacy, this could be a further limitation of use. In Nigeria, Sierra Leone, and Togo, there was a negative association between high DV tolerance and traditional method use, findings that are consistent with the study hypothesis. In Sierra Leone and Togo, modern contraceptive use is more prevalent than traditional methods, thus the observed odds could also be a reflection of the prevalent methods of choice in these countries. Although Togo is currently Francophone, it was originally a German colony, and later divided between the British and French. Additionally, Togo existed as a French colony for less than one year before gaining independence. Thus, it is possible that the French Anti-Contraception Laws did not exert a very strong effect in Togo (Wolf, 1973). Further, since the first population policy in 1998, the country has made concerted efforts and policy initiatives to increase access to modern contraceptive methods (McDavid & Kodjo, 2012). In addition, the sample size for Togo is small relative to the other countries in this study. Therefore, it is possible that the association could assume a different direction were the sample size larger.

2.7.1. Strengths and Limitations

Classifying contraceptive methods as either traditional or modern methods is an important strength of the current study. While the overall goal of reproductive health-related development programs is to increase the use of more effective and modern contraception, the reality is that there are a number of women who continue to use traditional methods. Thus, it is important to understand the drivers of traditional contraceptive method use in order to develop evidence-based programs and interventions

for such populations. My study extends research in this area by assessing attitudes toward DV on a gradient to help identify variations by the degree of tolerance of DV, and also by classifying contraceptive method choice as traditional and modern methods.

The analysis of pooled, recent, transnational data is another study strength. Of particular note is the fact that the countries of West and Central Africa have much in common, including past or present civil unrest. Conflicts and civil unrest generally have devastating effects on health systems and the status of women, possibly contributing to poorer reproductive health indices compared to SSA. The questions on contraceptive use elicit responses on current behavior. The findings of this study should be generalizable to the West and Central African region, and to other SSA countries. Further, interviewers who spoke the local language, administered the surveys, thus improving data quality. Hence, this study adds to the existing literature in this region which has remained largely understudied.

Despite these strengths, this study has limitations. It is possible that tolerance of DV is under-reported, especially because the surveys are interviewer administered, and due to the potential for women to give socially desirable responses. If this was the case, it is likely to affect all women equally. The questions on justification of DV are related to current attitudes, and not past DV experience as is common in many household surveys. Thus, the likelihood of nondifferential misclassification, if present, should be minimal. Given that nondifferntial misclassification generally biases results towards the null and this study found associations between tolerance of DV and contraceptive use, the true associations may even be stronger. Lastly, this study was limited to the questions asked on the MICS survey. For example, the surveys did not include questions on DV

experience. It is possible that women's contraceptive behaviors may differ from the present findings if they were victims of DV.

2.8. Implications for Policy, Practice and Research

Findings from the present study on women's attitudes towards DV and contraceptive method choice provide useful insights for addressing low rates of contraceptive uptake and use, as well as ending violence against women by intimate partners. The high prevalence of justification of DV by women in the countries studied represents an important threat to the success of programs aimed at ending DV against women, and to women's reproductive health. Only 40% of women reported intolerance of DV for any of the five reasons. This result implies that over half of the women are tolerant of DV. Given the high association between attitudes towards DV and the experience of DV (Kishor & Johnson, 2004; Faramarzi et al., 2005; Uthman et al., 2009), it is important that programs that address violence against women focus not only on men's attitudes, but also women's attitudes towards DV, to help reduce the intergenerational transmission of attitudes that may promote acceptance of DV. Educational programs will be especially helpful.

These results also support the hypothesis that women who justify DV are less likely to use any method of contraception compared to women who do not justify DV. Specifically, women with high levels of tolerance of DV were least likely to use either traditional or modern methods of contraception, compared to those with low levels or no tolerance of DV. While the goal of population policies is to increase the prevalence of modern contraceptive use for birth spacing and limiting the number of children, it is important to pay special attention to norms and values that threaten women's perceived

self-efficacy. The fear of DV for any reason is an important barrier to modern contraceptive use (Oyedokun et al, 2008). It is important for health care providers to screen women for their attitudes toward DV to identify those at risk of DV and/or contraceptive nonuse or traditional method use. Education is linked to health literacy and the ability to understand and follow health information (Berkman, 2011). Education and literacy are also linked to self-efficacy (Berkman, 2011; Bandura, 1977); thus, one way to improve self-efficacy is to prioritize the education of girls and women in West and Central Africa. Countries need to commit to closing the gender gap in education by adopting policies that promote the enrollment and retention of girls in school. Not only does this action have the potential to increase self-efficacy, it also it may increase economic capital (Overbosch, 2004).

There are several possible pathways to contraceptive decision making, and women's perception of gender norms is only one such pathway. The presence of country effects in the association between attitudes towards DV and contraceptive behavior in country-stratified analysis calls for further research into other decision pathways to contraceptive behavior. For example, it would be plausible to consider female dependent vs. couple dependent contraceptive methods as possible classifications of contraceptive methods. In addition, many issues related to gender norms and values may be more difficult to measure and examine quantitatively, thus future research on women's attitudes towards DV and contraceptive behavior will benefit from a qualitative and mixed methods approach. Focus groups will be particularly helpful in understanding why women perceive wife beating to be acceptable in certain scenarios and not in others, while also shedding light on other drivers of contraceptive decision-making.

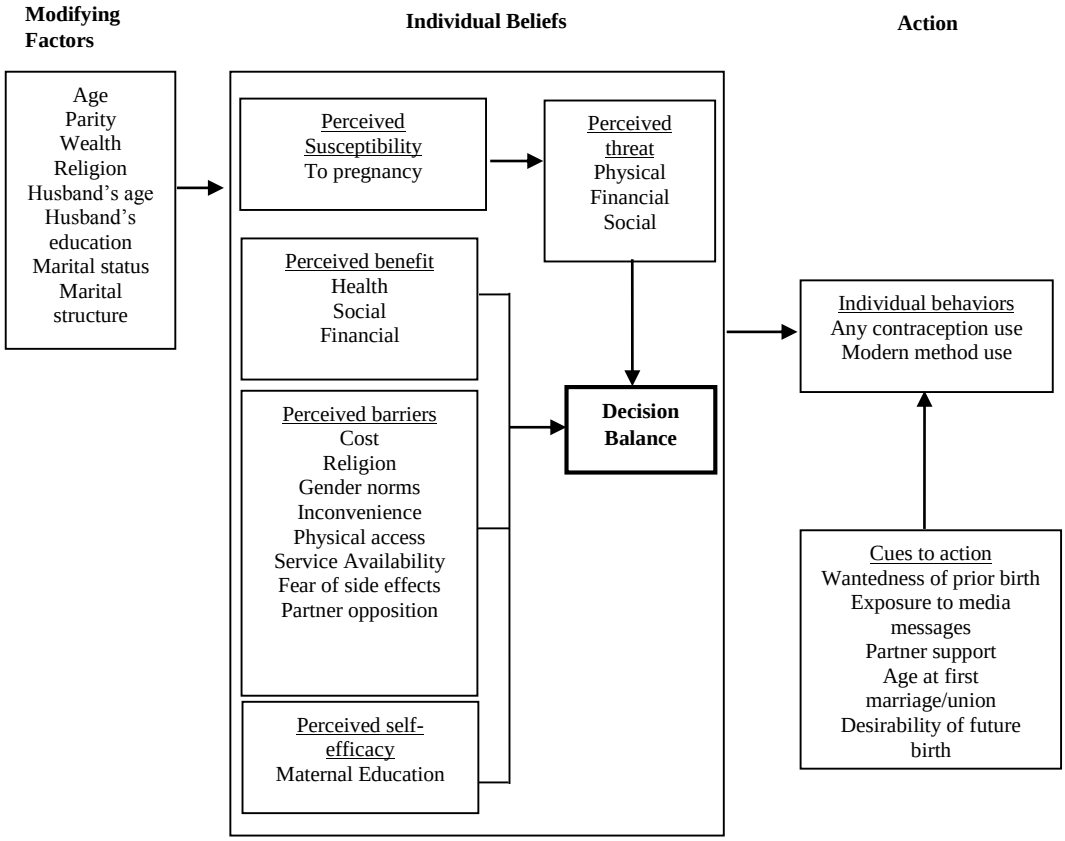

Figure 2.1: An adapted Health Belief Model illustrating components and variables

Table 2.1: Characteristics of West and Central African Women by Contraceptive Behavior: Multiple Indicators Cluster Survey, Round 4 (2009-2011)

Characteristic	**Total**	**Contraceptive Use N (%)***		
		Nonuse	**Traditional[a]**	**Modern[b]**
	80,055	**65,495 (80.7)**	**5,176 (6.6)**	**9,384 (12.7)**
DV tolerance				
None	30,974 (40.6)	24,707 (39.3)	2,104 (42.5)	4,163 (48.0)
Low (some)	36,521 (44.3)	29,837 (44.5)	2,414 (45.7)	4,270 (42.6)
High (all)	12,560 (15.0)	10,951 (16.2)	658 (11.7)	951 (9.5)
Maternal age				
15-24	29,454 (36.5)	24,783 (37.8)	1,561 (29.1)	3,110 (32.6)
25-34	25,677 (32.7)	20,309 (31.2)	1,979 (39.8)	3,389 (38.2)
35-49	24,924 (30.8)	20,403 (31.0)	1,636 (31.2)	2,885 (29.2)
Marital status				
Currently married	55,276 (68.4)	45,126 (68.3)	4,141 (79.4)	6,009 (64.0)
Never/ previously married	24,779 (31.6)	20,369 (31.8)	1,035 (20.6)	3,375 (36.0)
Women's education				
None	33,695 (38.2)	30,329 (42.8)	1,448 (23.3)	1,918 (16.6)
Primary	21,897 (28.5)	17,534 (27.8)	1,659 (33.3)	2,704 (30.0)
≥Secondary	24,458 (33.4)	17,628 (29.4)	2,069 (43.4)	4,761 (53.4)
Parity				
0	18,753 (24.0)	15,700 (24.5)	731 (15.0)	2,322 (25.4)
1-2	18,995 (24.4)	15,372 (24.0)	1,332 (26.6)	2,291 (25.8)
3-4	16,622 (21.3)	13,250 (20.6)	1,248 (25.4)	2,124 (23.5)
>4	25,685 (30.3)	21,173 (30.9)	1,865 (33.0)	2,647 (25.3)
Area of residence				
Urban	28,496 (38.8)	21,959 (35.7)	1,910 (40.9)	4,627 (57.7)
Rural	51,559 (61.2)	43,536 (64.3)	3,266 (59.1)	4,757 (42.3)

Table 2.1 (continued): Characteristics of West and Central African women by contraceptive behavior: Multiple Indicators Cluster Survey, Round 4 (2009-2011)

Characteristic	**Total**	**Contraceptive Use N (%)***		
	80,055	**Nonuse 65,495 (80.7)**	**Traditional 5,176 (6.6)**	**Modern 9,384 (12.7)**
Wealth quintile				
Poorest	17,119 (17.7)	15,097 (19.5)	997 (16.0)	1,025 (7.1)
Poor	15,787 (18.2)	13,548 (19.5)	924 (15.7)	1,315 (11.3)
Middle	15,487 (19.4)	12,752 (19.8)	1,009 (19.2)	1,726 (17.0)
Rich	15,588 (20.8)	12,219 (20.1)	1,066 (20.7)	2,303 (25.7)
Richest	16,074 (23.9)	11,879 (21.2)	1,180 (28.4)	3.015 (38.9)
Desire future birth				
Yes	54,541 (67.8)	45,688 (69.6)	3,364 (63.9)	5,489 (58.3)
No	16,375 (20.8)	12,643 (19.6)	1,303 (26.7)	2,429 (25.9)
Unsure/ don't know	9,139 (11.4)	7,164 (10.8)	509 (9.4)	1,466 (15.8)
Marital structure				
Polygamous	18,441 (21.4)	15,943 (23.0)	1,050 (17.0)	1,448 (13.9)
Monogamous	36,289 (46.3)	28,768 (44.6)	3,022 (61.0)	4,499 (49.4)
Missing	25,325 (32.3)	20,784 (32.4)	1,104 (22.0)	3,437 (36.7)
Spouse's education				
None	29,269 (36.3)	24,645 (37.5)	1,537 (29.4)	3,087 (32.6)
Primary	19,81 (26.3)	15,917 (25.8)	1,579 (32.5)	2,318 (26.3)
≥Secondary	23,004 (29.5)	18,372 (28.8)	1,721 (32.6)	2,911 (32.0)
Unknown/ missing	7,968 (8.0)	6,561 (8.0)	339 (5.5)	1,068 (9.1)
Religion				
Muslim	20,986 (23.5)	18,830 (26.2)	859 (12.8)	1,297 (12.0)
Christian	38,674 (51.5)	29,763 (48.2)	3,819 (77.9)	5,092 (58.6)
Others/unknown	3,728 (4.3)	3,070 (4.3)	284 (5.1)	374 (3.5)
Missing	16,667 (20.7)	13,832 (21.2)	214 (4.3)	2,621 (25.9)
Mean age at first marital union	17.85	17.61	18.91	18.88

Table 2.1 (continued): Characteristics of West and Central African women by contraceptive behavior: Multiple Indicators Cluster Survey, Round 4 (2009-2011)

Characteristic	**Total 80,055**	**Contraceptive Use N (%)***		
		Nonuse 65,495 (80.7)	**Traditional 5,176 (6.6)**	**Modern 9,384 (12.7)**
Mean age (women)	29.1	28.9	30.0	29.4
Mean age of spouse	45.7	46.3	42.9	43.4
Spousal age difference	14.2	14.9	11.4	11.0
Country				
CAR[d]	9,041 (11.3)	7,726 (11.6)	632 (11.6)	683 (9.7)
Chad	10,703 (13.4)	9,992 (15.6)	479 (7.6)	232 (2.5)
DRC[e]	9,393 (11.7)	7,363 (11.2)	1,288 (24.3)	740 (6.1)
Ghana	9,312 (11.7)	6,722 (9.7)	716 (16.9)	1,874 (21.4)
Nigeria	24,941 (31.2)	19,860 (30.5)	1,847 (35.4)	3,234 (34.5)
Sierra Leone	11,221 (13.9)	9,264 (14.3)	124 (2.4)	1,833 (17.9)
Togo	5,446 (6.8)	4,568 (7.0)	90 (1.9)	788 (7.93)

All p-values <0.001

[a] Traditional methods include: lactational amenorrhea method, periodic abstinence/rhythm, and withdrawal. [b] Modern methods include: male condom, female condom, diaphragm, foam/jelly, female sterilization, male sterilization, intrauterine device, injectables, implants, and the pill. [c] DV= domestic violence. [d] CAR = Central African Republic. [e] DRC = Democratic Republic of Congo

Table 2.2: Unadjusted odds ratios of contraceptive use by demographic characteristics of women in West and Central Africa: Multiple Indicator Cluster Survey, Round 4 (2009-2011).

Characteristic	**Unadjusted odds ratios and 95% confidence intervals of contraceptive use**	
	Traditional[a]	**Modern[b]**
Degree of DV[c] tolerance		
None	1.00	1.00
Low	0.95 (0.85-1.05)	0.78 (0.73-0.84)*
High	0.68 (0.56-0.82)*	0.48 (0.42-0.54)*
Maternal age		
15-24	1.00	1.00
25-34	1.66 (1.50-1.83)*	1.42 (1.32-1.53)*
35-49	1.31 (1.17-1.45)*	1.09 (1.00-1.18)
Marital status		
Currently married	1.00	1.00
Previously/ Never married	0.56 (0.50-0.62)*	1.21 (1.12-1.31)*
Women's education		
None	1.00	1.00
Primary	2.20 (1.95-2.47)*	2.78 (2.53-3.06)*
≥Secondary	2.71 (2.38-3.09)*	4.67 (4.25-5.14)*
Parity		
0	1.00	1.00
1-2	1.81 (1.59-2.06)*	1.04 (0.95-1.14)
3-4	2.01 (1.74-2.31)*	1.10 (0.99-1.22)
>4	1.74 (1.53-1.98)*	0.79 (0.72-0.87)*
Area of residence		
Urban	1.00	1.00
Rural	0.80 (0.70-0.91)*	0.41 (0.37-0.45)*

Table 2.2 (continued): Unadjusted odds ratios and 95% confidence intervals of the associations between women's characteristics and contraceptive method use

Characteristic	Unadjusted odds ratios and 95% confidence intervals of contraceptive use	
	Traditional[a]	Modern[b]
Wealth quintile		
Poorest	1.00	1.00
Poor	0.98 (0.85-1.14)	1.57 (1.39-1.78)*
Middle	1.18 (1.00-1.38)	2.34 (2.06-2.67)*
Rich	1.26 (1.07-1.48)*	3.49 (3.06-4.00)*
Richest	1.63 (1.38-1.94)*	5.02 (4.39-5.73)*
Desire for future birth		
Yes	1.00	1.00
No	1.48 (1.35-1.63)*	1.58 (1.46-1.72)*
Unsure/ don't know	0.95 (0.82-1.09)	1.74 (1.56-1.94)*
Marriage structure		
Polygamous	1.00	1.00
Monogamous	1.84 (1.66-2.05)*	1.83 (1.66-2.01)*
Missing	0.91 (0.79-1.04)	1.87 (1.67-2.08)*
Spouse's education		
None	1.00	1.00
Primary	1.12 (0.87-1.44)	0.98 (0.82-1.16)
≥Secondary	0.88 (0.63-1.23)	1.03 (0.81-1.29)
Religion		
Christian	1.00	1.00
Muslim	0.30 (0.26-0.35)*	0.38 (0.33-0.43)*
Other/ Unknown	0.72 (0.59-0.88)*	0.67 (0.56-0.80)*
Mean age at first marriage/ union	1.06 (1.05-1.07)*	1.06 (1.04-1.07)*
Spousal age difference	0.99 (0.98-0.99)*	0.99 (0.98-0.99)*

[a] Traditional methods include: lactational amenorrhea method, periodic abstinence/rhythm, and withdrawal. [b] Modern methods include: male condom, female condom, diaphragm, foam/jelly, female sterilization, male sterilization, intrauterine device, injectables, implants, and the pill
[c] DV= domestic violence. * p-value <0.05

Table 2.3: Adjusted odds ratios and 95% confidence intervals of contraceptive use among women in West and Central Africa: Multiple Indicator Cluster Survey, Round 4 (2009-2011).

	Adjusted odds ratios and 95% confidence intervals of contraceptive use	
	Traditional[a]	**Modern[b]**
Level of DV[c] tolerance		
None	1.00	1.00
Low	0.87 (0.78-0.98)*	0.86 (0.78-0.95)*
High	0.72 (0.60-0.90)*	0.62 (0.59-0.88)*

Adjusted for maternal age, women's education, wealth, area of residence, marriage structure, religion, parity, and spousal age difference.

[a] Traditional methods include: lactational amenorrhea method, periodic abstinence/rhythm, and withdrawal. [b] Modern methods include: male condom, female condom, diaphragm, foam/jelly, female sterilization, male sterilization, intrauterine device, injectables, implants, and the pill. [c] DV= domestic violence. * p-vlaue <0.05

Table 2.4: Adjusted odds ratios and 95% confidence intervals of contraceptive use among women in West and Central Africa stratified by country: Multiple Indicator Cluster Survey, Round 4 (2009-2011).

	Contraceptive Method					
	Traditional[a]			Modern[b]		
	Degree of DV[c] Tolerance					
Country	None	Low	High	None	Low	High
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
CAR[d]	1.00	1.05 (0.77-1.44)	1.02 (0.67-1.55)	1.00	1.18 (0.86-1.61)	1.50 (0.99-2.29)
Chad	1.00	1.17 (0.70-1.94)	0.87 (0.50-1.53)	1.00	0.94 (0.60-1.48)	1.24 (0.76-2.04)
DRC[e]	1.00	1.10 (0.84-1.43)	1.36 (0.92-2.01)	1.00	0.99 (0.72-1.37)	0.92 (0.61-1.39)
Ghana	1.00	0.95 (0.72-1.25)	0.97 (0.55-1.70)	1.00	1.07 (0.89-1.29)	1.01 (0.63-1.62)
Nigeria	1.00	0.87 (0.74-1.01)	0.40 (0.28-0.57)*	1.00	0.92 (0.80-1.08)	1.03 (0.79-1.34)
Sierra Leone	1.00	1.38 (0.83-2.28)	0.51 (0.20-1.31)	1.00	0.91 (0.72-1.14)	0.97 (0.74-1.27)
Togo	1.00	1.15 (0.69-1.91)	0.64 (0.13-3.29)	1.00	1.18 (0.97-1.45)	0.81 (0.45-1.46)

[a] Traditional methods include: lactational amenorrhea method, periodic abstinence/rhythm, and withdrawal. [b] Modern methods include: male condom, female condom, diaphragm, foam/jelly, female sterilization, male sterilization, intrauterine device, injectables, implants, and the pill. [c] DV= domestic violence. [d] CAR = Central African Republic. [e] DRC = Democratic Republic of Congo. * p-value <0.05

CHAPTER THREE: INDIVIDUAL AND COMMUNITY SOCIOECONOMIC EFFECTS ON THE QUALITY OF PRENATAL CARE: A MULTILEVEL ANALYSIS OF WEST AND CENTRAL AFRICA

3.1. Background

The fifth Millennium Development Goal (MDG5) focuses on improving maternal health (United Nations, 2000). The first target of MDG5 is to reduce by the maternal mortality ratio by 75% between 1990 and 2015. Although there has been remarkable progress worldwide in reducing the maternal mortality ratio from 380 to 210 deaths per 100,000 live births (45% reduction between 1990 and 2013), the number of women dying from pregnancy-related causes still remains high (UNDP & WHO, 2014). According to recent United Nations (UN) estimates, globally, nearly 300,000 women died from pregnancy-related causes in 2013 (UNDP & WHO, 2014). Approximately 85% of these deaths occurred in the resource-poor countries of Southern Asia and sub-Saharan Africa (UNDP & WHO, 2014). The second target of MDG5 is to achieve universal access to reproductive health care by 2015 (UN, 2000). The indicators of this target include contraceptive prevalence rate, adolescent birth rate, prenatal care (also used interchangeably with antenatal care) coverage, and unmet need for contraception (United Nations, 2008).

The World Health Organization (WHO) recommends a minimum of four prenatal care visits with a skilled health provider, the first visit being in the first trimester (WHO, 2004). Skilled health providers include physicians, nurses, and midwives. Additionally,

the WHO recommends a minimum care package that women should receive during pregnancy. This package includes routine monitoring of pregnancy progression, diagnostic tests to detect potential complications, tetanus vaccination, micronutrient supplementation, intermittent preventive treatment of malaria in pregnancy (IPTp) in endemic areas, and information on safe delivery, health promotion, and prevention of HIV transmission from mother to child (WHO, 2006 (Tann, 2007). Thus, good quality prenatal care offers an important opportunity to address risk factors for adverse pregnancy outcomes and to educate women about danger signs of pregnancy and pregnancy outcomes, thereby reducing maternal and infant morbidity and mortality (Pathak, 2010).

There have been questions about the direct effects of prenatal care in reducing maternal morbidity and mortality, largely due to the failure of prenatal risk assessment to detect most high-risk pregnancies (Bergsjø, 1997). Nonetheless, the consensus led by the WHO is that prenatal care, if composed of a minimum package of services, has important benefits for improving maternal health. In addition, prenatal care contributes to reductions in maternal morbidity and mortality by encouraging women to adopt healthy behaviors in pregnancy, including delivering in a health facility or with a skilled birth attendant (WHO, 2004; WHO, 2006). Furthermore, prenatal care improves neonatal survival and outcomes through reduced incidence of low birth weight infants, prevention of neonatal tetanus, and prevention of mother-to-child-transmission of HIV (Darmstadt, 2005).

Available data suggest that although, globally, there has been an increase in the proportion of pregnant women who had at least one prenatal care visit, from 64% in 1990

to 83% in 2013, only 52% had four or more visits (UNDP & WHO, 2014). However, there are regional disparities in the progress made so far. In West and Central Africa, the prenatal coverage rates are slightly lower: 76% of women had at least one prenatal care visit, while only 50% had at least four visits (UNICEF, 2014). There is further evidence to suggest that many women who received prenatal care, even when provided by a skilled provider, did not receive the minimum prenatal care package (Babalola, 2014).

Additionally, several studies have identified inequities in both access to and the quality of prenatal care. At the individual level, women with lower levels of education, autonomy, and decision-making ability are less likely to receive prenatal care (Babalola, 2014; Bloom, 2001) Other studies have indicated that lower economic status, power dynamics within marital relationships, living standards and income limit the use of services (Montgomery, 2009) Other determinants of prenatal care-seeking behavior include demographic factors such as maternal age, marital status, and parity (Magadi, 2000; Simkhada, 2008). Although there is limited research on the contextual determinants of maternal health care-seeking behavior in sub-Saharan Africa (SSA), available evidence points to important barriers over which women may have little control. These contextual factors include proportion of women with a previous encounter with the health system in a neighborhood (e.g. seeking care during a previous pregnancy), living in a poor neighborhood where having large number of children is the norm, and rural or urban residence (Magadi, 2003; Stephenson, 2006). The purpose of this study is to examine the associations between the socioeconomic status of a community and the quality of prenatal care women living in the community received.

3.2. Literature Review

Prenatal care provides a valuable opportunity for early detection and prompt treatment of conditions that may threaten the health of a mother and her unborn child. During prenatal care, women are able to receive preventive health care services including immunization against neonatal tetanus, malaria prevention through the use of intermittent presumptive treatment approach, and HIV counseling and testing, as well as weight, blood pressure and blood glucose monitoring (Babalola, 2009; UNICEF, 2015). Furthermore, a prenatal care visit is a useful opportunity to deliver educational services that may increase the use of other maternal and child health services such as institutional delivery (childbirth in a health facility), early childhood immunizations, and other disease prevention interventions (Kogan et al., 1998). Thus, prenatal care may provide very important benefits in resource-limited countries where access to health services is limited, and most prenatal care visits serve as the first contact most women ever had with the formal health care system.

Several studies have considered the role of education and wealth in maternal health care-seeking behavior (Ahmed, 2010; Babalola, 2014; De Allegri, 2011; Greenaway, 2012). A few other studies have investigated contextual determinants of maternal health care-seeking using a multilevel approach (Babalola, 2009; Gage, 2007; Gage, 2006; Jat, 2011; Stephenson, 2006). Most of these studies assessed the factors that predicted the probability of a woman attending any prenatal care or the recommended minimum number of prenatal visits. While it is vital to get women to attend prenatal care visits, also important is what services they receive during these visits. What services do women receive when they visit a health facility for prenatal care? What factors determine the

components of prenatal care received? There is little information on differentials in the content of prenatal care in developing countries; however, studies often attribute differences in the interventions received to socioeconomic factors like education (Babalola, 2014; Habibov, 2011; Obermeyer, 1991), and wealth (Habibov, 2011; Rani, 2008). A review of relevant studies follows.

Rani et al., (2008) examined the socioeconomic differentials in the quality of prenatal care in northern and southern Indian states. The socioeconomic variables were household wealth (in quintiles), and education (none, primary, or secondary and higher). The authors defined the quality of prenatal care as clinical quality (e.g., blood pressure checks, urine and blood tests), and interpersonal quality (e.g., how a woman perceived she was treated by the health worker). Their findings indicated sub-optimal quality of prenatal care in both northern and southern states, but significantly better quality in the southern states compared to the north. Compared to 87% in the southern states, only 40% of women in the north had their blood pressure checked during prenatal care. They found similar patterns for urine and blood tests. Additionally, only 23% of women in the north and 44% in the south received information on pregnancy and delivery danger signs. The authors also found significant socioeconomic variations in the quality of prenatal care. There were also significant regional (north/south), educational, and wealth variations in the clinical components of prenatal care. Compared to the poorest women, the wealthiest were more likely to receive prenatal care of good clinical quality (β=0.93; p-value <0.001). Similarly, compared to women with no education, those with secondary or higher levels of education received prenatal care of higher clinical quality (β=0.49; p-value <0.001) (Rani, 2008).

In a study of rural, low-income women in Mexico, Barber, Bertozzi, and Gertler (2007) assessed the quality of prenatal care by health provider type, health facility type, and socioeconomic status. They defined the quality of prenatal care as a composite score of 13 possible procedures recommended by national guidelines. These procedures include history taking (e.g., asked about vaginal bleeding and discharge during pregnancy), diagnostic tests (e.g. blood and urine tests), physical examination (e.g. blood pressure checks, weight monitoring, fundal height measurement, and pelvic examination), and other preventive procedures (e.g. tetanus toxoid vaccinations, iron supplementation, and advice on breastfeeding, and postpartum family planning). Whereas the majority of women self-reported having their weight and blood pressure checked and receiving a tetanus vaccination, less than half the sample had their blood or urine tested. The authors also found that women who received prenatal care from private health facilities and non-physicians received fewer services and had lower standardized quality scores compared to those who attended public facilities and were attended by physicians (42.9% of all services and -1.32 standard deviations vs. 81.9% of all services and 0.34 standard deviations, respectively). In addition, they observed socioeconomic differences in the quality of prenatal care; for example, women in the poorest wealth quartile received significantly fewer services that those in the least poor quartile. Similarly, being poor and indigenous was associated with significantly lower quality scores compared to being non-poor and indigenous (-1.15 standard deviations vs. -0.63 standard deviations from the mean) (Barber, 2007).

Babalola (2014) used Demographic and Health Survey data for three SSA countries (Kenya, Malawi, and Nigeria) to examine the relationship between a woman's

educational attainment and the quality of prenatal care. The author defined prenatal care as a combination of key services performed during visits (i.e. blood pressure checks, blood and urine tests, iron supplementation, and information on possible pregnancy complications). The author further examined if the number of visits mediated the relationship between maternal education and the quality of prenatal care. Although most women in all three countries reported that they had their blood pressure checked (80%) and their blood tested (75%), much fewer women (between 27.9% in Malawi and 68% in Kenya) reported having a urine test. Even fewer women (between 35% in Nigeria and 56.4% in Kenya) received information about potential pregnancy complications. Consistent with the study hypothesis, after accounting for demographic and economic factors, the findings indicated a strong, direct relationship between women's education and the quality of prenatal care received (Babalola, 2014).

3.2.1. Study Setting

The West and Central Africa sub-region comprises 24 countries located in the western and central regions of Africa, south of the Sahara Desert. According to recent UN data, the sub-region had a total population of 412 million in 2013, with an annual growth rate of 2.6% (UNICEF, 2013). While some countries in West and Central Africa were English colonies (e.g., Sierra Leone, Nigeria, and Ghana), others were French (e.g., CAR, DRC, and Chad), or Portuguese (e.g., Cape Verde) colonies. A few countries in the sub-region initially started out as German colonies, but were later divided between the British and French (e.g., parts of Togoland later became a British colony and thereafter joined Ghana, while the French part is present-day Togo; Cameroon has a similar history,

with the north becoming a British colony, and the south a French colony) (Griffiths, 1986).

Historical research has shown that the colonial influences largely define present-day political and socioeconomic development in West and Central Africa and other parts of the world (Griffiths, 1986; Ichoku, Mooney, & Ataguba, 2013). For example, the historical patterns of colonial settlement and activities determined the patterns of urbanization and rapid development in the post-colonial era (Ichoku et al., 2013). Similarly, investments in health care infrastructure and human resources have typically followed the patterns of colonial settlement and development, thus fostering systemic socioeconomic inequities between and within countries.

Furthermore, several countries in the region have experienced complex civil conflicts, and some are emerging from extended periods of armed conflicts. Conflicts affect almost every aspect of social, economic and cultural life; for example, people lose their land and other sources of income (Horn, 2010). In addition, conflicts generally lead to the destruction of health care and social infrastructure, and loss of health care personnel (Kinney et al., 2010), which affect the availability and quality of health services.

Therefore, it is not surprising that in the countries of West and Central Africa, there are inequalities in the opportunities, resources, and health care infrastructure and personnel that are available to individuals and communities. As a result, socioeconomic and health disparities have persisted within and among countries. Reproductive health indices are particularly poor in most West and Central African countries, and many countries are not likely to achieve the MDG-5 targets.

3.3. Conceptual Framework

One of the major goals of health policy and health systems is equitable access to health care services. Similarly, the reproductive health policies of organizations assume that services are provided for the benefit of populations. However, in reality, this assumption is not often the case, and some sub-populations are consistently excluded from the health care delivery system. Consequently, disparities in health and health care persist across and within countries and regions of the world.

Andersen (1968) describes equitable access as the distribution of health services that is defined only by need (perceived or evaluated). However, inequities in access exist when socio-structural factors (such as race/ethnicity, education, and employment status), health beliefs, or financial resources define who gets access to health care. Andersen introduced the behavioral model of health services' use in 1968 to describe why families use health services (Andersen, 1968). After several revisions, the sixth version of the model suggests that improving access to health care can be achieved by focusing on contextual as well as individual determinants (Andersen, 1995, 2008; Andersen, et al., 2014). The authors describe contextual determinants as the circumstances and environment within which individuals access health care (such as community, organizational, and provider factors). Contextual factors, unlike individual factors, are often measured at aggregate levels (for example, community/cluster level), and individuals are related to these groups through membership or residence in a given region.

The revised behavioral model of health services' use theorizes that contextual factors, just like individual factors, have three major components – predisposing, enabling, and

need characteristics. Predisposing characteristics include conditions that make people use or not use health services; enabling characteristics include conditions that facilitate or hinder the use of health services; and need characteristics include conditions that require the use of health services (Andersen, 1968; Andersen, 1995). This version of the model emphasizes that the context (community, structure, and process) of health care provision is very important to access (Donabedian, 1980). Despite the emphasis on the contextual determinants of access to health services, the model focuses on providing understanding about the health behavior of individuals in regards to health services use and the resulting outcomes of use (Kominsky, 2014).

Laypeople and health care providers recognize pregnancy as a condition requiring the use of prenatal care services. Despite this recognition, not all pregnant women have access to prenatal care. Andersen's description of equitable access (Andersen, 1968) implies that pregnant women should have access to prenatal care regardless of social status, resource availability, and place of residence. However, given the limited nature of health care and personal resources, and health information asymmetry, not every pregnant woman benefits from available maternity services; consequently, inequities exist in access. The behavioral model of health services' use (Andersen, 1995, 2008; Andersen et al., 2014) provides a useful framework for assessing the contextual and individual determinants of access to prenatal care services in West and Central Africa.

From the foregoing, I hypothesize that neighborhood characteristics such as employment status of heads of households, wealth status, and educational attainment will play an important role in determining which women are able to access prenatal care services in the community. In addition, individual-level predisposing, enabling, and need

factors may also play a role in determining access to maternal health services. In an inequitable health care system, contextual and individual predisposing and enabling factors will be stronger predictors of access to prenatal care than need factors. Thus, consistent with other studies utilizing contextual-level predictors of access (Stephenson, 2006; Babalola & Fatusi, 2009; Parkhurst et al., 2005; Aremu et al., 2011), pregnant women in socially disadvantaged settings will have a poorer realized access to prenatal care services than those in less disadvantaged settings. Similarly, pregnant women with higher socioeconomic status (SES) will have better realized access to high quality prenatal care services than those who have lower SES (Greenaway, 2012; Gyimah, 2006; De Allegri et al., 2011; Corroon et al., 2013).

SES is a latent indicator of a person's or group's access to resources and ability to succeed in the society (Oakes and Rossi, 2003). Researchers and policy makers have defined and measured SES individually or collectively, as in the case of a community, in different ways such as education, occupation, wealth, and income. The construct covers a wide range of social, political, economic, and cultural ideologies. Although there is no universal definition of SES, the research and policy communities agree on its importance as a determinant of the health of individuals and communities (Oakes and Rossi, 2003).

3.4. Study Objectives and Hypotheses

3.4.1. Study Objectives

The objective of my study was to examine the effects of individual and community socioeconomic characteristics on the quality of prenatal care. Additionally, I sought to assess the extent of variations in the quality of prenatal care that is attributable to community-level factors.

3.4.2. Study Hypotheses

I hypothesize that residence in a socioeconomically disadvantaged community is associated with lower odds of receiving the recommended components of prenatal care services, beyond the contribution of individual demographic and reproductive factors. Given the historical, political, cultural, and socioeconomic differences among countries in this region, I expect that the content of prenatal care will also differ among countries.

3.5. Methods

3.5.1. Data Source and Study Sample

I used data from the fourth phase of the UNICEF Multiple Indicators Cluster Survey (MICS), conducted between 2009 and 2011. MICS is an international household survey developed by UNICEF to monitor the situation of women and children. The survey employs a face-to-face method of data collection by trained interviewers. MICS surveys were first launched in the mid-1990s to support countries in assessing progress towards the achievement of population and international development goals (UNICEF, n.d.).

UNICEF launched the first round of the survey in over 60 countries, and to date over 100 countries have participated in MICS surveys. Since 2009, UNICEF began collecting the MICS data every three years, an improvement from the initial five-year interval. Nationally representative sample are collected from households selected via a multi-stage stratified cluster sampling approach. For the first stage, clusters/enumeration areas are selected from the most recent national census in each country and are representative at state/regional levels, while also allowing for rural-urban stratification. For the second stage of sampling, an equal number of households are selected from each cluster on a systematic random basis. Each selected household is eligible to participate in the study

upon informed consent. MICS surveys are weighted for over- or under-sampling and for non-response (UNICEF, 2009).

Designated national government agencies conduct the surveys with technical support and financial assistance from UNICEF and partner agencies. UNICEF develops standard sets of core questionnaire modules and adapts these to suit country contexts. Trained interviewers obtain informed consent from the eligible households and women prior to conducting the interviews using pencil-and-paper questionnaires. Thus, the design and standardized core modules allow for regional and transnational comparison of the data (http://www.childinfo.org/mics4_manual.html).

Eleven countries in West and Central Africa participated in the fourth round of the MICS surveys. However, at the time of my dissertation research, seven countries had complete datasets (i.e. Central African Republic (CAR), Chad, Democratic Republic of Congo (DRC), Ghana, Nigeria, Sierra Leone, and Togo). Three of these countries are in Central Africa: CAR, Chad, and DRC. The other four countries are in West Africa: Ghana, Nigeria, Sierra Leone, and Togo. Whereas CAR, Chad, DRC, and Togo are Francophone countries, Ghana, Nigeria, and Sierra Leone are Anglophone.

The questionnaires developed for use by participating countries included: household, women's, children's, and men's questionnaires. Of 100,088 eligible households in the seven countries, interviewers successfully administered the surveys to 98,154 households, with a response rate of 98.1%. A total of 101,457 women were successfully interviewed out of 109,575 eligible women, representing a response rate of 92.6%.

This study used data from 34,792 women who had given birth in the two years prior to the surveys. I excluded women from the sample if they had missing information on

prenatal care (n=182), prenatal care services received (n=383), or if they had missing information or "don't know" for educational level of household heads (n=1,740). Thus, the descriptive sample for this study was 32,487 women. Since the focus of this study is on the quality of prenatal care, women were further excluded from the multilevel analysis if they did not receive prenatal care (n=7,769). Therefore, the final analytic sample for this study was 24,718 women.

3.5.2. Study Variables

The data for this study were obtained from the household and women's questionnaires. The outcome variable was the quality of prenatal care. I defined prenatal care consistent with the WHO recommendation of a minimum set of services that women should receive during visits. The WHO recommendation of a minimum standard prenatal care package for resource-limited settings include blood pressure monitoring, blood tests, weight monitoring, urine tests, tetanus immunization, micronutrient (iron) supplementation, malaria prophylaxis in endemic regions, and information on identifying danger signs and seeking help, infant feeding, birth preparedness, and prevention of maternal transmission of HIV. The data, however, did not include measures of micronutrient supplementation and the information components of prenatal care. Thus, I limited my definition of the quality of prenatal care to the six components measured in the data (blood pressure checks, blood tests, urine test, HIV test, tetanus immunization, and malaria prophylaxis). Interviewers asked women if they received each of these six services during prenatal visits. I created a composite score of the number of services received. Women who received 1-5 services out of six were grouped as receiving low quality prenatal care, while those who received all six services were grouped as receiving

high quality prenatal care. In order to aid in the description of the entire sample with regards to prenatal care, for the descriptive analysis only, women who did not receive prenatal care or had a score of zero services were grouped as "none". As mentioned earlier, women who did not receive prenatal care were excluded from the multilevel analysis. In addition, women who had missing values on prenatal care were excluded from all analyses.

The MICS survey has a hierarchical structure, with individuals nested in households, and households nested in primary sampling units (PSUs). The survey employs a two-stage stratified sampling technique, which draws a random sample of households and individuals from PSUs. The PSU is the administrative unit for which standard census data are available across countries. Researchers have used the PSU as a proxy for communities or neighborhoods in developing countries (Aremu et al., 2011; Fotso & Kuate-Defo, 2005). I use community in this context to describe clustering within the same geographic residential environment. In rural areas, PSUs are census villages, but contiguous villages with less than 25 households are merged to create a PSU. In urban areas, a PSU is usually a census block.

Thus, I used a two-level multilevel modeling approach, which enables the identification of individual- (level 1) and community-level (level 2) effects on the quality of prenatal care. This approach also allows for clustering of observations within PSUs, while simultaneously accounting for ecological fallacy (Duncan, et al., 1998). Ecological fallacy is the attribution of group characteristics to individuals in the group. At level 1, my primary exposure was socioeconomic characteristics, including wealth quintile (poorest, poor, middle, rich, and richest) and education (no education, primary, and

secondary or higher). Individual-level covariates included maternal age (15-19, 20-29, 30-39, and 40-49 years), and parity (number of children ever born). Other individual-level variables were marital status (currently married, or formerly/never married), religion (Christian, Moslem, or others – traditional and other religion adherents), residence (rural or urban), pregnancy intention/wantedness (wanted then, or not wanted then), and history of child mortality (yes or no).

The main level-2 independent variable was the community socioeconomic profile (poor or wealthier). At the community-level, I constructed an aggregate variable measuring the socioeconomic profile of communities. The characteristics of interest included education of household heads, and household wealth index. For the community-level poverty index, I constructed a standardized variable with mean 0 and standard deviation 1, measuring the proportion of household heads with no education, and proportion of households in the poorest wealth quintile (Aremu et al., 2011; Uthman, et al., 2009). Using the mean of this variable as a cut-off, I grouped the resulting score into two categories: high poverty index (poorest) and low poverty index (wealthier). The other community-level variables were frequency of prenatal care visits (1-3 or ≥4), and skilled prenatal care (yes or no), used as a proxy for access to maternal health services and the general quality of health care services, respectively, in the community (Gage, 2007;Magadi, 2000).

3.5.3. Statistical Analysis

Descriptive statistics including means and frequencies were calculated for the sample. Bivariate analysis using Chi-square tests for categorical variables and t-tests for continuous variables were used to test for differences between individual and contextual

characteristics and the components of prenatal care women received. I estimated country-stratified, two-level models to identify associations between individual- and community-level socioeconomic characteristics and the quality of prenatal care.

I modeled the effects of individual socioeconomic characteristics and community socioeconomic characteristics on the odds of receiving high quality prenatal care as defined above. Since the dependent variable is binary, I used multilevel logistic regression to estimate the likelihood of receiving some or all recommended prenatal care services. First, I fitted a null model to estimate the extent to which communities varied in the quality of prenatal care. I fitted a second model to include level-1 variables in order to assess individual differences in the quality of prenatal care. I used a third model to include the level-2 variables measuring the effect of community characteristics on the quality of prenatal care.

I expressed measures of fixed effects as odds ratios and 95% confidence intervals. To estimate the extent by which the quality of prenatal care varied among communities, I used the variance partition coefficient (also known as the intra-class correlation coefficient) as the measure of random effects (Larsen & Merlo, 2005). The differences in the nested models were estimated using the likelihood-ratio test, and all results at or below the 0.05 alpha level were considered significant. I fitted the multilevel random intercept models using Stata's *melogit* syntax with 14 integration points. I stratified the analysis by country to avoid masking country-level differences. I assessed model fit by comparing the Akaike's information criterion (AIC), with lower values indicating better fit. My assessment of multicollinearity yielded a variance inflation factor of 1.9,

indicating the absence of significant collinearity among the variables retained in the final model. I used Stata Version 13 for all analyses (StataCorp, 2013).

3.5.4. Ethical Considerations

The UNC Charlotte Institutional Review Board approved this study. UNICEF granted access to the fourth round of the MICS data following the submission of a brief proposal of research objectives. The MICS datasets are publicly available, and access to download datasets is via a user name and password granted by UNICEF's *ChildInfo*, the administrator of MICS data.

3.6. Results

3.6.1. Descriptive Characteristics

In the pooled data, the highest proportions of women had no education (45.5%), were in the poorest wealth quintile (21.3%), were 20-29 years old (51.6%), were Christian (57.0%), and lived in rural areas (69.8%) (Table 3.1). In addition, most were married (91.2%), wanted the most recent birth then (73.1%), and had an average of four children ever born (mean= 3.9, SD= 2.55). Poor and wealthier communities were equally represented in the sample (49.4% low poverty index vs. 50.6% high poverty index).

Nearly one-quarter of women did not receive prenatal care during their most recent pregnancy (23.0%); about one-half received low quality prenatal care (54.4%); and slightly more than one-fifth received high quality prenatal care (22.6%). Among women who received high quality prenatal care, the majority had secondary or higher education (44.8%), while most women who received low quality prenatal care had no education (42.8%), and the majority of women with no prenatal care also had no education (74.7%). The highest proportion of women who received high quality prenatal care were in the

wealthiest quintile (37.0%), compared to the highest proportion of women with no prenatal care who were in the poorest quintile (36.8%).

Women aged 20-29 years composed the highest proportion of those individuals who high quality prenatal care (51.5%), closely followed by women aged 30-39 years (36.1%). Whereas women reporting Muslim affiliation composed the highest proportion of those with no prenatal care, women reporting Christian affiliation made up the majority of those who received low or high quality prenatal care (59.9% and 67.9%, respectively). More women living in urban areas reported receiving high quality prenatal care (53.2%), compared to 46.8% of women living in rural areas. Women living in rural areas reported higher proportions of those with some or no prenatal care (71.3% and 89.0%, respectively). Women who received high quality prenatal care had fewer children ever born (mean= 3.3, S.E= 0.04), compared to women who received low quality of no prenatal care (mean number of children ever born= 3.8, S.E= 0.03 and mean number of children ever born= 4.4, S.E= 0.05, respectively). Among the countries, women in Nigeria and Ghana made up the highest proportions of those who received all services (33.2% and 20.5%, respectively). Among women who received some prenatal care services, women in Ghana composed the highest proportions (94.5%). On the other hand, women in Nigeria and Chad made up the highest proportions of those with no prenatal care (37.7% and 37.2% respectively).

The majority of women who received all six prenatal care services resided in wealthier communities (65.2%), while most of the women who had no prenatal care resided in poor communities (67.8%). Women who had four or more prenatal care visits made up the highest proportions of those who received some or all recommended

services (63.5% and 85.0%, respectively). Similarly, women who reported having a skilled prenatal care provider composed the majorities of those who received some or all six prenatal care components (92.5% and 95.4%, respectively).

3.6.2. Components of Prenatal Care

The components of prenatal care provided most commonly across countries were blood pressure monitoring (between 79.1% in DRC and 99.1% in Ghana), tetanus immunizations (between 87.1% in DRC and 97.2% in Sierra Leone) (see Table 3.2). Intermittent presumptive treatment of malaria in pregnancy (IPTp) was also provided frequently (ranged from 60.1% in DRC to 93.9% in Ghana). Urine and blood tests were provided less frequently (between 48.3% in Chad and 93.7% in Ghana and between 43.6% in Chad and 95.5% in Ghana, respectively). The service provided least frequently was HIV testing (ranged from 16.2% in Chad to 73.3% in Ghana).

3.6.3. Multilevel Modeling Results

The data were first assessed to justify the use of multilevel modeling for the analysis. Based on the variance partition coefficients computed for each country's null model, there were significant community-level differences in the quality of prenatal care in the seven countries (Table 3.3).

Table 3.4 presents the fixed- and random-effects from the multilevel modeling of the quality of prenatal care. At the individual level, being in the wealthiest quintile was associated with statistically significant increased odds of receiving high quality prenatal care services, compared to being in the poorest quintile (lowest OR= 1.82, 95% CI: 1.21, 2.73 in CAR and highest OR= 11.98, 95% CI: 5.74, 25.0 in DRC). Similarly, having secondary or higher education was statistically significantly associated with increased

odds of receiving high quality prenatal care services, compared to having no education (lowest OR= 1.64, 95% CI: 1.34, 2.02 in Nigeria and highest OR= 3.11, 95% CI: 1.97, 4.92 in Chad). Primary education was statistically significantly associated with increased odds of receiving high quality prenatal care services in only three countries (OR= 1.54, 95% CI: 1.01, 2.36 in Chad, OR=1.53, 95% CI: 1.20, 1.95 in Ghana, and OR= 1.23, 95% CI: 1.01, 1.51 in Nigeria).

In three countries, women who reported Muslim affiliation were statistically significantly less likely to receive all recommended prenatal care components compared to those women who reported Christian affiliation (OR= 0.64, 95% CI: 0.42, 0.98 in Chad, OR= 0.60, 95% CI: 0.46, 0.77 in Ghana, and OR= 0.71, 95% CI: 0.61, 0.84 in Nigeria). With the exception of Ghana and Nigeria, living in an urban area was associated with statistically significant increased odds of receiving the recommended prenatal care services compared to living in a rural area (OR= 1.19, 95% CI: 0.86, 1.66 in Ghana, and OR= 1.01, 95% CI: 0.84, 1.21 in Nigeria).

In the full model, accounting for all individual and contextual socioeconomic variables, the degree of variation in the quality of prenatal care across the seven countries was reduced significantly. The greatest reduction in community-level variation in the quality of prenatal care was in CAR with a 60% reduction, while the lowest was in Sierra Leone with 25.6% reduction. The smallest community-level variation was observed in CAR with 15.0% (VPC= 0.15), while the highest was in DRC with 59.0% (VPC= 0.59).

After adjusting for all individual and contextual characteristics, the community poverty index was significantly associated with the odds of receiving high quality prenatal care in six countries. Residence in a poor community was associated with

statistically significant reduced odds of a woman receiving all six services (CAR: OR= 0.76, 95% CI: 0.58, 0.98; Chad: OR= 0.48, 95% CI: 0.32, 0.74; Ghana: OR= 0.86, 95% CI: 0.61, 0.97; Nigeria: OR= 0.74, 95% CI: 0.61, 0.92; Sierra Leone: OR=0.71, 95% CI: 0.57, 0.91; and Togo: OR= 0.80, 95% CI: 0.47, 0.91). In DRC, however, the association was not statistically significant (OR= 0.92, 95% CI: 0.63, 1.33). With the exception of Chad, having four or more prenatal care visits was statistically significantly associated with increased odds of receiving all six of the recommended interventions (Chad: OR= 1.26, 95% CI: 0.91, 1.75). Compared to women who had 1-3 prenatal care visits, women who had four or more visits had between 1.6 to 3.3 times the odds of receiving all six interventions (lowest OR=1.60, 95% CI: 1.36, 1.88 in CAR and OR=1.60, 95% CI: 1.24, 2.06 in Togo; and highest OR=3.31, 95% CI: 2.41, 4.54 in Ghana). Having a skilled prenatal care provider was associated with statistically significant increased odds of receiving high quality prenatal care in only two countries (CAR: OR= 2.35, 95% CI: 1.04, 1.76 and Nigeria: OR=2.20, 95% CI: 1.63, 2.7).

3.7. Discussion

This study examined the associations between individual and community socioeconomic characteristics and the quality of prenatal care women received in seven West and Central African countries: Central African Republic (CAR), Chad, Democratic Republic of Congo (DRC), Ghana, Nigeria, Sierra Leone, and Togo. The results indicate that more than a fifth of women in the study did not receive any prenatal care. Although more than 75% of women had at least one prenatal care visit during their most recent pregnancy, less than one- third of women received high quality prenatal care (defined as: blood pressure monitoring, blood tests, urine tests, malaria prophylaxis, tetanus toxoid

vaccine, and HIV test). While it is vital to get women to participate in prenatal care, it is useful to understand the services they receive during these visits. The results of this study highlight important socioeconomic inequalities in the quality of prenatal care women receive. Where a woman lives matters in terms of receiving high quality prenatal care. The country-stratified analysis makes it possible to examine these useful relationships across countries.

My results suggest that women who live in poor communities are less likely to receive high quality prenatal care, even when they have multiple prenatal care visits. DRC is the only exception to this finding. Furthermore, living in close proximity to other poor households is associated with a lower likelihood of receiving high quality prenatal care in all countries. Few studies have examined the quality of prenatal care using a multilevel approach; however, the findings of the present study are consistent with previous studies that found a socioeconomic gradient in the quality of prenatal care women received (Adjiwanou, 2013;Barber, 2007;Rani, 2008). The results of the present study also support the inverse care law, which suggests that socially disadvantaged persons who need more health care receive the least amount of care (Mercer, 2007). Women living in poor communities are likely to have more risk factors for poor pregnancy outcomes and, as a result, are more in need of quality, preventive maternal health services. The non-significant finding in DRC warrants further investigation to understand what is different within the country and to inquire if other factors are more relevant within the country's context. A recent study on the use and quality of maternal health services in a large, urban city in DRC generally reported low quality of prenatal care, with women receiving fewer services than recommended, largely because the

services were not available in the health facilities or the women could not pay for them (Abel, 2012).

Similar to prior studies in SSA and elsewhere, in the present study, women who had four or more prenatal care visits received a higher quality of prenatal care than those who had less than four visits (Abel, 2012;Babalola, 2014;Barber, 2007;Magadi, 2000). While the number of prenatal care visits may mediate the quality of prenatal care, the effect is not so large as to attribute most of this relationship to the number of visits (Babalola, 2014). Babalola (2014) examined the mediation effect of the number of prenatal care visits on the relationship between women's education and the quality of care in three SSA countries, and found that only 19% of the association was attributable to the indirect effect of number of visits in Kenya. In Nigeria and Malawi, the indirect effects of number of prenatal care visits were 7.9% and 33.1%, respectively (Babalola, 2014). The net effects of the number of prenatal care visits on the quality of prenatal care were even smaller for women's wealth household status.

The lack of statistical significance in the relationship between number of prenatal care visits and the content of prenatal care in Chad may be due in part to the perceived quality of care. It is possible that the quality of prenatal care is so low that women who attend perceive the services as poor, and may be unwilling to make future visits. On the other hand, perceived high quality of care may motivate women to continue to seek prenatal care (Adjiwanou, 2013;Rani, 2008).

The receipt of prenatal care from a skilled provider was statistically significant in only two countries: CAR and Nigeria. Previous studies have reported significantly higher quality of prenatal care when provided by a physician than when provided by a nurse

(Adjiwanou, 2013;Rani, 2008). The differences in results between the results of prior studies and those of the present study may be due in part to the health provider classifications used. The previous studies differentiated physicians from nurses/midwives. I used skilled (physicians, and nurses or midwives) vs. unskilled providers as defined by the WHO (WHO, 2004). However, Adjiwanou (2013) used an identical classification of prenatal care providers (skilled vs. unskilled) in one of the four countries (Tanzania) in their study. Adjiwanou (2013) found a statistically significant lower likelihood of women attended by unskilled providers to receive high quality prenatal care (β= -0.29, p-value <0.001). My results for CAR and Nigeria are consistent with those of Adjiwanou (2013) for the data from Tanzania. The reason for the non-significant results in five countries in my study is unclear, and warrants further investigation of the general quality of maternal health care in these countries (Chad, DRC, Ghana, Sierra Leone, and Togo). It is also important to note that this study did not account for health facility type (private or public) and level (health post, primary health care center, or hospital) (Barber, 2007). Thus, the observed relationships may be related to how the health systems are structured within these countries.

At the individual level, women's socioeconomic status was significantly related to the content of prenatal care. Similar to prior studies in SSA and elsewhere, secondary or higher education was consistently associated with increased odds of receiving high quality prenatal care across all seven countries (Babalola, 2014; Habibov, 2011; Obermeyer, 1991; Pallikadavath; Rani, 2008). Women with higher levels of education are likely more knowledgeable about what to expect during prenatal care visits, and may be more likely to request those services. Lower levels of maternal education, on the other

hand, may be related to a lack of awareness of prenatal care services. Thus, these women may be less likely to request services when they are not provided. In addition, lower levels of education may also create language barriers for women, making them less likely to request services. Being in the wealthiest quintile was also statistically significantly associated with increased odds of receiving the full range of prenatal care services measured in this study. This result was similar to those of previous studies, which have reported a wealth gradient in the receipt of high quality prenatal care (Adjiwanou, 2013; Babalola, 2014; Barber, 2007; Habibov, 2011; Pallikadavath, 2004; Rani, 2008). With lower levels of wealth, the relationships are not as distinct or as strong. It is likely that, regardless of where they live, wealthy women have better access to different sources of health information and resources, and have better health care-seeking behaviors, compared to poorer women.

Similar to previous studies, the effect of maternal age on the content of prenatal care varied across countries (Adjiwanou, 2013). Women aged 30-39 years were more likely to receive the full range of prenatal care services in three countries: Chad, Ghana, and Nigeria. Similarly, women who reported Muslim affiliation were significantly less likely to receive the full range of six prenatal care services in three countries: Chad, Ghana, and Nigeria. Previous studies have reported inconsistent results among countries. For example, some studies from India and SSA found that Muslim women were more likely than others to use prenatal care (Bhatia, 1995; Pallikadavath, 2004; Mbuagbaw, 2011 (Dairo, 2010). Some studies, however, have found that Muslim women were less likely to use maternal health services, including prenatal care (Dixon, 2014; Overbosch, 2004). Other studies have found non-significant associations between religion and maternal

health care utilization (Abosse, 2010; Mbuagbaw, 2011). These variations could be due to the proportion of Muslims in the country and their level of religiosity. Many studies from SSA where the level of religiosity of the Muslims are high tend to report lower utilization rates of maternal and child health services (Stephenson, 2006;Nguyen, 2012; Addai, 2000). Similar to prior studies in SSA and several West and Central African countries, marital status was not significantly associated with the content of prenatal care among all seven countries (Gyimah, 2006; Mbuagbaw, 2011; Adjiwanou, 2013). Higher parity was significantly associated with reduced odds of receiving high quality prenatal care in only one country: DRC. This finding is consistent with previous studies that reported that multiparous women were less likely to receive good quality prenatal care in Tanzania (Adjiwanou, 2013), and Cameroon (Mbuagbaw, 2011).

In CAR, Chad, DRC, Sierra Leone, and Togo residence in an urban area was associated with increased odds of receiving high quality prenatal care, compared to residence in a rural area. This finding is consistent with previous research (Abel, 2012; Mbuagbaw, 2011; Obermeyer, 1991; Pallikadavath, 2004; Van Eijk, 2006; Barber, 2007). It is possible that women living in urban areas have higher levels of education and greater awareness of the expected prenatal care services. It is also possible that health facilities in urban areas may be better equipped, and have better trained providers, and thus are able to provide more comprehensive prenatal care services than those in rural areas. In the other two countries (Ghana and Nigeria), the association between urban residence and the content of prenatal care was not statistically significant. These results are similar to the findings of some previous studies in Ghana, Ethiopia, and elsewhere (Abosse, 2010; Aseweh Abor, 2011; Habibov, 2011). In DRC and Nigeria, having an unintended

pregnancy was associated with significantly reduced odds of receiving high quality prenatal care. Previous research has found that women with unplanned pregnancies may delay initiating prenatal care and have fewer prenatal care visits than those with planned pregnancies (Erci, 2003; Magadi, 2000), both of which may indirectly affect the quality of prenatal care a woman may receive.

The findings of this study are consistent with Andersen's behavioral model of health services use; enabling characteristics seem to be more important of high quality prenatal care than need characteristics. In addition, these findings are consistent with my hypothesis that there are significant socioeconomic variations in the content of prenatal care at the community-level. Furthermore, the extent of these variations differed between countries. After adjusting for individual and community socioeconomic and demographic characteristics, the variations significantly reduced, but persisted in all of the countries except CAR.

Overall, the multilevel models explained a significant portion of the variations in the content of prenatal care among the seven countries. The variables in my multilevel models explained more than 50% of the community-level variations in the quality of prenatal care in three countries (CAR: 60.0%; DRC: 57.6%; and Togo: 53.9%). In three other countries, the models explained between 30-50% of the community-level variation in the quality of care (Chad: 43.9%; Ghana: 33.3%; and Nigeria: 36.0%), while in Sierra Leone, the variation explained was less than 30% (25.6%). In CAR, the residual variation in the quality of prenatal care was only 6%, which suggests that the individual and community variables accounted for a substantial portion of the variation. In the other six countries: Chad, DRC, Ghana, Nigeria, Sierra Leone, and Togo, significant

community variations remained in the content of prenatal care. These findings highlight the importance of the country context and the need to tailor access and quality improvement efforts to the local context.

3.7.1. Strengths and Limitations

Certain limitations should be considered when interpreting the results of this study. First, the data were self-reported and were not validated using more objective sources. Nonetheless, trained interviewers, who speak the local language, administered the questionnaires, thus improving the quality of the data. Second, endogeneity arising from omitted variables has the potential to affect the directions and strengths of the observed associations. These omitted variables, such as unmeasured cultural beliefs and norms toward health service utilization, may have the potential to affect the odds of receiving quality maternal health services. In many countries in SSA, including those in this study, many women lack decision making autonomy, and may need to get permission from a husband, parent, or mother in-law before seeking maternal health care (Mpembeni, 2007; Telfer, 2002). Other socioeconomic variables with the ability to affect a woman's likelihood of using maternal health services include distance to the nearest health facility, and ability to pay for the cost of transportation and user-fees. (Khan, 2006; Ebeigbe, 2013; Perkins, 2009). The community poverty index may have explained some of this variation, but other sources of variation may be more difficult to capture in a large population-based survey of this nature. Unmeasured health systems factors such as the availability of maternal health services including availability of equipment and supplies to provide the full range of recommended services may also have an impact on the quality of maternal health care (Khan, 2006). I used the frequency of prenatal care visits

as a proxy for access to health services, and skilled prenatal care as a proxy for the quality of care; however, these may not be adequate measures. Thus, some of the observed effects may be due to the omission of unmeasured variables that are associated with both the exposure and outcome. These unmeasured factors could result in an over- or under-estimation of the observed associations. Third, the quality of prenatal care assessed in this study was limited to those included in the dataset. For example, weight monitoring and information on pregnancy complications and health promotion are important components of any prenatal care package, but these variables were not included in the data. If these factors were included in the construction of the outcome variable, the observed associations may have been different.

Despite these limitations, this study has a number of strengths. This study is among the first transnational studies that focus exclusively on the West and Central African sub-region to examine contextual factors that could affect the quality of prenatal care. This study goes beyond simply having a prenatal care visit to examining what happens when women present for prenatal care. This distinction is a useful step towards promoting better prenatal care quality. Given the inherent differences between countries in SSA and West and Central Africa, this study estimated separate multilevel models for each country. This approach helps avoid masking effects, which could arise from the use of pooled data. In addition, the country-stratified approach enables the identification of context-specific factors that may affect what services women receive during prenatal care. Furthermore, this study provides clear evidence in support of moving beyond individual determinants of access to maternal health services to incorporating factors related to the context within which women live and seek maternal health care. The

findings of this study should be generalizable to other West and Central Africa and, to some extent, SSA countries.

3.8. Implications for Policy, Practice and Research

The results of this study provide insights into community characteristics that are related to the quality of prenatal care in West and Central Africa. These findings offer a first step toward developing policies and programs aimed at quality improvement. These findings underscore the importance of adopting a multilevel approach to improving the quality of prenatal care through evidence-based programming to increase access and utilization of services. Multilevel modeling has the ability to identify individual and contextual determinants of access and use of health services simultaneously. This approach could be extended to other health outcomes and populations.

The variation across countries in the community-level variance suggests that interventions need to be adapted to the specific context to address the issues within countries. For example, efforts in countries with relatively low prenatal care coverage (CAR, Chad, DRC, and Nigeria) may need to focus on improving access as well as improving the quality of prenatal care. In other countries with relatively higher prenatal care coverage (Ghana, Sierra Leone, and Togo), it would be more meaningful to focus efforts on improving the quality of prenatal care. In addition, there are important opportunities to improve the provision of critical components of prenatal care that also have implications for the long-term health of the mother and child. Only small percentages of women were given presumptive treatment for malaria, and tested for HIV. Thus, maternal health care systems may be missing an opportunity to prevent malaria and maternal transmission of HIV. Given the endemic nature of malaria in the West and

Central African sub-region, coupled with the potential for maternal anemia, spontaneous abortions, and low birth weight, it is important that prenatal care programs offer services for intermittent presumptive treatment of malaria in pregnancy. These issues are especially important for women who live in poor communities and, may have more risk factors for poor pregnancy outcomes. The low coverage rates of HIV testing and malaria prevention warrant further investigation in order for women to obtain better benefits from prenatal care attendance.

In addition, the unresolved variations among all countries would warrant further research to understand the complex sets of contextual and individual factors that influence maternal health care seeking within communities across countries. Qualitative research would be especially useful in this regard. Specifically, questions exploring women's perceptions of prenatal health care services and costs may provide useful insights into the extent cost of these services prevent women from receiving the recommended prenatal services. This could also have policy implications for removal or subsidization of user fees and social transfer programs as possible ways of increasing economic access and the demand for maternal health services. Maternal health care providers may also provide useful qualitative data on the health systems barriers they may face in providing specific components of prenatal care in their health facilities. In addition, the existence of unmeasured contextual factors highlights the inability of the current population-based surveys to capture information on the context within which women and households make health care decisions. Thus, to strengthen multilevel policies and programs, population-based surveys may need to consider including measures of health systems factors such as service availability and distance to the nearest

health facility within communities as important correlates of the decision to seek prenatal care and the quality of care.

Table 3.1: Descriptive characteristics of women in West and Central Africa by quality of prenatal care received, 2009-2011 Multiple Indicator Cluster Surveys

	Weighted N (%)			
	All women	**None**	**Low**	**High**
	32,487	**7,769**	**17,822**	**6,896**
	(100.0)	**(23.0)**	**(54.4)**	**(22.6)**
Level 1: Individual characteristics				
Education				
No education	16,025 (45.5)	5,832(74.7)	8,254 (42.8)	1,939 (22.2)
Primary	9,301 (29.8)	1,455 (19.1)	5,642 (33.0)	2.204 (33.1)
Secondary or higher	7,161 (24.7)	482 (6.2)	3,926 (24.2)	2,753 (44.8)
Wealth quintile				
Poorest	7,843 (21.3)	2,932 (36.8)	4,001 (20.1)	910 (8.3)
Second	7.089 (20.7)	2,149 (27.4)	3,887 (21.4)	1,053 (12.2)
Middle	6,442 (20.0)	1,411 (18.9)	3,772 (21.5)	1,259 (17.4)
Fourth	6,136 (19.9)	910 (12.5)	3,599 (20.9)	1,627 (25.1)
Wealthiest	4,977 (18.2)	367 (4.5)	2,563 (16.1)	2,047 (37.0)
Covariates				
Maternal age				
15-19	3,463 (10.3)	897 (11.4)	1,969 (11.0)	597 (7.4)
20-39	16,554 (51.6)	3,905 (51.3)	9,146 (51.7)	3,503 (51.5)
30-39	10,223 (31.8)	2,369 (29.7)	5,481 (30.9)	2,373 (36.1)
40-49	2,247 (6.4)	598 (7.6)	1,226 (6.4)	423 (5.0)
Religion				
Christianity	17,289 (57.0)	2,887 (39.6)	10,021 (59.9)	4,381 (67.9)
Islam	12,637 (36.2)	4,452 (54.9)	6,264 (32.7)	1,921 (25.3)
Others	2,333 (6.9)	412 (5.5)	1,389 (7.4)	532 (6.8)
Residence				
Urban	9,662 (30.2)	1,143 (11.0)	5,331 (28.7)	3,188 (53.2)
Rural	22,825 (69.8)	6,626 (89.0)	12,491 (71.3)	3,708 (46.8)
*Marital status**				
Currently married	29,607 (91.2)	7,265 (93.7)	16,189 (90.7)	6,153 (89.8)
Never/ formerly married	2,877 (8.8)	504 (6.3)	1,630 (9.3)	743 (10.2)

Table 3.1 (continued): Descriptive characteristics of women in West and Central Africa by quality of prenatal care received, 2009-2011 Multiple Indicator Cluster Surveys

	Weighted n (%)			
	All women 32,487 (100.0)	**None 7,769 (23.0)**	**Low 17,822 (54.4)**	**High 6,896 (22.6)**
Wanted child then				
Yes				
No	23,931 (73.1)	6,005 (77.8)	13,043 (72.7)	4,883 (69.5)
Missing	8,529 (26.8)	1,756 (22.1)	4,764 (27.2)	2,009 (30.5)
	27 (0.8)	8 (0.12)	15 (0.08)	4 (0.04)
Parity				
Mean (SE)	3.9 (0.01)	4.4 (0.05)	3.8 (0.03)	3.3 (0.04)
History of child death				
No	20,598 (64.1)	4,444 (56.5)	11,250 (63.7)	4,904 (73.1)
Yes	11,889 (35.9)	3,325 (45.5)	6,572 (36.3)	1,992 (27.0)
Country				
CAR[a]	4,398 (13.2)	1,005 (13.5)	2,225 (12.0)	1,168 (15.9)
Chad	5,989 (18.9)	2,591 (37.2)	3,180 (17.7)	218 (3.1)
DRC[b]	4,535 (14.9)	545 (7.2)	3,416 (21.2)	574 (7.6)
Ghana	2,838 (7.8)	95 (0.8)	1,334 (5.5)	1,409 (20.5)
Nigeria	9,485 (29.0)	3,236 (37.7)	4,142 (23.6)	2,107 (33.2)
Sierra Leone	3,327 (10.6)	87 (1.1)	2,390 (14.1)	850 (11.7)
Togo	1,915 (5.5)	210 (2.4)	1,135 (5.8)	570 (8.0)
Level 2: Community characteristics				
Community Poverty index				
Low	15,956 (50.6)	2,583 (32.2)	9,055 (52.3)	4,318 (65.2)
High	16,531 (49.4)	5,186 (67.8)	8,767 (47.7)	2,578 (34.8)
Number of ANC visits				
None	7,769 (23.0)	7,769 (100)	---	---
1-3	7,837 (23.2)	---	6,650 (36.5)	1,187 (15.0)
4 or more	16,881 (53.8)	---	11,172 (63.5)	5,709 (85.0)
Skilled ANC provider§				
No	1,879 (6.6)	---	1,506 (7.5)	373 (4.5)
Yes	22,839 (93.4)	---	16,316 (92.5)	6,523 (95.4)

* p-value <0.01. All other p-values are <0.001. [a]CAR= Central African Republic; [b]DRC= Democratic Republic of Congo

Table 3.2: Components of prenatal care received by country, West and Central Africa, 2009-2011 Multiple Indicators Cluster Surveys

Prenatal care component	**%**						
	CAR	**Chad**	**DRC**	**Ghana**	**Nigeria**	**Sierra Leone**	**Togo**
Blood pressure	86.5	79.2	79.1	99.1	91.9	86.1	96.4
Urinalysis	83.2	48.3	50.5	93.7	82.5	59.1	83.0
Blood tests	82.0	43.6	59.2	95.5	82.4	69.2	74.9
Tetanus vacc	88.9	90.5	87.1	88.3	89.4	97.2	91.4
IPTp*	81.6	73.0	60.1	93.9	69.1	78.7	90.9
HIV test	55.7	16.2	24.6	73.3	62.3	51.6	49.5
No prenatal care	23.5	45.3	11.1	2.5	29.9	2.5	10.0
N	4,398	5,989	4,535	2,838	9,485	3,327	1,915

*IPTp: intermittent preventive treatment of malaria in pregnancy

Table 3.3: Parameter estimates showing measures of variation in the quality of prenatal care in West and Central Africa, 2009-2011 Multiple Indicator Cluster Survey- Null models without covariate

	CAR[a]	Chad	DRC[b]	Ghana	Nigeria	Sierra Leone	Togo
Random effects							
Community random variance (SE[c])	0.57 (0.10)	2.25 (0.46)	4.67 (0.67)	1.84 (0.24)	1.11 (0.12)	2.12 (0.28)	1.14 (0.23)
Log-likelihood	-2101.59	-742.78	-1315.41	-1769.18	-3837.32	-1693.14	-1,048.15
VPC[d]	0.15	0.41	0.59	0.36	0.25	0.39	0.26
AIC[e]	4,207.19	1,489.55	2,634.82	3,542.35	7,678.65	3,390.29	2,100.31

[a]CAR= Central African Republic; [b]DRC= Democratic Republic of Congo; [c]SE= standard error; [d]VPC= variance partition coefficient; [e]AIC= Akaike's information criterion

Table 3.4: Multilevel modeling of the quality of prenatal care received by women in West and Central Africa, 2009-2011 Multiple Indicators Cluster Survey[a]

	OR (95% CI)						
	CAR	**Chad**	**DRC**	**Ghana**	**Nigeria**	**Sierra Leone**	**Togo**
				Fixed effects			
Individual variables							
Education							
None	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00(Referent)	1.00(Referent)	1.00(Referent)
Primary	1.18(0.98,1.42)	1.54(1.01,2.36)*	1.03(0.66,1.61)	1.53(1.20,1.95)†	1.23(1.01,1.51)*	1.19(0.89,1.58)	1.11(0.82,1.48)
Secondary+	1.83(1.38,2.40) ‡	3.11(1.97,4.92) ‡	1.83(1.16,2.84)†	1.98(1.25,3.15)†	1.64(1.34,2.02) ‡	2.05(1.55,2.71) ‡	1.93(1.32,2.81)†
Wealth							
Poorest	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Poor	0.97 (0.68,1.38)	1.14(0.32,4.01)	0.75(0.35,1.64)	1.43(1.04,1.99)*	1.45(1.11,1.90) †	1.25(0.87,1.79)	1.46(0.97,2.21)
Middle	1.22 (0.86,1.73)	1.27(0.39,4.11)	1.51(0.76,3.04)	1.46(0.98,2.18)	2.14(1.63,2.81) ‡	1.35(0.93,1.95)	1.89(1.23,2.90)†
Rich	1.23 (0.86,1.77)	1.73(0.55,5.38)	2.98(1.49,5.97)†	3.03(1.90,4.18) ‡	2.91(2.19,3.87) ‡	2.38(1.63,3.46) ‡	2.33(1.35,4.02)†
Richest	1.82 (1.21,2.73)†	3.35(1.04,10.75)*	11.98(5.74,25.0) ‡	2.76(1.57,4.85) ‡	3.75(2.75,5.11) ‡	3.70(2.41,5.69) ‡	2.86(1.53,5.33) ‡
Age							
15-19	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
20-29	1.08 (0.87,1.36)	1.58 (0.98,2.55)	1.24(0.83,1.88)	1.35(0.85,2.12)	1.84(1.31,2.56) ‡	1.56(0.85,1.57)	0.93(0.56,1.55)
30-39	1.31 (0.94,1.82)	2.16 (1.12,4.15)*	1.52(0.91,2.54)	1.77(1.06,2.96)*	1.98(1.37,2.85) ‡	1.31(0.89,1.92)	1.01(0.56,1.81)
40-49	1.36 (0.81,2.27)	1.12(0.33,3.76)	1.96(0.92,4.19)	1.67(0.88,3.15)	1.86(1.19,2.91) †	1.33(0.72,2.45)	0.85(0.39,1.88)
Marital status							
Married	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Not married	1.01 (0.78,1.30)	1.24(0.69,2.21)	1.25(0.91,1.73)	1.01(0.70,1.45)	1.09(0.82,1.46)	1.04(0.79,1.38)	1.10(0.69,1.75)

Table 3.4 (continued): Multilevel modeling of the quality of prenatal care received by women in West and Central Africa, 2009-2011 Multiple Indicators Cluster Survey[a]

	OR (95% CI)						
	CAR	**Chad**	**DRC**	**Ghana**	**Nigeria**	**Sierra Leone**	**Togo**
Religion							
Christian	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00(Referent)	1.00 (Referent)	1.00 (Referent)	1.00(Referent)
Muslim	1.15 (0.88,1.51)	0.64(0.42,0.98)*	0.68(0.32,1.43)	0.60(0.46,0.77) ‡	0.71(0.61,0.84) ‡	0.93(0.74,1.19)	0.79(0.47,1.32)
Others	0.89 (0.54,1.48)	0.36(0.10,1.23)	1.01(0.61,1.1.66)	0.73(0.55,0.96)*	0.69(0.36,1.31)	0.79(0.49,1.29)	1.00(0.78,1.29)
Residence							
Rural	1.00 (Referent)	1.00 Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Urban	2.16(0.37,0.59) ‡	1.88(1.11,3.21)*	2.12(1.33,3.40)†	1.19(0.86,1.66)	1.01(0.84,1.21)	1.69(1.19,2.40) †	2.37(1.52,3.69)†
Parity	0.99 (0.94,1.04)	0.96 (0.87,1.05)	0.90(0.84,0.97)†	0.95(0.89,1.02)	0.97(0.94,1.01)	0.95(0.89,1.01)	1.05(0.97,1.14)
Wanted pregnancy then							
Yes	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
No	1.24 (1.71,2.72)*	1.05(0.75,1.49)	0.77(0.60,0.98)*	1.10(0.89,1.37)	0.86(0.71,0.99)*	0.91(0.70,1.18)	0.98(0.77,1.26)
Contextual variables							
Poverty index							
Low	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
High	0.76 (0.58,0.98)*	0.48(0.32,0.74) ‡	0.92(0.63,1.33)	0.86(0.61,0.97)*	0.74(0.61,0.92) †	0.71(0.57,0.91) †	0.80(0.47,0.91)*
Number of ANC visits[b]							
1-3	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
≥ 4	1.60(1.36,1.88) ‡	1.26(0.91,1.75)	1.63(1.28,2.09) ‡	3.31(2.41,4.54) ‡	2.04(1.69,2.49) ‡	1.86(1.33,2.61) ‡	1.60(1.24,2.06) ‡
Skilled ANC[c]							
No	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Yes	1.35 (1.04,1.76)*	3.27(0.43,24.84)	3.19(0.69,14.71)	1.34(0.80,2.27)	2.20(1.63,2.97) ‡	1.04(0.72,1.49)	1.05(0.76,1.45)

Table 3.4 (continued): Multilevel modeling of the quality of prenatal care received by women in West and Central Africa, 2009-2011 Multiple Indicators Cluster Survey[a]

	OR (95% CI)						
	CAR	**Chad**	**DRC**	**Ghana**	**Nigeria**	**Sierra Leone**	**Togo**
				Random effects			
Community level variance (SE)[d]	0.23 (0.06) ‡	0.99 (0.27) ‡	1.09 (0.23) ‡	1.04 (0.17) ‡	0.61 (0.08) ‡	1.32 (0.20) ‡	0.45 (0.15) ‡
Log-likelihood	-1978.46	-659.82	-1151.10	-1637.81	-3582.96	-1586.73	-961.91
Residual VPC	0.06	0.23	0.25	0.24	0.16	0.29	0.12
AIC	3996.91	1359.65	2342.19	3315.64	7205.92	3213.57	1963.82
LR test χ^{2e}	246.28	165.82	327.47	262.19	508.72	212.64	172.48

[a]Full model including all level 1 and level 2 covariates; [b]frequency of ANC visits used as proxy for access to health services; [c]Skilled ANC used as proxy for quality of care/ access to skilled health care workers; [d]Significance of random effects evaluated by comparing model with a similar one in which random effects have been constrained to be zero; [e]Compares full model to null model with no covariates. *$p < 0.05$; ǂ $p < 0.01$; ‡$p < 0.001$

CHAPTER FOUR: INDIVIDUAL AND COMMUNITY SOCIOECONOMIC EFFECTS ON INSTITUTIONAL DELIVERY: A MULTILEVEL ANALYSIS OF WEST AND CENTRAL AFRICA

4.1. Background

Nearly three decades after the 1987 launch of the Safe Motherhood Initiative, maternal mortality remains a major public health challenge, especially in resource-limited settings where most maternal deaths occur (Starrs, 2006). In 2013, of the estimated 289,000 global maternal deaths recorded, over 85% occurred in sub-Saharan Africa (SSA) and South Asia (UNDP & WHO, 2014). SSA has the highest burden of maternal deaths globally; however, within SSA, West and Central Africa accounts for a disproportionate share of maternal deaths (UNICEF, 2009). Specifically, West and Central Africa accounts for more than 30% of the global burden of maternal mortality, and about 60% of the burden of maternal mortality in SSA (UNDP & WHO, 2014). Additionally, whereas the lifetime risk of maternal death in industrialized countries is 1:4,000, it is 1:38 in SSA and 1:30 in West and Central Africa (UNICEF, 2014). In the West and Central African sub-region, three countries (Niger, Nigeria, and Chad) account for approximately 20% of global maternal deaths (UNDP & WHO, MDG,2014).

Consequently, despite the global reduction in maternal mortality achieved between 1990 and 2013, there are marked disparities among countries. At the current rate of progress, SSA, and most West and Central African countries in particular, are projected

to fall short of attaining the Millennium Development Goal (MDG) -5 target of a 75% reduction in maternal deaths between 1990 and 2015 (Kinney, 2010; Zere, 2012).

Most maternal deaths are preventable. However, over 70% of maternal deaths are attributable to direct obstetric complications occurring around the time of childbirth (Say, 2014 #1301). Scientific evidence supports selected interventions to prevent and treat pregnancy-related complications. One such intervention for reducing maternal morbidity and mortality is skilled birth attendance, i.e. childbirth attended by a physician, nurse, or midwife (WHO, 2004). Institutional delivery (childbirth in a health facility) is instrumental in assuring skilled birth attendance, and provides a critical opportunity for postnatal follow-up of mothers and their infants (Starrs, 1997). However, only half of all 2009-2013 births in West and Central Africa occurred in a health facility, compared to 68% globally (UNICEF, 2014).

Several studies have examined individual determinants of maternal health care, including institutional deliveries. A number of individual and demographic characteristics such as wealth, education, age, parity, religion, residence, and employment status have been identified as important determinants of maternal health care utilization (Ezeh & Oronje, 2008; Fotso, Ezeh, Madise, Ziraba, & Ogollah, 2009; Magadi, Zulu, & Brockerhoff, 2003; Gyimah, 2006; Greenaway, 2012; De Allegri et al., 2011). Fewer studies have assessed the household determinants of maternal health care use (Moyer & Mustafa, 2013). Some household factors affecting the use of maternal health services include: household decision-making and couple communication (Corroon et al., 2013), and distance to a health facility (Mpembeni, et al., 2007). Research has also identified several contextual determinants of maternal health care use. Contextual determinants are

related to the context in which individuals seek and access health care. Neighborhood characteristics such as socioeconomic status, rural or urban residence, levels of poverty, occupation and literacy levels of household heads, and cultural norms and practices are important determinants of access to health services generally (Diez-Roux, 2001& 2010; Anderson et al., 1997). The concept of community or contextual determinants has also been applied to studies in SSA that seek to understand what groups of women are able to access maternal and child health services in the community (Aremu, 2011; Aremu, 2012; Babalola, 2009; Fotso, 2005; Stephenson, 2006). Findings have shown that pregnant women in more socioeconomically disadvantaged settings face substantially more barriers to maternal health care utilization than those women in less disadvantaged settings (Stephenson, 2006; Bablola & Fatusi, 2009; Parkhurst et al., 2005; Aremu et al., 2011).

Although the concept of contextual determinants of health has been applied to reproductive health research in SSA (Stephenson et al., 2006; Aremu et al., 2011; Babalola & Fatusi, 2009; Fotso & Kuate-Defo, 2005; Fotso, Ezeh, Madise, Ziraba, & Ogollah, 2009), important gaps remain in our understanding of this concept in West and Central Africa. Further, countries experiencing conflict have elevated rates of maternal mortality due to the instability of institutions and destruction of infrastructure, which can lead to weakened health systems (Kinney, 2010). Recently, many countries in West and Central Africa have experienced complex conflicts, while some are currently in the throes of armed conflict. Thus, examination of contextual factors in West and Central Africa may provide useful insights into specific community-level socioeconomic barriers to institutional delivery in this sub-region. Given the extremely high levels of maternal

death in the sub-region, it is a matter of concern that there is a paucity of transnational studies on reproductive health that focus specifically on West and Central Africa.

4.2. Literature Review

4.2.1. Study Setting

The West and Central Africa sub-region comprises 24 countries in the western and central regions of Africa, south of the Sahara Desert. According to recent UN data, the sub-region had a total population of 412 million, with an annual growth rate of 2.6% (UNICEF, 2013). While some countries in West and Central Africa were English colonies (e.g. Sierra Leone, Nigeria, Ghana), others were French (e.g. CAR, DRC, and Chad), or Portuguese (e.g. Cape Verde). A few countries, initially started out as German colonies, but were later divided between the British and French (e.g. parts of Togoland later became a British colony and later joined Ghana, while the French part is present-day Togo; Cameroon has a similar history, with the north becoming a British colony, and the south a French colony) (Griffiths, 1986).

Historical research has shown that the colonial influences largely define present-day political and socioeconomic development in West and Central Africa and other parts of the world (Griffiths, 1986; Ichoku, Mooney, & Ataguba, 2013). For example, the historical patterns of colonial settlement and activities determined the patterns of urbanization and rapid development in the post-colonial era (Ichoku et al., 2013). Similarly, investments in health care infrastructure and human resources have typically followed the patterns of colonial settlement and development, thus fostering systemic socioeconomic inequities between and within countries.

Furthermore, several countries in the region have experienced complex civil conflicts, and some are emerging from extended periods of armed conflicts. Conflicts affect almost every aspect of socioeconomic and cultural life, for example, people lose their land and other sources of income (Horn, 2010). In addition, conflicts generally lead to the destruction of health care and social infrastructure, and loss of health care personnel (Kinney et al., 2010), which affect the availability and quality of health services.

Therefore, it is not surprising that in the countries of West and Central Africa, there are inequalities in the opportunities, resources, and health care infrastructure and personnel that are available to individuals and communities. As a result, socioeconomic and health disparities have persisted within and among countries. Reproductive health indices are particularly poor in most West and Central African countries, and many countries are not likely to achieve the MDG-5 targets.

4.2.2. Leading Causes of Maternal Deaths

The highest risk of maternal death is between the onset of labor and 48 hours after childbirth; more than half of all maternal deaths taking place within one day of childbirth. During this critical period, an estimated 145,000 maternal deaths and over one million neonatal deaths occur annually (Ronsmans, 2006). Say et al. (2014) conducted a systematic meta-analysis of selected studies and the WHO database of vital registration data, and estimated the main direct and indirect causes of maternal death. Their findings indicate that globally, the main direct causes of maternal death are: hemorrhage or severe bleeding (27.1%), hypertensive disorders or eclampsia (14%), sepsis or infections (10.7%), unsafe abortions (7.9%), and other direct causes, including complications of delivery, obstructed labor, and other causes (12.8%). Indirect causes account for 27.5%

of maternal deaths, and these include: pre-existing medical conditions (14.8%), HIV alone (5.5%), and other indirect causes such as poverty and social inequities (7.2%). The leading causes of maternal death in SSA including West and Central Africa are similar to the global leading causes, although unsafe abortions, HIV alone, and other indirect causes account for higher proportions of maternal deaths in SSA than the global estimates (9.6%, 6.4%, and 9.3% respectively) (Say, 2014). Many of the leading causes of maternal death are preventable and amenable to interventions when women make use of health facilities and skilled attendants for childbirth.

4.2.3. Importance of institutional delivery

Institutional delivery is one of the most critical, evidence-based interventions for reducing maternal morbidity and mortality from direct and indirect causes (WHO, 2004). Institutional delivery is also key to reducing newborn mortality since the health of the mother and newborn is intricately linked (Kinney et al., 2010; Fillipi et al., 2006). When women deliver in a health facility, they are assured of the presence of health professionals who are trained to handle childbirth and complications that may arise before, during, or immediately following the birth process. In addition, institutional delivery ensures access to emergency obstetric care and referral to higher level or better-equipped facilities if needed. In developing and developed countries alike, historical data have shown strong correlations between skilled birth attendants in a health facility and reduced maternal mortality (UNFPA, 2005).

4.2.4. Determinants of institutional delivery

4.2.4.1. Individual determinants of institutional delivery

A number of studies have examined the individual demographic and socioeconomic determinants of access to and utilization of institutional delivery in SSA, both regionally and in single countries. Some of the factors identified include maternal age, parity, residence, marital status, religion, and socioeconomic status including education, wealth, employment, and empowerment (Ezeh & Oronje, 2008; Fotso, Ezeh, Madise, Ziraba, & Ogollah, 2009; Magadi, Zulu, & Brockerhoff, 2003; Gyimah, 2006; Greenaway, 2012; De Allegri et al., 2011). Many of these factors are amenable to public health interventions. Several programs and policy initiatives have been adopted by the international community and other stakeholders to address the all-important issue of preventable maternal deaths (for example, the Safe Motherhood Initiative, and the fifth Millennium Development Goal) (Maine, 1991;UN, 2000). However, despite these initiatives, progress towards reducing maternal mortality has been sub-optimal, and policy goals have remained unmet several decades later. Many women and population sub-groups lack access to institutional delivery. As a result, women in the poorest regions of the world have continued to die from largely preventable causes (WHO, 2004; UNDP, WHO, 2014).

4.2.4.2. Contextual determinants of institutional delivery

A few studies have sought to investigate other indirect factors that may constitute barriers to institutional delivery. Studies conducted in single countries and across selected countries within SSA and elsewhere suggest that, beyond the contribution of individual socio-demographic factors, the characteristics of a community affect variations in the use

of health services in general (Anderson, 1997;Diehr, 1993;Diez Roux, 2001). With regards to maternal and child health care, studies have found that the context within which families live (community) affects care-seeking behavior (Aremu, 2011; Babalola, 2009; Moyer, 2013; Stephenson, 2006; Fotso, 2009; Fotso, 2005). Multilevel modeling enables researchers to simultaneously examine how the individual and contextual determinants affect health outcomes. Thus, multilevel modeling has become an increasingly important analytical approach to understand how the context in which people live affects their health seeking behaviors, including the use of maternal health care.

A recent study in India used multilevel modeling to estimate the effects of individual, community, and district variables on the use of three maternal health services (i.e. prenatal care, skilled delivery care, and postnatal care) (Jat, 2011). Among 15,782 women with a recent live birth in Madhya Pradesh State, maternal education and household wealth were important individual-level predictors of the utilization of the three services. Additionally, the authors found a 29% and 8% variation in the use of skilled delivery assistance among communities and districts, respectively. However, after adjusting for individual socio-demographic, community, and district covariates, the amount of the variation attributable to contextual effects at the community and district levels decreased to 15% and 4.3% respectively (Jat, 2011). These results indicate the strong influence of contextual factors on maternal health care seeking behavior within communities, but not at the district level.

Aremu, Lawoko, and Dalal (2011) conducted a multilevel analysis of Demographic and Health Survey data in Nigeria to assess the roles of individual and community

socioeconomic disadvantage on place of childbirth. Beyond the effect of individual socioeconomic factors (e.g. household wealth, spouse's educational level, women's occupation, and possession of health insurance), the authors found that living in a socioeconomically disadvantaged community was associated with higher likelihood of home delivery compared to the use of public or private health facilities for childbirth. They also found that choice of place of delivery was clustered around neighborhoods, underpinning the importance of community effects in access to institutional delivery (Aremu, 2011).

Similarly, Babalola and Fatusi (2009) examined the individual, household, community, and state-level determinants of maternal services utilization in Nigeria. At the individual level, education was a strong predictor of all three indicators assessed (i.e. prenatal care, skilled birth attendance, and postnatal care). They also identified household wealth and community characteristics as significant predictors of the use of maternal health services across the three selected indicators. At the community level, the authors found urban residence and media saturation to be consistently, positively associated with all three indicators. However, the prevalence of small family size (families with four children or less) was not associated with postnatal care. In addition, findings from the study suggested that between 15% and 18% of the variation in the use of the selected services were attributable to variations at the state level (Babalola, 2009).

Stephenson, et al., (2006) used pooled data from six SSA countries (Burkina Faso, Ghana, Ivory Coast, Kenya, Malawi, and Tanzania) to determine the individual and contextual determinants of childbirth in a health facility (Stephenson, 2006). Individual data were collected from the most recent Demographic and Health Surveys (DHS) for

these countries, and community data were obtained by averaging some individual socioeconomic information from the DHS and administrative data from geographic information systems. Multilevel models were fitted to estimate the random effects of the community and district on a woman's choice of place of childbirth. The authors found strong community-level influences on the place of delivery among all the countries. In adjusted models, among all six countries in the sample, individual-level variables did not account for all the variation in the use of institutional delivery services. The models adequately explained most of the district-level variation in four of the six countries; however, the authors found significant community-level variations in institutional delivery across all countries (Malawi, variance (var)= 0.275, standard error (SE)= 0.046; Tanzania, var= 0.371, SE= 0.13; Kenya, var= 0.499, SE= 0.10; Burkina Faso, var= 0.656, SE= 0.147; Ghana, var= 0.545, SE= 0.155; Ivory Coast, var= 0.718, SE= 0.223). The community-level variances in institutional delivery were higher in the three West African countries (Burkina Faso, Ghana, and Ivory Coast) compared to the three East African countries (Malawi, Kenya, and Tanzania). The most consistent predictors of institutional delivery at the community-level were the birth of at least one previous child in a health facility and secondary or higher levels of maternal education. However, the district-level effect was only significant in Kenya and Tanzania (var= 0.405, SE= 0.136 and var= 0.282, SE= 0.139, respectively). These findings underscore the important role of the community context in care seeking for childbirth.

4.2.5. Gaps in the Literature

The review of extant literature, described above, suggests that the context of the community is an important determinant of maternal health care seeking behavior that

needs attention. Because humans are social beings and tend to belong to groups and to be influenced by group norms, the concept of examining the contextual determinants of access to reproductive health services in West and Central Africa is especially important (Oakes & Rossi, 2003). Although individual determinants of health have been studied extensively, and used to inform policy and programmatic interventions, the context within which women live and make health-related decisions has received less attention. Further, the sub-optimal performance towards achieving MDG-5 targets in the sub-region, warrants further research into other possibly overlooked barriers to access and use of reproductive health services. This research may identify barriers that are specific to West and Central Africa, given their similar histories or current experiences of community disturbances. The findings from this dissertation research may contribute to formulating policy and strategic approaches for reducing preventable maternal deaths in West and Central Africa and the Post-2015 Sustainable Development Goals.

4.3. Conceptual Framework

One of the major goals of health policy is equitable access to and use of health services. Similarly, the reproductive health policies of multilateral, bilateral, and local agencies draw on the key assumption that services are provided for the benefit of populations. However, in reality, some sub-populations consistently lack access to the health care delivery system. Consequently, disparities in health and health care remain pervasive within and across countries and regions of the world.

Andersen (1968) describes equitable access as the distribution of health services that is only defined by need (perceived or evaluated). However, when socioeconomic factors (such as race/ethnicity, education, wealth, and employment status), health beliefs, or

financial resources define who has access to health care, then inequities in access exist. Andersen first introduced the behavioral model of health services' use in 1968 to describe why families use health services. The model also aided in the measurement of and policy development for equitable access (Andersen, 1968). Following several revisions, in the 6th version of the model Andersen, et al. (2014) suggests that improving access to health care will be best achieved by focusing on contextual determinants as well as individual determinants (Andersen, 1995, 2008; Andersen, et al., 2014). The authors describe contextual determinants as the circumstances and environment in which health care access is achieved (e.g. community factors). Contextual factors, unlike individual factors, are measured at aggregate levels (e.g. family, neighborhood, and community levels), and individuals are related to these groups through membership or residence in a given jurisdiction.

The 6th version of the behavioral model of health services' use suggests that contextual (e.g. community) factors, just like individual factors that determine access, have three major components. Predisposing characteristics include conditions that make people use or not use health institutions for childbirth; enabling characteristics include conditions that facilitate or hinder the use of institutional delivery services; and need characteristics include conditions that require health services (e.g. childbirth) (Andersen, 1968; Andersen, 1995). This version of the model adds to previous versions the recognition that the context (community structure and process) of health care provision is very important to realized access (Donabedian, 1980). In spite of the emphasis on contextual determinants of access to health services, the focus of the model is on providing understanding about the health behavior of individuals in regards to health

services use and the resulting outcomes of use while also accounting for the contextual socioeconomic influences (Kominsky, 2014).

Socioeconomic status (SES) is a latent indicator of a person's or group's access to resources and ability to succeed in society. Researchers and policy makers have defined and measured SES individually or collectively, as in the case of a community, in different ways. The construct covers a wide range of social, political, economic, and cultural ideologies. Although there is no universal definition of SES, researchers and policy makers agree on its importance as a determinant of the health of individuals and communities (Oakes and Rossi, 2003). In this study, I measured community socioeconomic status as an aggregate of household heads who have no formal education and who are in the poorest wealth quintile.

Laypeople and experts recognize childbirth as a condition that requires the use of skilled birth attendants, preferably, in a health institution. Despite this knowledge, not every pregnant woman has access to institutional delivery for childbirth. Andersen's description of equitable access (Andersen, 1968) implies that pregnant women should have access to institutional delivery services regardless of their social status, or place of residence. Nonetheless, given the limited nature of health care and personal resources, and health information asymmetry, not every pregnant woman benefits from available maternal health services, consequently, inequities in access exist. The behavioral model of health services use (Andersen, 1995, 2008; Andersen et al., 2014) provides a useful framework for assessing the contextual and individual determinants of access to maternal health services in West and Central Africa.

From the foregoing, it is reasonable to hypothesize that community characteristics such as levels of poverty, wealth status, and educational attainment, will play an important role in enabling or limiting a woman's access to institutional delivery services. In addition, individual predisposing, enabling, and need factors may also play a role in facilitating or limiting access to institutional delivery. It is expected that in an inequitable health care system, contextual and individual predisposing and enabling factors will be stronger predictors of access than need factors. Thus, consistent with other studies using contextual determinants of access (Stephenson, 2006; Bablola & Fatusi, 2009; Parkhurst et al., 2005; Aremu et al., 2011), my expectation is that pregnant women in more disadvantaged settings will be likely to have a lower demand for institutional delivery services than those in less disadvantaged settings. Similarly, I expect that pregnant women with higher socioeconomic status will have a higher demand for institutional delivery than women with lower socioeconomic status (Greenaway, 2012; Gyimah, 2006; De Allegri et al., 2011; Corroon et al., 2013). Individual characteristics may modify the effect of community characteristics on health. For example, some individuals may have personal characteristics that make them more susceptible to adverse neighborhood conditions, while others may have personal and financial resources that enable them to overcome the effects of the neighborhood disadvantage (Diez-Roux & Mair, 2010).

4.4. Study Objectives and Hypothesis

4.4.1. Study Objectives

The objective of this study was to examine the effects of individual and community socioeconomic characteristics on institutional delivery. Additionally, the study sought to

assess variations in institutional delivery which are attributable to community-level factors.

4.4.2. Study Hypothesis

I hypothesized that after adjusting for individual characteristics, women who live in a poor community will have lower odds of institutional delivery compared to women who live in less disadvantaged communities. Additionally, given the historical, political, socioeconomic, and cultural differences between these countries, the individual and community socioeconomic effects on institutional delivery will differ by country.

4.5. Methods

4.5.1. Data Source and Study Sample

I used data from the fourth phase of the UNICEF Multiple Indicators Cluster Survey (MICS), conducted between 2009 and 2011. MICS is an international household survey developed by UNICEF to monitor the health and well-being of women and children. The survey employs a face-to-face method of data collection by trained interviewers. MICS surveys were first launched in the mid-1990s to support countries in assessing progress towards the achievement of population and international development goals (UNICEF, n.d.).

UNICEF launched the first round of the survey in over 60 countries, and to date over 100 countries have participated in MICS surveys. Since 2009, UNICEF began collecting the MICS data every three years. Nationally representative data are collected from samples of households using a multiple stage, stratified cluster sampling approach. For the first stage, clusters/enumeration areas are selected from the most recent national census in each country and are representative at state/regional levels, while also allowing

for rural-urban stratification. For the second stage of sampling, an equal number of households are selected from each cluster on a systematic random basis. Each selected household is eligible to participate in the study upon informed consent. MICS surveys are weighted for over- or under-sampling and for non-response (UNICEF, 2009).

Designated national government agencies conduct the surveys with technical support and financial assistance from UNICEF and partner agencies. UNICEF develops standard sets of core questionnaire modules and adapts these to suit country contexts for data collection. Trained interviewers obtain informed consent from the eligible households and women prior to conducting the interviews using pencil-and-paper questionnaires. Thus, the design and standardized core modules allow for regional and transnational comparison of the data (http://www.childinfo.org/mics4_manual.html).

Eleven countries in West and Central Africa participated in the fourth round of the MICS surveys. However, at the time of my dissertation research, seven countries had complete datasets (i.e. Central African Republic (CAR), Chad, Democratic Republic of Congo (DRC), Ghana, Nigeria, Sierra Leone, and Togo). Three of these countries are in Central Africa: CAR, Chad, and DRC. The other four countries are in West Africa: Ghana, Nigeria, Sierra Leone, and Togo. Whereas CAR, Chad DRC, and Togo are Francophone countries, Ghana, Nigeria, and Sierra Leone are Anglophone.

The questionnaires developed for use by participating countries included: household, women's, children's, and men's questionnaires. Of 100,088 eligible households in the seven countries, interviewers successfully administered the surveys to 98,154 households, with a response rate of 98.1%. A total of 101,457 women were successfully interviewed out of 109,575 eligible women, representing a response rate of 92.6%.

This study included data for 34,792 women who had given birth in the two years prior to the surveys. Women were excluded from the sample if they had missing information on where the most recent childbirth occurred (n=565), or if they had missing information or answered "don't know" for educational level of household heads (n=1,740). Thus, a total of 32,487 women were included in the analytic sample for this study.

4.5.2. Study Variables

I used data from the household and women's questionnaires for this study. The outcome variable was the place of childbirth. Women with a recent live birth (defined as a birth within two years of administration of the survey) were asked the place of childbirth. Response options included respondent's or other home, government hospital or health center, private hospital or clinic, and "other." Women who delivered at home or "other" were coded as "0" category (home delivery) of a binary variable, and those who delivered in a health facility - all levels of government and private health facilities - were coded as "1", and considered as having an institutional delivery. As mentioned earlier, missing values for the location of childbirth were deleted.

The MICS survey has a hierarchical structure, with individuals nested in households, and households nested in primary sampling units (PSUs). The survey employs a two-stage stratified sampling technique, which draws a random sample of households and individuals from PSUs. The PSU is the administrative unit for which standard census data are available across countries. Researchers have used the PSU as a proxy for communities or neighborhoods in developing countries (Aremu et al., 2011; Fotso & Kuate-Defo, 2005). I use community in this context to describe clustering within the

same geographic residential environment. In urban areas, a PSU is usually a census block. In rural areas, PSUs are census villages, but contiguous villages with less than 25 households are merged to create a PSU.

Thus, I used a two-level multilevel modeling approach, which enables the identification of individual- (level 1) and community-level (level 2) effects on the quality of prenatal care. This approach also allows for clustering of observations within PSUs, while simultaneously accounting for ecological fallacy (Duncan, et al., 1998). Ecological fallacy is the attribution of group characteristics to individuals in the group. At level 1, I considered individual characteristics, including wealth quintile (poorest, poor, middle, rich, and richest), and education (no education, primary, and secondary or higher). Individual covariates included maternal age (15-19, 20-29, 30-39, and 40-49 years), and mean number of children born (parity). Other individual level variables were marital status (currently married, or formerly/never married), religion (Christian, Muslim, and others- traditional and other religion adherents), residence (rural or urban), pregnancy wantedness (wanted then, or not wanted then), and history of child mortality (yes or no).

The level-2 variable was community socioeconomic profile (poor or wealthier). At the community level, I constructed an aggregate variable measuring the socioeconomic profile of communities. The characteristics of interest included education of household heads, and household wealth index. For the community-level poverty index, I constructed a standardized variable with mean 0 and standard deviation 1, measuring the proportion of household heads with no education, and proportion of households in the poorest wealth quintile (Aremu et al., 2011; Uthman, et al., 2009). Using the mean of this variable as a cut-off, I grouped the resultant score into two categories: high poverty

index (poorest) and low poverty index (wealthier). The other community level variables were frequency of prenatal are visits (1-3 or ≥4), and skilled prenatal care (yes or no), used as a proxy for access to maternal health services and the general quality of health care services, respectively, in the community {Gage, 2007; Magadi, 2000).

4.5.3. Statistical Analysis

Descriptive statistics including means and frequencies were calculated. Bivariate analysis, including Chi-square tests for categorical variables and t-tests for continuous variables, was used to explore potential differences in the place of delivery by background characteristics. The MICS survey has a hierarchical structure, with individuals nested in households and households nested in PSUs. Thus, multilevel models were estimated, enabling the identification of community- and individual-level influences on the place of delivery, and allowing for clustering of observations within PSUs (Duncan, et al., 1998).

The models estimated the effects of individual and contextual socioeconomic characteristics on the odds of giving birth in a health facility. Since the dependent variable was operationalized as a binary variable, multilevel, random intercepts, logistic regression was used to estimate the likelihood of institutional delivery. First, I fitted a null model to estimate the extent to which communities varied in the outcome, and to assess if the data supported the use of multilevel modeling. A second model was fitted to include level 1 variables in order to assess the odds of institutional delivery. The third model included the level 2 variables: community poverty index, frequency of prenatal care, and skilled prenatal care. A third (full) model was estimated using all individual and community socioeconomic and demographic variables.

Measures of fixed effects were expressed as odds ratios and 95% confidence intervals. To estimate the extent to which a woman's place of childbirth varies at the community level, the variance partition coefficient (also known as the intra-class correlation coefficient) was computed as the measure of clustering of institutional delivery at the community level across countries (Larsen & Merlo, 2005). The differences in the nested models were estimated using the likelihood-ratio test. Results were considered statistically significant at the 0.05 alpha-level. I fitted the multilevel random intercept models using Stata's *melogit* syntax with 14 integration points. I stratified the analysis by country to avoid masking country-level differences. I assessed model fit by comparing the Akaike's information criterion (AIC), with lower values indicating better fit. My assessment of multicollinearity yielded a variance inflation factor of 2.3, indicating the absence of significant collinearity among the variables retained in the final model. I used Stata Version 13 for all analyses (StataCorp, 2013).

4.5.4. Ethical Considerations

The UNC Charlotte Institutional Review Board approved this study. UNICEF granted access to the MICS 4 data following the submission of a brief proposal of research objectives. The MICS datasets are publicly available, and access to download datasets is via a user name and password granted by UNICEF's ChildInfo, the administrator of MICS data.

4.6. Results

4.6.1. Descriptive Characteristics

Most women in the sample had no education (45.5%), were aged 20-29 years (51.6%), were Christians (57.0%), and lived in rural areas (69.9%) (Table 4.1). In

addition, most women were married (91.2%), wanted the most recent birth then (73.1%), and had an average of 4 children ever born (mean= 3.9, SD= 2.55). Household wealth was equally distributed across the sample (in five quintiles), as was community poverty level (49.4% low poverty index vs. 50.6% high poverty index).

Approximately half of all recent births occurred in a health facility (50.6%). The highest proportions of institutional deliveries were to women who were the most educated (40.2%), in the wealthiest quintile (29.2%), and Christian (68.9%). In contrast, the highest proportions of home deliveries were to women with no formal education (65.9%), in the poorest wealth quintile (31.3%), and of Muslim faith (48.9%). Additionally, women who had an institutional delivery had fewer children ever born (mean= 3.4, SD= 2.4) compared to an average of 4.3 children ever born for women who had home deliveries (mean = 4.3, S.D= 2.6). Among women who reported having a home delivery, most lived in rural areas (84.4%), and 15.7% lived in urban areas. Comparatively, 44.6% of institutional deliveries were to urban women, while 55.4% were to rural women.

Among women who reported having a home delivery, nearly 60% were residents of poor communities while only 37.5% of women who reported institutional deliveries were residents of poor communities. Additionally, women who had four or more prenatal visits comprised 73.5% of all institutional deliveries, compared to 22.7% and 3.4% among women who had less than four prenatal visits and no prenatal visits respectively. Similarly, among women who reported having an institutional delivery, 91.2% received prenatal care from a skilled provider, compared to 8.8% of women who did not receive prenatal care from a skilled provider. The highest proportion of home deliveries was to

women who were residents of poor communities (61.3%), compared to 38.7% who were residents of wealthier communities. Similarly, the highest proportion of home deliveries was to women who had no prenatal care 42.2%).

4.6.2. Multilevel Modeling Results

The data were first assessed to justify the use of multilevel modeling for the analysis. Table 4.2 shows the multilevel modeling results from the null models for each country. Based on the variance partition coefficients computed for each country's null model, there were significant differences in institutional deliveries in the seven countries. The smallest community-level variation was observed in CAR with 32.4%, while the largest was observed in Nigeria with 73.0% community variation in institutional delivery.

Table 4.3 shows the results of fixed- and random-effects from the multilevel modeling of institutional delivery. After accounting for individual and community level factors, the variations in institutional delivery attributable to differences in the communities across the seven countries were reduced. For example, the community level variation was reduced from 32.4% to 20.3% in CAR, and from 72.99% to 27.53% in Nigeria. Accounting for individual and community factors resulted in significant reductions in community-level variances across all countries; however, the largest reductions were in Nigeria (45 percentage points), Chad (over 31 percentage points) and Ghana (20 percentage points).

After adjusting for all individual and community level factors, the community poverty index significantly predicted the odds of institutional delivery in five of the seven countries. Residing in communities with high levels of poverty was associated with statistically significant decreased odds of institutional delivery compared to communities

with low poverty levels (CAR: OR= 0.69, 95% CI: 0.54, 0.89; Chad: OR= 0.85, 95% CI: 0.65, 0.99; DRC: OR= 0.82, 95% CI: 0.71, 0.83; Ghana: OR= 0.88, 95% CI: 0.56, 0.99; and Nigeria: OR= 0.87, 95% CI: 0.68, 0.98). In Sierra Leone and Togo, there was no association between community poverty levels and institutional delivery (OR= 0.93, 95% CI: 0.69, 1.12; and OR= 0.92, 95% CI: 0.39, 1.61, respectively). However, among all seven countries, having at least one prenatal visit was statistically significantly associated with institutional delivery. Compared to women who did not receive prenatal care, having 1-3 visits was associated with 2 to nearly 11 times the odds of institutional delivery (lowest OR= 2.20, 95% CI: 1.52, 3.19 in Nigeria to highest OR= 10.92, 95% CI: 4.97, 24.0 in DRC). Similarly, having 4 or more prenatal visits was associated with 5 to nearly 33 times the odds of institutional delivery, compared to having no prenatal care (lowest OR= 5.29, 95% CI: 3.77, 7.42 in Nigeria to highest OR= 32.71, 95% CI: 9.41, 113.73 in Ghana). Receiving prenatal care from a skilled provider (physician, nurse, or midwife) was statistically significantly associated with increased odds of institutional delivery in only two of the seven countries (CAR: OR= 1.33, 95% CI: 1.03, 1.70; and Nigeria: OR= 2.25, 95% CI=1.67, 3.04).

Among individual socioeconomic factors, being in the wealthiest quintile was statistically significantly associated with institutional delivery compared to the poorest quintile among all seven countries (lowest OR= 1.73, 95% CI: 1.12, 2.68 in CAR and highest OR= 26.91, 95% CI: 7.61, 95.17 in Togo). Further, in Nigeria and Sierra Leone, wealth had a positive linear relationship with institutional delivery: as wealth increased, the odds of institutional delivery also increased. Maternal education also had gradient response except in CAR and Sierra Leone. In CAR, only secondary and higher education

was significantly associated with increased odds of institutional delivery (OR= 2.37, 95% CI: 1.68, 3.33). In Sierra Leone, while all educational levels were associated with increased odds of institutional delivery, only primary education was statistically significant (OR= 1.34, 95% CI: 1.03, 1.75). Among all countries except Sierra Leone, living in rural areas was significantly associated with decreased odds of institutional delivery compared to urban living (from OR= 0.21, 95% CI: 0.11, 0.38 in DRC to OR= 0.56, 95% CI: 0.44, 0.72 in Nigeria). In Sierra Leone the association was not significant (OR= 1.15, 95% CI: 0.79, 1.68).

4.7. Discussion

This study examined the association between individual and community factors and institutional delivery in seven West and Central African countries. I found that only half of all births took place in a health facility. Furthermore, the results suggest that greater attention should be given to efforts to address community barriers to institutional delivery as well as individual level barriers among women in West and Central Africa. There were also marked socioeconomic disparities within and between countries in institutional delivery.

At the individual level, women's socioeconomic status was statistically significantly associated with the likelihood of having an institutional delivery. Women with secondary and higher levels of education were the most likely to have an institutional delivery compared to those with no education. Education has been shown to be related to higher levels of use of maternal health services (including skilled birth attendants and institutional delivery) in several countries in Africa and Asia (Babalola, 2009; Feyissa, 2014; Pathak, 201; Tann, 2007; Teferra, 2012). Educated women are more likely to have

higher and better health care-seeking behaviors, most likely due to increased awareness of health services and importance of the use of such services (Rowe, 2005). Further, among all seven countries included in this study, being in the wealthiest quintile was statistically significantly associated with increased odds of having an institutional delivery. These findings are similar to previous findings from SSA and other developing countries (Gabrysch, 2009; Ononokpono, 2014; Tann, 2007; Van Eijk, 2006; Ahmed, 2010).

Consistent with previous studies (Amano, 2012; Babalola, 2009; Feyissa, 2014; Stephenson, 2006; Thind, 2008), women living in rural areas were significantly less likely than those living in urban areas to have an institutional delivery in all countries except Sierra Leone. The reduced likelihood of institutional delivery in rural areas could indicate less physical access to health facilities, or additional barriers poor women living in poor communities may face (e.g., availability of transportation or the cost of transportation) (Feyissa, 2014; Gage, 2007; Stephenson, 2006).

At the community level, women living in high-poverty areas were less likely than women residing in low-poverty areas to have an institutional delivery in most countries. This finding suggests that the level of poverty in a community may be a strong barrier to women's use of institutional delivery services. However, these findings did not apply to Sierra Leone and Togo. In Sierra Leone and many other countries in the region (e.g., Ghana, Nigeria), maternal and child health services are free. Yet, the rates of institutional delivery are sub-optimal. Following the 2010 removal of user fees for pregnant women and children in Sierra Leone (Donnelly, 2011; Diaz et al., 2013), research identified significant associations between using traditional treatments and the failure to seek

appropriate health care for diarrhea, malaria and pneumonia in children. Women who used traditional treatments were less likely to seek appropriate care for childhood illnesses (Diaz, 2013). Thus, it is plausible to posit that there may be strong cultural preferences for traditional birth practices, as has been reported from previous studies in SSA (Bazzano, 2008; Olusanya, 2010).

Moreover, although many countries in the region have a free maternal and child health care policy, there are significant informal fees and out-of-pocket costs to women who deliver in health facilities (Perkins, 2009; Ebeigbe, 2013; Wagstaff, 2002; Chama-Chiliba, 2014). These informal fees are especially important in areas with the highest concentrations of poverty. Prior studies have found that the poorest communities are at least 50% farther away from the closest health care facility of any type compared to areas with lower concentrations of poverty (Khan, 2006). Further, health facilities closest to poor communities may have fewer skilled personnel and supplies of equipment and drugs compared to health facilities with lower concentrations of poverty (Khan, 2006). Thus, it is reasonable to postulate that women who have no option besides these health facilities may incur out-of-pocket fees for delivery-related supplies. As a result, women living in poor communities with less household resources to seek care for childbirth, may face more barriers to institutional delivery than those in wealthier communities, even where there are free maternal health policies.

Consistent with previous studies, women who had more prenatal care visits were more likely to have an institutional delivery in all countries (Rai, 2012; De Allegri, 2011; Gabrysch, 2009). Prenatal care could provide opportunities for health care workers to promote institutional delivery, either as a best practice or based on pregnancy risk

assessment. Nonetheless, in this study, prenatal care visits were associated with a linear trend in the likelihood of having a facility-based birth. This relationship could also indicate the accessibility of health services and interaction with health systems in the community (Gage, 2007; Gabrysch, 2009; Gage, 2006; Yanagisawa, 2006). In addition, this finding suggests that the use of other reproductive health services can provide an important opportunity to promote institutional delivery and its benefits to women.

Skilled prenatal care was associated with increased odds of institutional delivery in only two of the seven countries assessed (CAR and Nigeria). The results for the other five countries were not consistent with my expectation. A recent study in Cambodia found that women who received skilled prenatal care, but also consulted a traditional birth attendant with pregnancy-related problems had up to 46% decreased odds of institutional delivery; however, this result was not statistically significant (Yanagisawa, 2006). Similarly, a population-based study in rural Tanzania found inconclusive associations between having a skilled prenatal care provider and facility-based delivery (Rockers, 2009). Compared to women who sought care from nurses, women who saw a physician during prenatal care were 30% more likely to have a facility-based delivery. Women who saw health workers with less rigorous medical credentials had about 30% lower odds of having an institutional delivery (Rockers, 2009); however, these results were not significant. The perception of the quality of care and skills of health care providers may vary with the level and size of the health care facility. I was not able to account for this factor. Lack of control for perceptions about the quality of care and skills of health care providers may contribute to the mixed findings from this study. This observation warrants further examination within the local context of each country.

After controlling for all individual and contextual characteristics in all models, significant variations persisted at the community level in all seven countries, suggesting that the models did not fully explain the community level variations in institutional delivery. This unobserved heterogeneity may be due to unmeasured factors (including cultural, socioeconomic, and health system variables) that were not included in the models but have the potential to affect the use of institutional delivery services. Unmeasured cultural factors could include beliefs and norms that influence maternal health services use. For example, in Ghana, there is a belief that childbirth at home is indicative of higher status of a woman within the family (Bazzano, 2008). Whereas the multilevel models explained some of the community-level variation in institutional delivery, the amount of variability explained differed among countries. The variables included in the models explained over 60% of the community-level variability in institutional delivery in two countries (Chad: 60.13%, and Nigeria: 62.28%); and between 30 to 40% in three countries: CAR: 37.3%, Togo: 38.9%, and Ghana: 43.2%. In DRC and Sierra Leone, the contextual variables in the models explained less than 30% of the community-level variation in institutional delivery (25.3% and 9.6%, respectively). These results suggest that the models are more appropriate for explaining community variations in institutional delivery in some but not all countries. The two countries where the contextual variables explained the least community-level variations in institutional delivery have both experienced extended periods of complex, armed conflicts, which have negative implications for health care infrastructure, human resources, and health outcomes (Kinney, 2010). This warrants more research into unmeasured or omitted factors that may potentially influence maternal service use in these countries.

4.7.1. Strengths and Limitations

The results of this study should be interpreted with some limitations in mind. First, the data were self-reported and were not validated from more objective sources. However, trained interviewers, who speak the local language, conduct the MICS interviews, thus improving the quality of the data. Second, endogeneity arising from omitted variables has the potential to affect the utilization of health institutions for childbirth. For example, distance to the nearest health facilities, financial costs of childbirth in a health facility, and cultural barriers to institutional delivery all have the potential to affect care-seeking decision making, but were not included in the survey. This could result in an over estimation or underestimation of the observed associations. Thus, it is possible that some of the observed effects may be due to the effects of unmeasured variables that are associated with both the exposures and outcome in the estimated models.

Despite these limitations, this study has a number of strengths. This study is among the first transnational studies that focuses exclusively on the West and Central African sub-region to examine contextual factors that could constitute barriers to access to institutional delivery. Identifying contextual barriers to institutional delivery is an important consideration, given the disproportionate burden of maternal deaths that the West and Central African sub-region bears. In recognition of differences between countries, this study estimated separate models for each of the seven countries, thereby avoiding masking effects which could arise from the use of pooled data. In addition, this stratification enables the identification of country-specific factors that may influence institutional delivery. Further, this study provides evidence in support of moving beyond

individual determinants of access to incorporating factors related to the context within which women make maternal health care-seeking decisions. The findings of this study should be generalizable to other West and Central Africa and SSA countries.

4.8. Implications for Policy, Practice and Research

The identification of community characteristics that influence the use of institutional delivery among West and Central African women is a first step towards leveraging such factors for developing policies and programs aimed at increasing the use of health facilities for childbirth. These findings underscore the importance of adopting a multilevel approach to reducing maternal mortality through evidence-based programming to increase service use. Multilevel modeling has the potential to simultaneously identify individual and contextual determinants of access and use of health services generally, and could be extended to other health outcomes and populations.

The variation across countries in the community factors identified suggests that policies and programs should be adapted to the specific context to reflect the leading influences within countries. In addition, the unresolved variation among all countries warrants further research to understand the complex sets of contextual and individual factors that influence care-seeking within communities across countries. Qualitative research would be especially useful in this regard. Specifically, questions about cultural barriers, and the quality and costs associated with institutional delivery may provide insights into some of the reasons for the persistent variations among communities in the use of institutional delivery services. This could also have policy implications for removal or subsidization of user fees and social transfer programs as possible ways of increasing economic access and the demand for maternal health services. Also, the

existence of unmeasured contextual factors highlights the inability of the current population-based surveys to capture information on the context within which women and households make health care decisions. Thus, to strengthen multilevel policies and programs, population-based surveys may need to consider including measures of factors such as service availability and distance to the nearest health facility within communities as important correlates of the decision to seek critical care for childbirth and other maternal health services.

Table 4.1: Select descriptive characteristics of West and Central African women by place of delivery, 2009-2011 Multiple Indicator Cluster Surveys (n=32,487)

		Weighted N (%)	
	All women	**Home**	**Health facility**
	32,487	**49.4%**	**50.6%**
Level 1: Individual characteristics			
Education			
No education	16,025 (45.5)	11,510 (65.9)	4,515 (25.1)
Primary	9,301 (29.8)	3,981 (24.9)	5,320 (34.7)
Secondary or higher	7,161 (24.7)	1,549 (9.2)	5,612 (40.2)
Wealth quintile			
Poorest	7,843 (21.3)	5,691 (31.3)	2,125 (11.2)
Second	7,089 (20.7)	4,483 (26.1)	2,606 (15.3)
Middle	6,442 (20.0)	3,249 (20.5)	3,193 (19.4)
Fourth	6,130 (19.9)	2,375 (15.0)	3,761 (24.8)
Wealthiest	4,977 (18.2)	1,242 (7.1)	3,735 (29.2)
Covariates			
Maternal age			
15-19	3,463 (10.3)	1,831 (11.0)	1,632 (9.5)
20-29	16,554 (51.6)	8,625 (51.6)	7,929 (51.5)
30-39	10,223 (31.8)	5,318 (30.3)	4,905 (33.3)
40-49	2,247 (6.4)	1,266 (7.1)	981 (5.7)
Religion			
Christian	17,289 (57.0)	6,970 (44.5)	10,319 (68.9)
Muslim	12,637 (36.2)	8,767 (48.9)	3,870 (23.2)
Others	2,561 (7.5)	1,303 (7.0)	1,258 (7.9)
Residence			
Urban	9,662 (30.2)	3,173 (15.7)	6,489 (44.6)
Rural	22,825 (69.9)	13,867 (84.4)	8,958 (55.4)
Marital status			
Currently married	29,607 (91.2)	15,859 (93.1)	13,748 (89.2)
Never/ formerly married	2,880 (8.8)	1,181 (6.9)	1,699 (10.8)

Table 4.1 (continued): Select descriptive characteristics of West and Central African women by place of delivery, 2009-2011 Multiple Indicator Cluster Surveys (n=32,487)

	Weighted N (%)		
	All women 32,487	**Home 49.4%**	**Health facility 50.6%**
Wanted child then			
Yes	23,931 (73.1)	13,047 (76.5)	10,884 (69.7)
No	8,529 (26.8)	3,972 (23.4)	4,557 (30.2)
Missing	27 (0.1)	21 (0.0)	6 (0.1)
Parity			
Mean (SD)	3.9 (2.55)	4.3 (2.61)	3.4 (2.42)
Country			
CAR	4,398 (13.2)	1,975 (12.2)	2,423 (14.3)
Chad	5,989 (18.9)	4,891 (31.8)	1,098 (6.1)
DRC	4,535 (14.9)	968 (6.9)	3,567 (22.9)
Ghana	2,838 (7.8)	1,238 (5.0)	1,600 (10.7)
Nigeria	9,485 (29.0)	5,542 (30.3)	3,943 (27.8)
Sierra Leone	3,327 (10.6)	1,674 (10.3)	1,653 (10.8)
Togo	1,915 (5.5)	752 (3.6)	1,163 (7.5)
Level 2: Community characteristics			
Community Poverty index			
Low	15,956 (49.4)	6,474 (38.7)	9,482 (62.5)
High	16,531 (50.6)	10,566 (61.3)	5,965 (37.5)
Number of ANC visits			
None	7,769 (23.0)	7,086 (42.2)	683 (3.8)
1-3	7,837 (23.2)	4,025 (23.8)	3,812 (22.7)
4 or more	16,881 (53.8)	5,929 (34.0)	10,952 (73.5)
Skilled ANC provider			
No	9,648 (28.1)	8,084 (47.4)	1,564 (8.8)
Yes	22,839 (71.9)	8,956 (52.6)	13,883 (91.2)

*All p-values are <0.001

Table 4.2: Parameter estimates showing measures of variation in institutional delivery in West and Central Africa, 2009-2011 Multiple Indicator Cluster Survey- Null models without covariate

	CAR[a]	Chad	DRC[b]	Ghana	Nigeria	Sierra Leone	Togo
Random effects							
Community random variance[c] (SE[d])	1.58 (0.22)	3.63 (0.42)	7.21 (0.97)	2.51 (0.31)	8.89 (0.68)	2.28 (0.27)	5.08 (0.79)
Log-likelihood	-2619.74	-2344.00	-1667.69	-1753.87	-4688.52	-2037.18	-1052.61
VPC[e] (%)	32.44	52.45	68.67	43.28	72.99	40.93	60.69
AIC[f]	5243.48	4692.00	3339.38	3511.74	9377.03	4078.36	2109.22

[a]CAR= Central African Republic; [b]DRC= Democratic Republic of Congo; [c]SE= Significance of random effects evaluated by comparing model with a similar one in which random effects have been constrained to be zero; [d]standard error; [e]VPC= variance partition coefficient; [f]AIC= Akaike's information criterion

Table 4.3: Multilevel modeling of institutional delivery among women in West and Central Africa, 2009-2011 Multiple Indicators Cluster Survey (n=32,487[a])

	OR (95% CI)						
	CAR	**Chad**	**DRC**	**Ghana**	**Nigeria**	**Sierra Leone**	**Togo**
				Fixed effects			
Individual variables							
Education							
None	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Primary	1.06 (0.89,1.26)	1.63(1.31,2.02) ‡	1.40(1.09,1.80)†	1.51(1.18,1.92)†	1.81(1.50,2.18)‡	1.34(1.03,1.75)*	1.83(1.31,2.55)‡
Secondary+	2.37(1.68,3.33) ‡	2.73(2.07,3.61) ‡	1.86(1.33,2.59)‡	3.25(1.73,6.09)‡	3.08(2.52,3.77)‡	1.31(1.00,1.71)	4.62(2.47,8.65)‡
Wealth							
Poorest	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Poor	0.87 (0.65,1.18)	1.02 (0.65,1.63)	1.31 (0.86,1.99)	1.51 (1.07,2.13)	1.66(1.31,2.12)‡	1.62(1.20,2.19)†	1.51 (0.99,2.28)
Middle	1.29 (0.95,1.75)	1.45 (.94,2.21)	1.15 (.74, 1.79)	1.98(1.29,3.03)†	3.18(2.46,4.11)‡	2.09(1.53,2.87)‡	3.56(2.23,5.67)‡
Rich	1.19 (0.85,1.67)	1.61 (1.05,2.45)*	2.09(1.24,3.53)†	4.10(2.44,6.89)‡	5.02(3.78,6.66)‡	2.44(1.74,3.43)‡	5.96(2.75,12.90)‡
Richest	1.73 (1.12,2.68)*	2.40 (1.54,3.76)‡	6.85(2.87,16.35) ‡	11.35 (4.73,27.22) ‡	10.76 (7.63,15.17)‡	4.24(2.78,6.46)‡	26.91 (7.61,95.17)‡
Age							
15-19	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
20-29	1.07 (0.89,1.33)	0.72 (0.57,0.93)*	0.90 (0.60,1.34)	0.63(0.40,1.00)	1.09 (0.82,1.44)	0.79 (0.59,1.04)	1.10 (0.58,2.10)
30-39	1.20 (0.87,1.64)	0.83 (0.59,1.18)	0.88 (0.53, 1.46)	0.73(0.43,1.25)	1.61(1.16,2.23) †	1.09 (.76,1.55)	1.31 (0.62,2.76)
40-49	1.88(1.14,3.11)*	1.17 (0.68,2.02)	0.95 (0.47,1.86)	0.99(0.51,1.92)	1.85(1.23,2.81)†	0.89 (.52,1.52)	1.98 (0.77,5.14)
Marital status							
Married	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Not married	1.11 (0.86,1.42)	0.91 (0.65,1.27)	0.91 (0.65,1.29)	1.21 (0.82,1.80)	1.22 (0.92,1.62)	1.15 (0.89,1.49)	1.27 (0.69,2.31)

Table 4.3 (continued): Multilevel modeling of institutional delivery among women in West and Central Africa, 2009-2011 Multiple Indicators Cluster Survey (n=32,487[a])

	OR (95% CI)						
	CAR	**Chad**	**DRC**	**Ghana**	**Nigeria**	**Sierra Leone**	**Togo**
Religion							
Christian	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Muslim	1.55(1.16,2.08)†	0.88 (0.68,1.14)	0.77 (0.36, 1.65)	0.79 (0.60,1.03)	0.38 (.32,.45)‡	0.82 (0.66,1.03)	1.45 (0.78,2.70)
Others	1.41 (0.84, 2.34)	0.62(0.39,0.98)*	1.23 (0.81, 1.86)	0.58(0.51,0.90)†	1.04 (0.59,1.84)	0.50(0.32,0.77)†	1.13 (0.82,1.54)
Residence							
Urban	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Rural	0.46(0.34,0.62)‡	0.24 (0.18,0.32)‡	0.21(0.11,0.38)‡	0.34(0.24,0.49)‡	0.56(0.44,0.72)‡	1.15 (0.79,1.68)	0.38(0.18,0.81)*
Parity	0.94(0.91,0.99)*	0.94(0.90,0.99)*	0.96 (0.91, 1.02)	0.91(0.85,0.96)*	0.92(0.89,0.95)‡	0.94(0.89,0.99)*	0.91(0.83,0.99)*
Contextual variables							
Poverty index							
Low	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
High	0.69(0.54,0.89)†	0.85 (0.65,0.99)*	0.82 (0.71,0.83)*	0.88 (0.56,0.99)*	0.87 (0.68,0.98)*	0.93 (0.69,1.12)	0.92 (0.39,1.61)
Number of ANC visits							
None	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
< 4	4.46 (3.29,6.06)‡	4.41 (2.21,8.80)‡	10.92 (4.97,24.0)‡	10.86 (3.05,38.67)‡	2.20 (1.52,3.19)‡	9.76 (3.62,26.28)‡	5.89 (3.15,11.02)‡
≥ 4	8.61(6.31,11.74)‡	6.63 (3.34,13.19)‡	13.79 (6.24,30.46)‡	32.71 (9.41,113.73)‡	5.29 (3.77,7.42)‡	16.88 (6.45,44.14)‡	17.89 (9.42,33.97)‡
Skilled ANC							
No	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Yes	1.33 (1.03,1.70)*	1.25 (0.65,2.34)	0.84 (0.40,1.72)	1.39 (0.82,2.35)	2.25 (1.67,3.04)‡	0.98 (0.72,1.35)	0.86 (0.59,1.26)

Table 4.3 (continued): (continued): Multilevel modeling of institutional delivery among women in West and Central Africa, 2009-2011 Multiple Indicators Cluster Survey (n=32,487[a])

	OR (95% CI)						
	CAR	**Chad**	**DRC**	**Ghana**	**Nigeria**	**Sierra Leone**	**Togo**
				Random effects			
Community variance[b] (SE)	0.84 (0.13)‡	0.87 (0.14)‡	3.47 (0.49)‡	1.07 (0.19)‡	1.25 (0.13)‡	1.93 (0.24)‡	1.99 (0.39)‡
Log-likelihood	-2222.88	-1965.81	-1473.60	-1468.84	-3626.30	-1942.23	-838.34
Residual	20.33	20.91	51.33	24.54	27.53	36.97	37.69
VPC (%)							
AIC	4482.41	3696.93	2589.45	2976.63	7292.51	3293.64	1715.28
LR test χ^{2} [c]	795.72	756.38	388.19	570.07	612.43	189.89	428.53

*p < 0.05; †p < 0.01, ‡p < 0.001. [a]Full model including all level 1 and level 2 covariates; [b]Significance of random effects evaluated by comparing model with a similar one in which random effects have been constrained to be zero; [c]Compares full model to null model with no covariates

CHAPTER FIVE: CONCLUSION

My dissertation research examined the contextual determinants of reproductive health disparities among women in West and Central Africa. I have presented findings from seven countries (Central African Republic [CAR], Chad, Democratic Republic of Congo [DRC], Ghana, Nigeria, Sierra Leone, and Togo), investigating inequities in access, use and the quality of reproductive health care. I assessed three aims. The first was the relationship between a woman's attitude towards domestic violence (DV) and her choice of contraceptive method. Second, I examined the effects of community and individual socioeconomic characteristics on the quality of prenatal care. Third, I investigated relationships between community and individual socioeconomic factors and childbirth in a health facility.

Findings indicate that women's tolerance of DV is associated with a reduced likelihood of any contraceptive method use. Specifically, as the degree of tolerance of DV increased from none to low, and low to high, the odds of using traditional or modern contraceptive methods decreased. There are several possible pathways to contraceptive decision making, and women's perception of gender norms is only one such pathway. The fear of DV for any reason is an important barrier to modern contraceptive use. Since the goal of population policies is to increase the prevalence of modern contraceptive use

for birth spacing and limiting, it is important to pay special attention to norms and values that threaten women's perceived self-efficacy to use contraception.

The results also suggest that several women do not receive all the components of prenatal care assessed (blood pressure checks, blood tests, urine tests, malaria prophylaxis, tetanus toxoid vaccine, and HIV test). My results highlight socioeconomic inequalities in the quality of prenatal care women receive. The findings of this study suggest that there are significant socioeconomic variations in the quality of prenatal care at the community-level. Where a woman lives matters for receipt of the recommended quality of prenatal care. Living in close proximity to other poor households appears to decrease the likelihood of receiving high quality prenatal care. Moreover, women who live in poor communities are less likely to receive all the essential components of prenatal care, even when they have several visits. While it is important to get women to attend prenatal care, the quality of the services they receive during these visits is equally important.

With only half of all births taking place in a health facility, institutional delivery among women in the seven countries remains sub-optimal. My findings suggest that greater attention should be paid to efforts to ameliorate not only individual, but also community barriers to institutional delivery among women in West and Central Africa. There were also marked socioeconomic disparities within and between countries in institutional delivery. Women living in poor communities are less likely than women living in richer communities to have an institutional delivery. There are significant variations in institutional delivery at the community level. These findings suggest that

the level of poverty in a community may constitute an important barrier to women's use of institutional delivery services.

The findings of my dissertation study provide insights into contextual determinants of access to and quality of reproductive health services in West and Central Africa. These results underscore the importance of adopting a multilevel approach to through evidence-based programming to increase access, utilization and quality of services. Given the high prevalence of poverty and user fees in the region, social protection policies have the potential to mitigate the economic barriers poor women who live in poor communities may face in accessing maternal health care. The variation across countries in the community factors identified suggests that interventions must be adapted to the specific country context in order to make meaningful impact.

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