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Social-Ecological Predictors of Contraceptive Use in Ethiopia

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Abstract

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MPH, Walden University, 2015

BS, University of Texas Medical Branch at Galveston, 2010

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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Abstract

Unintended pregnancy is a global public health threat that affects the lives of women, families, communities, and society. In 2008, the rate of unintended pregnancy in Ethiopia was 101 per 1,000 women aged 14 to 44 years. Although Ethiopia has experienced a steady increase in modern contraceptive use since 2004, this increase did not result in a proportional decline in unintended pregnancy, total fertility rates, or rapid population growth. In this cross-sectional study, associations between individual, interpersonal, community, and societal factors and contraceptive uptake were tested using a sample of 3,863 women aged 15 to 49 years who participated in the 2016 Ethiopian Demographic and Health Surveys. Statistically significant predictors of contraceptive use were included in the logistic regression model. Findings showed that age, education, marital status, type of residence, and wealth index reliably predicted contraceptive use. Increase in age, highest level of education, and wealth index were associated with 13%, 15%, and 65% increase in the odds of contraceptive use, respectively. Being married was associated with 85% decrease in the odds of contraceptive use and being from an urban residence was associated with 56% increase in the odds of contraceptive use. Results of the study can be used to develop targeted family planning interventions to increase contraceptive use and reduce unintended pregnancy, child and maternal mortality, total fertility rates, and rapid population growth in Ethiopia.

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Dedication

This research is dedicated to my father, Fisseha Gebrekidan (1956-2012). The death of my father was my inspiration for returning to school to finish my long-term goal of completing a doctoral degree. Dad, you will always be remembered for your positive effect on my life.

This research is also dedicated to my children, Ezra, Eldana, Sipara, and Maekot for their unconditional love and support throughout the doctoral study process.

Also, this research is dedicated to my wife, Selome Berehe, for her compassion, love, financial, and moral support. Finally, this research is dedicated to my mother Nigsti Tewele, brothers Negassi, Tsegay, and Adisu, and sisters Werknesh and Tirhas Fisseha.

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Introduction

Unintended pregnancy is a global public health threat that affects the lives and wellbeing of women, families, communities, and society (Peyman & Oakley, 2009). It is a major cause of maternal and infant mortality rates (Melese, Gebrie, Badi, & Mersha, 2016). In 2016, the pregnancy-related maternal mortality rate in Ethiopia was estimated to be 412 deaths per 100,000 live births (Central Statistical Authority & Inner-City Fund International [CSA & ICF], 2016). In the same year, the Ethiopian Demographic and Health Survey estimated that the neonatal, infant, and under-five mortality rates were 29, 48, and 67 deaths per 1,000 live births, respectively (CSA & ICF, 2016). Unintended pregnancy is the result of nonuse, misuse, or failure of contraceptive methods (Klima, 1998). Pregnancy and childbirth-related maternal deaths are increasing in developing countries including Ethiopia (Ackerson & Zielinski, 2017). In 2012, over 85 million or 40% of pregnancies were unintended worldwide (Sedgh, Singh, & Hussain, 2014). In 2008, the rate of unintended pregnancy in Ethiopia was 101 per 1,000 women age 15 to 44 years, twice the global average (Feyissa, 2017; Sedgh et al., 2014). This high number has significant consequences for the health of the mother, child, and the burden to the healthcare system (Habte, Teklu, Melese, & Magafu, 2013).

Since 2000, Ethiopia has experienced a steady increase in modern contraceptive use. However, this increase did not result in a proportional decline in unintended pregnancy, total fertility rates, or rapid population growth. While contraceptive use has increased six-fold, total fertility rates have slightly declined from 5.5 children in 2000 to

4.6 children per woman in 2016, a decrease of only 16% (CSA & ICF, 2016). Women may have barriers that prevent them from using contraception, although they have a high desire to delay or limit their birth (Delbiso, 2014). This substantial gap between women's reproductive desire and current contraceptive use is called unmet needs for family planning (Cleland, Harbison, & Shah, 2014).

In third world countries, more than 200 million women who want to avoid pregnancy are not using modern contraceptive methods (Askew & Brady, 2012). According to the World Health Organization (WHO, 2014), six out of 10 women who want to delay pregnancy are not using any methods of contraception in developing countries. In Ethiopia, 22% of married women have unmet needs for family planning (CSA & ICF, 2016). Demographic, socioeconomic, cultural, and health-related factors can play a role in low contraceptive use and high fertility rates in Ethiopia. In a traditional and agrarian society such as Ethiopia, large family size is associated with high social and economic position (Ayele, 2015). Most families want more children because they are considered an economic asset and assist their parents with farming activities (Ayele, 2015).

There are significant disparities in terms of contraceptive use associated with individual factors (age, marital status, religion, and education), interpersonal factors (partner's attitude and opposition), community factors (place of residence and wealth index), and societal factors (access to contraception and women's empowerment). Researchers have studied disparities in contraceptive use to improve family planning interventions. However, barriers and gaps in terms of understanding the social-ecological

influences of contraceptive use still exist, resulting in a modest increase in contraceptive use without significant changes in child and maternal mortality, fertility, and population growth.

Family planning is a smart and cost-effective public health intervention. Family planning or contraception use can reduce high-risk pregnancies, abortions, and unintended pregnancies (Tiruneh, Chuang, Ntenda, & Chuang, 2016). In 2012, contraceptive use prevented over 218 million unintended pregnancies in developing countries (Singh & Darroch, 2012). An increase in contraceptive use reduced maternal, infant, and child mortality rates by 40, 10, and 21% respectively in the past two decades by reducing only unintended pregnancies (Cleland et al., 2012).

The social change implication of the study is that researchers and public health professionals can potentially use results of the study to increase contraceptive use among women age 15 to 49 years in Ethiopia through the improvement of family planning program interventions. The study may also help achieve Millennium Development Goals (MDG) and family planning 2020 (FP2020) agenda. The most cost-effective approach to achieve FP2020 goals is to ensure universal access to effective, acceptable, and affordable contraceptive methods are available at multiple delivery points suitable to the needs and situations of women of diverse groups.

Section 1 is an introduction to the subject of contraceptive use. It will cover the problem statement, purpose of the study, nature of the study, research questions and hypotheses. In addition, the theoretical framework, literature review of basic concepts, limitations, and significance of the study will be discussed.

Problem Statement

Ethiopia has experienced a steady increase in modern contraceptive use since 2000 (CSA & ICF, 2016). The contraceptive use rate has increased from 6% in 2000 to 36% in 2016 (CSA & ICF, 2016). While the contraceptive use rate has increased six-fold, the total fertility rate has slightly declined from 5.5 children in 2000 to 4.6 children per woman in 2016, a decrease of 16% (CSA & ICF, 2016). However, this steady increase in contraceptive use did not result in a proportional decline in total fertility rates, unintended pregnancy, maternal and child mortality, or population growth in Ethiopia.

Women in Ethiopia represent almost 50% of the total population. Of these, one-fourth of the total population are women of reproductive age group between 15 and 49 years old (Yared, 2012). They play a key role in childbearing and the management of family affairs. However, their economic, educational, and political participation is low. In addition, women have poor health status associated with high unwanted pregnancies and unmet needs for family planning. As a result, total fertility is 4.8 children per woman, the highest rate in Sub Saharan Africa (Yared, 2012). Moreover, the maternal mortality rate is estimated to be 676 per 100,000 live births, the highest in the world (Yared, 2012). Women may have barriers that prevent them from using contraception although they have a high desire to delay or limit their birth (Delbiso, 2014).

In third world countries, more than 200 million women who want to avoid pregnancy are not using modern contraceptive methods (Askew & Brady, 2012). In Ethiopia, it was reported that 22% of married women have an unmet need for family planning (CSA & ICF, 2016). Demographic, socioeconomic, cultural, and health-related

factors can contribute to low contraceptive use and high fertility rates in Ethiopia. In a traditional and agrarian society such as Ethiopia, large family size is associated with high social and economic position (Ayele, 2015).

Ethiopia has high fertility rates and rapid population growth. If the current Ethiopian population growth continues at the same level, Ethiopia will be the world's 10th most populous country by 2050, with an estimated population of 167 million (Olson & Piller, 2013). Although much is known about the benefits of contraceptive use, emerging evidence suggests that the overall prevalence of contraceptive use in Ethiopia is very low (Tilahun et al., 2013). There are multiple barriers to contraceptive use. Addressing such barriers is instrumental for designing proper family planning programs and policies that have the potential to improve contraceptive use, thereby improving child and maternal survival as well as reducing high fertility rates and rapid population growth in Ethiopia (Tilahun et al., 2013).

No study has yet examined the predictors of contraceptive use using the social-ecological model. According to the model, creating a conducive environment is essential for developing a successful family planning program (Glanz & Bishop, 2010). In light of limited research, and a lack of the social-ecological model in contraceptive studies, this has created room for further research.

First, previous studies have used behavioral theories of change to predict contraceptive use. Individual or behavioral factors alone do not explain the factors responsible for low contraceptive use (Kaggwa, Diop, & Storey, 2008; Scholmerich & Kawachi, 2016). In addition to individual factors, interpersonal, community, and societal

factors have a detrimental impact on women's contraceptive use (Scholmerich & Kawachi, 2016). The social-ecological model was selected for the study because the model targets multiple factors such as individual, interpersonal, community, and societal factors that influence contraceptive behavior. Changing individual behaviors without changing their social environment is not a sustainable solution (Crosby, Salazar, & DiClemente, 2011).

Moreover, contraceptive use behaviors are shaped by the social environment. Some of the findings of the determinants of contraceptive use in Ethiopia and Sub-Saharan African countries are contradictory. For example, Malalu et al. (2014) found the likelihood of contraceptive use among married women to be three times more than single women in Kenya. Andi, Wamala, Ocaya, and Kabagenyi (2014) found low modern contraceptive use among married women compared to single or never married women in Uganda. Catholic churches teach against contraceptives use, but Agadjanian (2013) found a high prevalence of modern contraceptive use among Catholic and, to a lesser extent, traditional Protestants in Mozambique. Achana, Bawah, Jackson, et al. (2015) found a positive relationship between spatial proximity to health delivery points and modern contraceptive use in Ghana. However, Achana et al. (2015) found a nonlinear relationship between spatial proximity to the nearest health facility and contraceptive use suggesting that women do not necessarily have their contraceptive services at the nearest facility. Moreover, a significant gap exists regarding the knowledge and understanding of the socioecological (individual, interpersonal, community, and societal) determinants of contraceptive use in Ethiopia. Therefore, this study will use the social-ecological model

as the theoretical lens or framework to explore the predictors of contraceptive use at multiple levels of influence.

This research will fill the gap in understanding the individual, interpersonal, community, and societal levels of influence on contraceptive use among women aged 15 to 49 years in Ethiopia. Results of the study can be useful for future family planning program implementation. Finally, recommendations for practical solutions which might help solve the barriers to contraceptive use and the reproductive right to freely decide the timing and number of children they want to achieve the objectives of the FP2020 and Millennium Development Goals (MDGs) will be discussed.

Purpose of the Study

The purpose of this cross-sectional quantitative study was to explore the association between individual, interpersonal, community, and societal levels of influence and contraceptive use in Ethiopia. The predictors of contraceptive use are aligned with the four levels of the social-ecological model (individual, interpersonal, community, and societal factors) adopted from the Centers for Disease Control and Prevention (CDC) used to prevent violence in the United States. The CDC (2018) used these levels of the social-ecological model to better understand violence and the effect of potential prevention strategies. According to the CDC (2018), the individual factors are biological and personal factors that increase the likelihood of age and education. Prevention strategies at the individual level (age, marital status, religion, and level of education) are designed to promote behavioral changes, attitudes, and beliefs that prevent violence (CDC, 2018). The interpersonal factors include the individual's closest social circle

peers, partners, and family members that influence their behavior. Community factors are settings in which social relationships occur (CDC, 2018). Finally, societal factors are sociocultural norms that encourage or inhibit violence (CDC, 2018).

The main reason for selecting the research topic are: First, contraceptive use has not been studied from a social-ecological perspective. Second, the findings of this study will help public health planners, policymakers, researchers, and communities to implement evidence-based family planning programs that will bring effective and sustainable positive social changes regarding contraceptive use. Finally, the study findings will give baseline information for future researchers and contribute new insight to family planning research.

Research Questions and Hypotheses

RQ1: Is there an association between individual factors (age, marital status, religion, and education) and contraceptive use among women age 15 to 49 years in Ethiopia?

$H_0$1: There is no association between individual factors (age, marital status, religion, and education) and contraceptive use among women age 15 to 49 years in Ethiopia.

H_a1: There is an association between individual factors (age, marital status, religion, and education) and contraceptive use among women age 15 to 49 years in Ethiopia.

RQ2: Is there an association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women age 15 to 49 years in Ethiopia?

H_02: There is no association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women age 15 to 49 years in Ethiopia.

H_a2: There is an association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women age 15 to 49 years in Ethiopia.

RQ3: Is there an association between community factors (type of residence and wealth index) and contraceptive use among women age 15 to 49 years in Ethiopia?

H_03: There is no association between community factors (type of residence and wealth index) and contraceptive use among women age 15 to 49 years in Ethiopia.

H_a3: There is an association between community factors (type of residence and wealth index) and contraceptive use among women age 15 to 49 years in Ethiopia.

RQ4: Is there an association between societal factors (access to contraception and women empowerment) and contraceptive use among women age 15 to 49 years in Ethiopia?

H_04: There is no association between societal factors (access to contraception and women empowerment) and contraceptive use among women age 15 to 49 years in Ethiopia.

H_a4: There is an association between societal factors (access to contraception and women empowerment) and contraceptive use among women age 15 to 49 years in Ethiopia.

RQ5: Is there an association between individual, interpersonal, community, and societal factors and contraceptive use among women age 15 to 49 years in Ethiopia?

H_05: There is no association between individual, interpersonal, community, and societal factors and contraceptive use among women age 15 to 49 years in Ethiopia.

H_a5: There is association between individual, interpersonal, community, and societal factors and contraceptive use among women age 15 to 49 years in Ethiopia.

Theoretical Foundation

The theoretical framework for this study will be the social-ecological model. The model was originated from the work of early researchers in the field of human psychology and child development. Researchers such as Lewin (1935) conceptualized the relationship between individual and environmental factors. According to Lewin (1935), behavior (B) is the function of the person (P) and their environment (E), represented by the equation B = f (P, E). Bronfenbrenner, a student of Lewin, extended the social-ecological model to human development to account for the complex interplay between the constructs of the socioecological model (microsystem, mesosystem, exosystem, and macrosystem). According to Bronfenbrenner (1979), the social-ecological environment is "a set of nested structures, each inside the next, like a set of Russian dolls" (p. 3). McLeroy et al. (1988) first applied the social-ecological model to public health and health promotion program interventions and later the model was evolved and adopted by the World Health Organization (WHO), National Institutes of Health (NIH), Office of Behavioral and Social Science Research (OBSSR), Department of Health and Human Services (DHHS), and CDC (Golden & Earp, 2012; Lounsbury & Michell, 2009).

Family planning programs that are based on social and behavioral models and theories are more effective than those without theoretical bases (Glanz & Bishop, 2010).

Models and theories are used to guide the development of rigorous study designs and clarify the inconsistent findings of the predictors of contraceptive use (Hall, 2012). The Institute of Medicine (IOM) defined the social-ecological model as "a model of health that emphasizes the linkages and relationships among multiple factors or determinants affecting health" (p. 5). Similarly, Golden, McLeroy, Green, Earp, and Lieberman (2015) defined the social-ecological model as the dynamic relationships among individuals, groups, and their environments. The model provides a framework to understand how individuals interact with their social environment (Wendel & McLeroy, 2012).

The basic premise of social-ecological thinking is that the determinants of health behavior are interrelated (Crosby et al., 2011; Gombachika et al., 2012). The social-ecological model targets the determinants of contraceptive use behavior at multiple levels of influence (individual, interpersonal, community, and societal factors). Changing individual behavior without changing individual social environment is not a sustainable solution (Crosby et al., 2011). According to the CDC (2018), the socio-ecological model consists of four core constructs: individual, interpersonal, community, and societal levels of influence. The main strength of social-ecological model to family planning program intervention is that it integrates behavioral and environmental factors in to a broad theoretical framework (Stokols, 1996). Although the model is useful for addressing the inherent problems of behavioral and environmental approaches, there are some limitations (Stokols, 1996). These limitations are: first, it is difficult to include all factors that may affect contraceptive use. A representative range of factors that may affect contraceptive use are included in the study. Second, there are many interactions or

overlap across the different levels of the social-ecological framework that the model could not capture.

Previous research on contraceptive use has focused on individual levels of influence mostly the health belief model, theory of planned behavior, transtheoretical model, and social cognitive theory. The health belief model was designed to predict and explain the "sick role behavior" rather than "preventive health behavior" (Hall, 2012). Individual levels of influence (age, marital status, religion, and levels of education) may be effective for changing individual behavior; however, the population as a whole may not benefit from those interventions. The social-ecological model avoids blaming the person and emphasizes the complexity of health behavior (Crosby et al., 2011). According to this perspective, a behavior is influenced by multiple social and environmental changes directed at multiple levels of influence (Crosby et al., 2011).

In this study, the social-ecological model was used as the foundation. Therefore, it guided the exploration of the association between individual, interpersonal, community, and societal factors and contraceptive use in Ethiopia. Table 1 summarizes the social-ecological factors defined within the constructs of the model.

Table 1

Social-Ecological Model

Constructs	Multilevel Factors
Individual	Age, marital status, education, and religion
Interpersonal	Husband's attitude and opposition
Community	Residence and wealth index
Societal	Access and women's empowerment

Nature of the Study

This study was a cross-sectional quantitative study investigating associations between individual, interpersonal, community, and societal levels of influence and contraceptive use. The cross-sectional study design is used to examine the association between variables of interest in a population at a single point in time or during a short period of time (Alexander et al., 2014; Setia, 2016). The cross-sectional study design is appropriate for population-based demographics and health surveys (Alexander et al., 2014; Setia, 2016). Unlike other observational studies, participants in cross-sectional studies are selected based on the inclusion and exclusion criteria set by the survey administrator (Setia, 2016). This method can be used to estimate the prevalence of contraceptive use and odd rates of the dependent and independent variables in the study (Setia, 2016).

In this study, the ordinal (age group, education, and wealth index) and categorical (marital status, religion, husband's attitude and opposition, residence, access to contraception, and women's empowerment) independent variables with one categorical dependent variable (contraceptive use) were analyzed. The most suitable methods for statistical analysis of this study are chi-square, univariate, bivariate, and multiple logistic regression model. The rationale for using the multiple regression model was because of its relevance to examine the association between the independent and dependent variables. The multiple logistic regression model is used to predict and make inferences about the effect of multiple independent variables on one dichotomous dependent variable. The model will provide an objective approach for studying the effects of

covariates on the binary outcome (contraceptive use or non-use of any method to delay or avoid pregnancy) and addresses both categorical and continuous covariates, without imposing any subjectivity to categorize a continuous covariate (Hongyue et al., 2017).

The Ethiopian Demographic and Health Survey, which contains individual (age, marital status, education, and religion), interpersonal (husband's attitude and opposition), community (residence and wealth index), and societal (access to contraception and women's empowerment) factors that affect contraceptive use, was analyzed. The dependent variable contraceptive use was defined as a dichotomous (yes/no) response in terms of whether the women currently used any method to delay pregnancy. The independent variables were age, marital status, education, religion, husband's attitude and opposition, residence, wealth index, access to contraception, and women's empowerment.

Literature Review Search Strategy

A systematic literature searches for factors affecting contraceptive use in different populations was conducted. The search databases included health sciences and multidisciplinary databases such as CINAHL & Medline, PubMed, EBSCOHost, ProQuest, SAGE Journals, Academic Search Complete, Science Direct, Demographic and Health Survey publications, and Google Scholar. The keywords used in the search were *history of contraception*, *contraceptive use*, *contraceptives*, *birth control*, *family planning*, *preventing pregnancy*, *multilevel predictors*, *predictors*, *barriers*, *social-ecological model*, *Ethiopia*, *developing countries*, *Sub-Saharan Africa*, *Horn of Africa*, and *Africa*. The keywords were used in various orders to gather as many relevant articles

as possible that were less than 5 years old. The search period started from 2013 unless it was a critical source for the development of this research study.

Literature Review of the Historical Development of Contraception

A better understanding of the historical development and evaluation of the concept of contraception is essential to explore the determinants of contraceptive use in Ethiopia. This chapter tries to create a mutual understanding among researchers on the past and current thinking regarding contraceptive use at the global, continental, and regional levels of thinking. The concept of contraception use has undergone a considerable historical evolution, reflecting changes in perceptions of the increasing world population and declining world food production.

Historically, human beings have tried many birth control methods to prevent pregnancy. The condom is the oldest form of birth control. There are written historical records of contraceptive remedies in ancient Egyptian. They used spermicidal agents such as cotton, dates, pepper, barriers, honey, and acacia as birth control suppositories. In the ancient Greek writing of Soranus, people used to wipe out the vagina after intercourse to prevent pregnancy. These methods are now known to be ineffective. Other ineffective remedies used by ancient people included women holding their breath during ejaculation or jumping backward seven times after coitus (Potts & Campbell, 2009). Still, in ancient Egypt, Latin America, and the Islamic world, people used crocodile, mice, or elephant dung as contraceptive remedies, respectively (Potts & Campbell, 2009). Although it is rarely discussed, nonvaginal intercourse was practiced in Moche culture of Peru between 500 to 800 AD as a contraceptive measure (Potts & Campbell, 2009).

The Christian church has been using biblical references to argue and morally reject the use of contraceptive devices. According to Genesis 1:28, God created men and women in his image to be procreative and "blessed to be fruitful and multiply, fill the earth and subdue it" (Hollinger, 2013, p. 685). However, Hollinger (2013) argued that there is no direct teaching about contraception and the text is describing the procreative nature of the sexual intimacy between couples. The second biblical argument against contraception is referenced in Genesis 38: 8-10 where the story tells about "divine judgment for failing to carry out a procreative responsibility" (Hollinger, 2013, p. 686). According to Genesis 38: 8-10, Judah said to Onan, "Sleep with your brother's wife and fulfill your duty to her as a brother-in-law to raise up offspring for your brother" (Hollinger, 2013, p. 686). Knowing that the offspring would not be his, Onan went into his brother's wife and wasted his seed on the ground in order not to give offspring to his brother. Because of his wicked act in the Lord's sight, the Lord put him to death (Gen. 38:8–10).

However, this text has no direct and real bearing on contraception (Hollinger, 2013). The other argument is based on the guilt of association. Contraception has historically been associated with prostitution and abortion (Hollinger, 2013). Christians unknowingly assume that all contraceptives were abortive in nature (Hollinger, 2013). The argument is not compelling because contraception is not abortive and is not used primarily by prostitutes (Hollinger, 2013). The last argument is based on the nature of sex, that its only legitimate end is procreation (Hollinger, 2013). The Roman Catholic

church banned artificial contraception based on the nature of this argument rooted in the teachings of Augustine and Thomas Aquinas (Hollinger, 2013).

Similarly, coitus interruptus, one of the oldest forms of birth control, was mentioned in the Quran (Potts & Campbell, 2009). Coitus interruptus is allowed with a wife's consent (Hollinger, 2013). However, the Quran does not explicitly forbid birth control, and the verses are not related to birth control or family planning. They are referring to the killing of one's child due to the fear of poverty. Family planning is by no means equated to the killing of a child (Hollinger, 2013).

The most notable change about family planning began in the 19th century with the revival of Malthusian theory. According to Malthus, when the natural rate of human reproduction remains unchecked, it will lead to a geometric increase in population, doubling every 25 years while food production increases only in arithmetic progression (Hollinger, 2013). He argued that the gap between population and food production would continue to grow over time. As a result, Malthus proposed two general kinds of population checks: preventive or negative checks and positive or natural checks. Preventive checks are intended to reduce birth rates, and positive checks are assumed to increase the death rate. Malthus explicitly expressed the need for artificial means of birth control and suggested as an alternative that birth rate be decreased through preventive measures such as late marriage, moral restraint, and chastity. He contended that without such negative or preventive restraints, the world would face widespread hunger, poverty, and misery. However, Malthus' view has been widely criticized because the validity of geometric population growth and arithmetic growth in food production has been rarely

seen. Malthus exaggerated the role of positive checks and did not visualize the role of family planning and contraceptive use. Malthus was severely criticized for his failure to visualize that human beings would invent new birth control, contraceptives and other family planning devices. He failed to recognize the role of changing technology and societal socioeconomic transformation.

The contraceptive pill was first introduced by Margaret Sanger, a pioneer in the American family planning movement. She said, “No women can call herself free who does not control her own body” (Klima, 1998, p. 483). Although significant work has been done to improve maternal health status, still much work is needed to be done in contraception research. In the 1960s, the FDA approved oral contraceptive pills. Between 1976 and 1977, the pill was used by 80 to 100 million women around the world, enabling women to pursue higher levels of education and employment, attain economic independence, and enjoy sexual expression without having the risk of unintended pregnancy. In the late 1990s, pharmaceutical companies began to develop effective long-term reversible contraceptive such as new implants, medicated IUDs, vaginal rings, transdermal patches, and oral contraceptives. Current contraceptive innovations include the male contraceptive pill, injections, gels, and women’s contraceptive chips. Today, more research is needed to develop cost- effective, safe, easy, reversible, and women-controlled contraceptive methods that protect men and women from sexually transmitted diseases.

In the Ethiopian context, the first family planning program was established in 1966, with the formation of the Family Guidance Association of Ethiopia (FGAE), an

affiliate of the International Planned Parenthood Federation (IPPF). The purpose of the program was to provide information, counseling, and family planning services to families who want to space or limit their births (Yared, 2012). During the early phase of the program, government officials and religious and community leaders opposed the family planning program due to negative attitudes toward contraception and a pronatalist view of the government (Yared, 2012). In 1975, the association obtained legal recognition from the Ministry of the Interior and opened its first family planning program in Addis Ababa, the capital city of Ethiopia. In the early 1980s, family planning was integrated with a national maternal and child health (MCH) program under the umbrella of the Ethiopian Ministry of Health (Yared, 2012).

To reduce rapid population growth and its socioeconomic consequences, the government of Ethiopia adopted a national population policy in 1993. The objective of the policy was to expand family planning coverage and reduce total fertility rates in Ethiopia. The Ethiopian government created a favorable policy conditions for family planning community outreach programs and participation of nongovernment donor organizations (Yared, 2012). In addition to a national population policy, Ethiopia adopted a national health and women's policy to improve the quality and coverage of family planning services as well as empower and ensure women have access to family planning services (Yared, 2012).

In 2003, Ethiopia adopted a health extension program (HEP) to provide family planning services to the underserved and hard-to-reach rural populations of Ethiopia (Yared, 2012). Family planning was one of the 16 packages of the health extension

program. Between 2003 to 2010, over 30,000 health extension workers (HEWs) were trained in rural areas of Ethiopia. Since then, contraceptive prevalence rates have increased from less than 6% in 2000 to 36% in 2016 (Central Statistical Authority & ICF, 2016). While contraceptive prevalence rates have increased six-fold, total fertility rates have slightly declined from 5.5 children in 2000 to 4.6 children per woman in 2016, a decrease of only 16 % (CSA & ICF, 2016). Research shows that women may have barriers that prevent them from using contraception although they have a high desire to delay or limit their birth (Delbiso, 2014). In the following section, the determinants of contraceptive use will be discussed using the social-ecological model as the theoretical lens.

Literature Review of Key Concepts

Key concepts noted in the literature review concerning the social-ecological predictors of contraceptive use are centered around individual factors (age, marital status, education, and religion); interpersonal factors (husband's attitude and opposition); community factors (type of residence and wealth index); and societal factors (access to contraception and women's empowerment). At each level of the social-ecological framework, there are key factors that should be analyzed to better understand the predictors of contraceptive use. Family planning issues cannot be effectively addressed by focusing only on one factor. It is essential to look at the determinants of contraceptive use at multiple levels of influence using the social-ecological framework. Family planning or contraceptive use is cost effective and best practice to reduce unintended pregnancy, abortion and improve child and maternal health outcomes. The focus of this

literature review is to identify a gap in the literature on the predictors of contraceptive use among women age 15 to 49 years in Ethiopia.

Individual levels of influence. At the center of the social-ecological model is the individual's own behavioral determinants of contraceptive use. Individual factors may influence contraceptive uptake. These factors include knowledge, attitude, belief, and skills, the biological, demographic, and socioeconomic status of women. However, only age, marital status, education, and religion are included in the model. Below, the research findings and key concepts from earlier research findings that are relevant to this research study will be highlighted.

Age. Women's age is a key demographic determinant of contraceptive use. It is related to the biological, behavioral, social, and environmental factors affecting contraceptive use. Few studies have reported that contraceptive use increases with age, but others have found the opposite. For example, Malalu, Alfred, Too, and Chirchir (2014) conducted a cross-sectional descriptive study to explore the determinants of modern family planning methods in Kenya. According to their study, for every unit increase in age, there was a seven percent increase chance of using modern contraceptive method (Malalu et al., 2014). Similarly, Asiimwe, Ndugga, Mushomi, and Ntozi (2014) used the 2011 Uganda Demographic and Health Survey to explore whether the predictors of modern contraceptive use differ by age. The researchers found variations in the determinants of modern contraceptive use among young and older women (Asiimwe et al., 2014). They recommended the need for coordinated effort to address low contraceptive use associated with socioeconomic barriers among young and old women

(Asiimwe et al., 2014).

In Bangladesh, Hossain, Khan, Ababneh, and Shaw (2018) studied factors influencing contraceptive use using Bangladesh Demographic and Health Survey (BDHS) data. According to their study, women age 20 to 24 years had 27% higher chance of using contraception than teens age 15-19 years (AOR: 1.27, 95% CI: 1.10-1.47) and the chance of using contraception doubled for women age 25 to 29 years (AOR: 1.87, 95% CI: 1.62-2.16) and tripled for women age 30 to 34 and 35 to 39 years (AOR:3.37 and 3.23, 95% CI: 2.89-3.94 and 2.73-3.8) respectively (Hossain et al., 2018). Similarly, Haq, Sakib, and Talukder (2017) reported results consistent with the findings in Hossain et al. (2018) that women age 20 to 24 years are more likely to use contraception than women age 15 to 19 years in Bangladesh.

The finding of Haq et al. (2017) and Hossain et al. (2018) were similar to the study by Nonvignon and Novignon (2014), who found an association between young women's age and increased contraceptive use until age 35 to 39 years but start to decline after that. In a similar study conducted in Malawi, Palamuleni (2013) found the highest prevalence of contraceptive use among women aged between 20 to 39 years than those younger less than 20 and older women greater than 39 years old. In Ethiopia, Tekelab, Melka, and Wirtu (2015) found a similar pattern of high modern contraceptive use among women age 25 to 34 years than other age groups. This significant decrease in contraceptive use among older women is because older women are more reluctant to use contraception than their counterparts (Haq et al., 2017). Ideally, contraceptive use should be consistent among women of all reproductive age groups. However, most studies

reported an increase in contraceptive use between age 25 to 44 years (Haq et al., 2017). During this reproductive period, women are willing to use modern contraception to delay or avoid unwanted pregnancy.

In the United States, Pazol, Whiteman, Folger et al. (2015) used 2006-2010 National Survey of Family Growth (NSFG) to study age specific prevalence of contraceptive use. They employed a logistic regression model to assess the odds of contraceptive use. They found age specific differences or decrease in stable contraceptive use across age groups from 80% among teens age 15 to 19 years to 74% for women age 20 to 24 years, and 71% for older women age 25 to 44 years (Pazol et al., 2015). They also found an increase in non-use of contraceptive across age groups from 5 percent among teens age 15 to 19 years to 9 to 20 percent for older women. Sporadic use was least common among older women age 35 to 44 years (Pazol et al., 2015).

As of 2016, over 250 million teens aged 15 to 19 years live in developing countries (Darroch et al., 2016). Adolescent women account for about 16% of all women of the reproductive age group 15 to 49 (Darroch et al., 2016). There are more teens in Africa than any other regions due to the fast-growing young population. It is estimated that more than 38 million sexually active teens age 15 to 19 want to delay pregnancy in the next two years (Darroch et al., 2016). Of those, only 15 million teens were using a modern contraceptive, the remaining 23 million had an unmet need for a modern contraceptive method and were at high risk for unintended pregnancy (Darroch et al., 2016). Meeting the contraceptive needs of teens age 15 to 19 would reduce unintended pregnancy by 6 million annually (Darroch et al., 2016).

Adolescence is a critical phase of transition from child to adulthood, the time of opportunities and risks (Darroch et al., 2016). During this age, sexually active young girls marry, become pregnant and have a child without having adequate family planning information and services needed to delay their pregnancy (Darroch et al., 2016). In addition, they have low educational attainment and lack the autonomy to delay early marriage and childbearing responsibilities (Darroch et al., 2016).

The study of contraceptive use by age group is important for public health planner to better tailor family planning program intervention to improve contraceptive use among women of reproductive age group. There is a growing body of evidence that shows the need to pay attention to the psychological and socioeconomic needs of young women age 15 to 19 in order to increase contraceptive prevalence (Darroch et al., 2016). The current study will provide additional information about the association between women's age and contraceptive use in Ethiopia. New knowledge discovered from this study could provide insights for family planning researchers and planners to tailor interventions that increase contraceptive use among high risk girls and mothers. However, data is not available for teens less than 15 years of age because Demographic and Health Surveys have a lower age boundary of 15 years (Darroch et al., 2016).

Marital status. Marital status is another important determinant of contraceptive use. A study conducted in Kenya shows that the likelihood of contraceptive use among married women was three times more than single women (Malalu et al., 2014). On the contrary, Andi, Wamala, Ocaya, and Kabagenyi (2014) found low modern contraceptive use among married women compared to single or never married women in Uganda ($p <$

0.01). Researchers argue that married women in Uganda depend on husband approval for modern contraceptive use (Andi et al., 2014).

On the other hand, unmarried women do not seek approval from any one concerning contraceptive use, as a result, they are more likely to use contraception. For example, Marrone, Abdul-Rahman, De Coninck, and Johansson (2014) studied the predictors of contraceptive use among female adolescents in Ghana using the 2008 Ghana Demographic and Health Survey (GDHS). They found a fourfold increased likelihood of using contraceptives among unmarried adolescent compared to their married peers. They suggested that government and partners should provide youth friendly contraceptive services (Marrone et al., 2014). A husband's non-approval was cited as a major reason for poor contraceptive use in developing countries (Andi et al., 2014). Haq et al. (2017) found the age of the first marriage as the predictor of contraceptive use in Bangladesh. In their study, they found no progress in child marriage between 2004 and 2014 in Bangladesh. Researchers suggested that policymakers should take the initiative to reduce child marriage and increase the rate of contraceptive use among married women in Bangladesh (Haq et al., 2017).

The role of marital status in contraceptive use has not been adequately studied in Ethiopia. The current study will provide new insights into the association between marital status and contraceptive use in Ethiopia. The study shows that both married and unmarried girls and women have an unmet need for contraceptive use (Askew & Brady, 2012). Knowledge discovered from this study will provide insights for family planning researchers and planners to tailor interventions that increase contraceptive use in

Ethiopia.

Religion. The impact of religion on contraceptive use is poorly understood in Sub Saharan Africa including Ethiopia. For example, Osuafor, and Mturi (2013) examined the effect of religion on contraceptive use among currently married women in Nigeria. Researchers used four Nigerian Demographic and Health Survey data. After controlling for other variables, researchers found an association between religion and contraceptive use (Osuafor & Mturi, 2013). According to their study, Christians, in general, are more likely to use contraception than their Muslim counterparts (Osuafor & Mturi, 2013).

The association between religion and contraceptive use has been an area of debate among researchers and policymakers (Agadjanian, 2013). Some researchers argue that Catholic churches teach against contraceptives use. But Agadjanian (2013) found a high prevalence of modern contraceptive use among Catholic and, to a lesser extent, traditional Protestants in Mozambique. He also found a positive association between religious involvement or frequent church attendance and modern contraceptive use (Agadjanian, 2013). The study also shows that liberal Protestant do not forbid contraception use within a marriage because the decision of contraceptive use is a couple's business matter.

Walelign, Mekonen, Netsere, and Tarekegn (2014) conducted a community based comparative cross-sectional study among Orthodox Christian and Muslim women of reproductive age in Bahir Dar City of North West Ethiopia. The sample consists of 504 participants from both groups and 232 (91.7%) orthodox women and 144 (57.1%) Muslim women who have ever used a form of modern contraceptive method in their

lifetime (Walelign et al., 2014). They found that current modern contraceptive use was highest among orthodox women (63.9%) compared to Muslim women (36.1%). They also found significant differences in modern contraceptive use between religious and less religious women (Walelign et al., 2014). According to their study, less religious Orthodox Christian women were 5.56 times more likely to use modern contraceptive (AOR: 5.56, 95% CI: 1.4-21.3) than religious Orthodox Christian women (Walelign et al., 2014). Similarly, less religious Muslim women were 5 times more likely to use modern contraceptives (AOR: 5, 95% CI: 1.9-14.8) than their counterparts (Walelign et al., 2014). Similarly, Haq et al. (2017) found comparable patterns of contraceptive use in Bangladesh. According to Haq et al. (2017), Muslim women have lower odds of using contraception than non-Muslim women. This indicates that Muslim women have less favorable attitudes toward contraception and family planning than non-Muslim women.

Similarly, Muslim women are more likely to have a lower contraceptive use approval rate than non-Muslim women (Haq et al., 2017). Women's religious beliefs may influence contraceptive use because children are a gift from God and believe that using contraception is against God. The study of religion as a predictor of contraceptive use is essential for tailoring family planning programs to improve contraceptive use among women with diverse religious backgrounds. The current study could potentially add new insights to the field of family planning research concerning the influence of religion on contraceptive use in Ethiopia.

Education. The association between education and contraceptive use has been well established. Education improves women's contraceptive knowledge and use in

Ethiopia (Tiruneh et al., 2016). Previous studies have consistently reported the association between education and contraceptive use in selected SSA countries such as Ghana, Kenya, Madagascar, Zambia, and Ethiopia (Larsson and Stanfors, 2014; Tilahun et al., 2013; Tiruneh et al., 2016). Gordon, Sabates, Bond, and Wubshet (2011) examined the association between education and contraceptive use using a sample of 1,200 sexually active women in Ethiopia. They used structural modelling equation to demonstrate the effect of education on contraceptive use mediated by attitude, knowledge, and access to contraceptive methods. They concluded that educated women were more likely to have favorable attitudes toward family planning, have greater knowledge of contraceptive use, and are more likely to visit health clinics, as a result, were more likely to use modern contraceptives (Gordon et al., 2011). They found significant differences in modern contraceptive use between women who attended school (80%) and those who did not (56%), but no increment of contraceptive use was found with increasing levels of education (Gordon et al., 2011). Similarly, Tilahun et al. (2013) conducted a mixed research study using 854 married women in Jimma Zone of Ethiopia. The study found a strong association between education and knowledge of contraceptive methods among women (OR =2.77) and men (OR =1.49; $p<0.01$).

Kenya, Kimani, Njeru, and Ndirangu (2013) reported results consistent with findings reported in Ethiopia (Gordon et al., 2011; Tilahun et al., 2013) and in Angola (Weidert, Prata, Bell et al., 2016). They reported higher contraceptive use among women with secondary and above education compared to those with no or primary education only (Kimani et al., 2013). In bivariate and multivariate analyses, Larsson and Stanfors

(2014) examined the determinants of contraceptive use among married women aged 15 to 49 in selected Sub Saharan African countries such as Ghana, Kenya, Madagascar, and Zambia. They found an association between education and increased contraceptive use, yet the impact of woman's education varies according to context, region, culture, and level of development (Larsson & Stanfors, 2014). Emina, Chirwa, and Kandala (2014) reported results consistent with findings in Larsson and Stanfors (2014), Gordon et al. (2011), and Tilahun et al. (2013) studies.

Several studies confirm that educated women are more likely to use contraceptives than uneducated women in Bangladesh, India, Nigeria, Ethiopia (Haq et al., 2017; Islam, 2017; Johnson, 2017; Tekelab et al., 2015) respectively. This relationship is because educated women have a greater opportunity for better access to family planning services and information (Haq et al., 2017). In addition, educated women are open to new ideas and new methods of contraception. Moreover, educated women are empowered, exercise their reproductive health rights, and they are more likely to engage in professional and employment activities (Tekleab et al., 2015). They are more likely to use contraceptives to limit their desired number of children (Haq et al., 2017).

However, after adjusting for selected covariates, Islam (2017) found no significant difference in modern contraceptive use in Bangladesh by level of education. Islam (2017) emphasized the role of government in addressing the barriers of contraceptive use and improving education, employment, and socioeconomic status of women to increase contraceptive prevalence rates and ultimately reduce high fertility rates (Islam, 2017). Interventions designed to improve women's education are also

associated with women's empowerment, economic independence, and increased contraceptive use. Findings from the analysis of women's education and contraceptive use could be a contribution to an existing research and overcome some of the limitations of previous studies.

Interpersonal Levels of Influence: Interpersonal levels of influence may include woman's closest social circles such as husband, families, friends, and healthcare providers. A husband or partner's attitude and opposition may influence contraceptive use in Ethiopia. In the following section, the current research findings and gaps in the literature on partner's attitude, opposition, and contraceptive use will be explored.

Partner's Attitude. In a male dominated culture such as Ethiopia, contraceptive use is low (Tilahun et al., 2013). First, most interventions are targeting only women. Second, contraceptive use is considered a women's business. On the other hand, women have no or little control over their reproductive health in a male dominated society. Men are the primary decision makers of women's reproductive health including contraceptive use (Mboane & Bhatta, 2015). Studies suggest that a husband's attitude may play a significant role in woman's contraceptive use (Blackstone & Iwelunmor, 2017). Bietsch (2015) studied male attitudes towards family planning in Sub-Saharan Africa. She found significant variations in male's attitudes towards contraception by demographic characteristics and other external influences that may shape these attitudes (Bietsch, 2015).

A study in South Africa examined male University students' attitudes towards contraception and family planning (Raselekoane, Morwe, & Tsitangano, 2016). In this

quantitative study, 60 male university students participated. According to the study, many students had negative attitudes towards contraception and family planning (Raselekoane et al., 2016). Student's negative attitudes towards contraception was because contraceptive methods are unreliable, causes cancer, decreases sexual pleasure, increases promiscuity, and has no significant effect (Raselekoane et al., 2016).

On the contrary, Tilahun et al. (2013) found a negative association between increased men's attitudes towards contraception (93%) and men's ever use of contraception (0.2%). Such contradictory findings between men's attitudes towards contraception and low contraception use can be challenging for family planning programs planners. Similarly, Blackstone and Iwelunmor (2017) studied the determinants of contraceptive use among couples using 2013 Nigerian Demographic and Health Survey. According to this study, women were less likely to use contraception when men viewed contraceptives as an enabler for promiscuity (Blackstone & Iwelunmor, 2017). But their study found no association between men's perception of contraception as a woman's business and modern contraceptive use over no method (Blackstone & Iwelunmor, 2017). Their study highlighted the need for male partner's involvement in women's contraceptive decision making because excluding the participation of almost half of the population in reproductive and maternal health has significant implications.

Recently, researchers used the Health Belief Model (HBM) to predict the psychosocial influence that affects men's attitudes towards Vasalgel, a male long acting reversible contraceptive (King, Kaighobadi, & Winecoff, 2016). According to their study, the HBM predicted men's attitudes and intent to use Vasalgel, a long active reversible

contraceptive method (LARC). The model significantly improved the social norms and interpersonal factors for intent to use LARC but not attitudes (King et al., 2016). Addressing such barriers is important for implementing a successful and participatory family planning program in Ethiopia. The current research will provide new information about the association between a partner's attitudes and contraceptive use.

Partner's Opposition. Women in developing countries face multiple socioeconomic and demographic barriers to contraceptive use. One of them is the partner's opposition. Studies suggest that men have a major influence on women's decisions to use contraception (Mboane & Bhatta, 2015). Spousal support or disapproval affects contraceptive use. Evidence shows that women whose partners disapprove contraception are less likely to use modern contraceptive than women whose partners approve contraception (Ezeanolue et al., 2015). The husband and wife's desire for number of children and fertility preference is the major source of opposition to contraceptive use. When couples disagree on fertility related matters, contraceptive use will be lower (Tumlinson et al., 2013). Research suggests that couples perceived and actual agreement on fertility intentions have a significant effect on contraceptive use and fertility (Tumlinson et al., 2013). For example, Kiene, Hopwood, Lule, and Wanyenze (2013) used the Theory of Planned Behavior (TPB) to test the application of the model to predict contraceptive use in Uganda. Contraceptive use is highest among women who have discussions and supportive partners than their counterparts (Kiene et al., 2013).

Male involvement in family planning decision making is important to improve contraceptive use (Adelekan, Omoregie, & Edon, 2014). Men's approval of contraception

requires method knowledge, partner's communication, and mutual understanding (Adelekan et al., 2014). They found that more than 56% male approval for contraception and 46% would allow contraceptive use. This approval rate is lower than what was reported in Ethiopia (Tilahun et al., 2013; Berhane, Amberbir, Biadgilign, & Morankar, 2011). Similarly, 56% of Ethiopian men reported no family planning related discussions with their wives and believed that it is a natural process (Vouking, Evina, & Tadenfok, 2014). The remaining 44 % believed that family planning related discussions should always be initiated in the family. Similarly, Ethiopian men who reported joint decisions with their wife were 78% compared to 21% who believed family planning decisions should be done by wives alone. Another 12 % reported that the involvement of family members, relatives, and significant others in the family planning decision making process should occur (Vouking et al., 2014).

Partners' approval or communication between partners about family planning use is associated with modern contraceptive use. Similar findings were reported in Kenya (Irani, Speizer, & Fotso, 2014), Uganda (Kabagenyi, Jennings, Reid, et al., 2014) and Angola (Prata, Bell, Fraser, et al., 2017). However, these studies were limited to cross-sectional data, and the researchers were unable to establish a temporal and causal relationship between partner's communication and contraceptive use (Irani et al., 2014). Researchers recommended interpersonal communication training and counseling on family planning related issues to improve contraceptive use among women of reproductive age group.

Community Levels of Influence: Community levels of influence include

residence, where social relationships occur and wealth index, an aggregate economic opportunity of the community. Residence and wealth index may influence contraceptive use. In the subsequent section, the current state of knowledge and gap in literature will be discussed.

Place of Residence. Place of residence is an important determinant of contraceptive use. Paul, Ayo, and Ayiga (2015) used data from the 2011 Ugandan Demographic and Health Surveys to determine whether the place of residence is a major determinant of contraceptive use. According to their study, 39.3 and 56.7% of urban and rural women are not using contraception respectively (Paul et al., 2015). The proportion of contraceptive use is higher in urban Uganda compared to Rural areas. Similarly, Ferede (2013) used multilevel modeling of modern contraceptive use among rural and urban populations of Ethiopia. According to Ferede (2013), women living in more urbanized regions of Ethiopia (such as Addis Ababa, Dire Dawa, and Harari) are more likely to use modern contraceptives than women living in more rural areas. This finding is consistent with Islam's (2017) study which found less contraceptive use among women in rural India than women in urban India.

Similar studies reported regional variations in contraceptive use in Kenya (Kimani, Njeru, & Ndirangu, 2013). These studies were consistent with the previous reports that show higher levels of modern contraceptive use in Central province than the Coast and Nyanza Provinces of Kenya (Kimani et al., 2013). This regional variation was attributed to a higher socioeconomic status of women in the Central province compared to women in the other two provinces (Kimani et al., 2013). In addition, in the Central

province, there were few cases of women without education, low percentage of women in the poorest wealth category, and women tend to be less culturally conservative than the other two provinces. As a result, the Central province has the most favorable environment for the use of contraception (Kimani et al., 2013). However, their unexpected result shows that urban residence was not associated with higher contraceptive prevalence (Kimani et al., 2013). The rate of contraceptive use was higher in urban Coast Province and national level than rural area but not the case in Central and Nyanza provinces. The researchers found no statistically significant association, suggesting that urban areas are not necessarily a conducive environment for high contraception use (Kimani et al., 2013).

Their findings were inconsistent with previous studies, suggesting the need for further research to understand the factors for poor contraceptive acceptance rate in the two study areas in Kenya (Kimani, et al., 2013). In another study, Haq et al. (2017) reported results consistent with findings in Paul et al. (2015) and Ferede's (2013) studies. This is because women in urban areas have better access to contraception than women in rural areas. Moreover, urban women are more likely to accept any method of contraceptive than rural women (Haq et al., 2017). Family planning programs designed to improve contraceptive use should tailor to the local rural-urban environment (Winston, Calhoun, Corroon, et al., 2018). The current research will identify the prevalence of contraceptive use by place of residence. Evidence discovered from this study will help family planning researchers and planners to tailor targeted family planning interventions to meet the needs of the most vulnerable women and girls living in slum urban and remote rural communities in Ethiopia.

Wealth index. Unequal wealth distribution is a major problem in Sub Saharan Africa (Adebowale, Adedini, Ibisomi, & Palamuleni, 2014)**.** In Malawi**,** the authors examined the gap in modern contraceptive use among women in the richest and poorest wealth quintile. This cross-sectional study design used 2010 Malawi Demographic and Health Surveys. The study found a high prevalence of ever use of modern contraceptive among women in the richest wealth quintile (82.4%) compared to the poorest (66.8%) after controlling the effect of religion, education, and place of residence. This suggests that the total fertility rate among the poorest wealth quantile is higher than the richest (Adebowale et al., 2014). However, their study was limited to extreme wealth index than across a range of wealth index categories. A similar pattern was seen for current use of modern contraceptive among the richest and the poorest wealth quintile in other studies conducted in Ethiopia (Tiruneh et al., 2016) and Guatemala (Grace, 2010).

In a multilevel analysis, Dias and de Oliveira (2015) found a positive association between modern contraceptive use and women's socioeconomic position in the community and average community wealth in Mozambique. In similar studies, Yigzaw et al. (2015) used the 2011 Ethiopian Demographic and Health Survey to examine wealth related differences in family planning use between poor and rich Ethiopian women. According to their study, the difference in contraceptive prevalence between the poorest and the richest women in Ethiopia was over 25.3 percentage points (95 % CI = 18.9-31.7), and contraceptive use was more than twice among the richest women (RII: 2.6, 95 % CI = 2.0 - 3.3) compared to the poorest women in Ethiopia (Yigzaw et al., 2015). In Bangladesh, Haq et al. (2017) found an association between higher wealth quantile and

contraceptive use in one survey period (2004) and found no association in the other two survey periods (1994 and 2014). These differences are attributed to changes in the socioeconomic status of women.

In contrast, Islam (2017) found high contraceptive use among women with low wealth index than women with high wealth index in Bangladesh. This finding is attributed to greater awareness created by government and non-government organizations among women with the lowest wealth index category (Islam, 2017). However, Islam (2017) found low contraceptive use among women with low wealth index in India than women with high wealth index (Islam, 2017). Wealth index can positively or negatively influence women's socioeconomic status including access to family planning services and education. Improving women's socioeconomic status and investing in the education of the poor is an urgent public health need. Governments should reduce wealth inequalities to improve access and use of contraception method among with lowest wealth index. The current study will add new insights to the field of family planning research and help researchers and program planner to tailor family planning services to meet the needs of economically vulnerable women and girls in Ethiopia.

Societal Levels of Influence: Societal levels of influence are the broader societal factors that may influence contraceptive use. Social norms such as women empowerment and physical access to contraceptive methods may influence contraceptive use.

Access to Contraception. Contraceptive access is defined as easy accessibility, availability, and affordability of multiple methods to couples both in geographic proximity and at low cost (Ross & Hardee, 2013; Yared, 2012). Due to the paucity of

data, previous researchers have used two variables as a proxy of contraceptive access: home visit by health extension workers, community, or other health workers and obtaining family planning information and counseling from health workers during any visit to a health facility (Yared, 2012).

Physical access to contraceptive service delivery points (SDP's) may or may not have a significant effect on contraceptive use. Several studies in developing countries reported an association between easy access to contraception and greater contraceptive use (Ross & Hardee, 2013). Achana, Bawah, Jackson, et al. (2015) examined the effect of spatial proximity to service delivery points compared to the effects of social determinants of contraceptive use in Ghana. Data was collected from 1,769 households across seven districts. Participants were women aged 15 to 49 years old. They used a multivariate logistic regression model to estimate the effect of distance to health facility on contraceptive use after controlling for the effect of education, age, marital status, and other factors (Achana et al., 2015). Results show that women who live 2 or more kilometers away from the nearest Community based Health Planning and Services (CHPS) were less likely to use contraceptive method compared to those who live within 2 kilometers of the facility (Achana et al., 2015).

In similar studies, Shiferaw et al. (2017) carried out a study to determine the influence of contraceptive method availability and distance to the nearby facilities on modern contraceptive use among married women in rural areas in Ethiopia using geo-referenced data. They used data from the first round of surveys of the Performance Monitoring & Accountability 2020 project in Ethiopia (Shiferaw et al., 2017). They

analyzed 1,763 married women age 15 to 49 years and 198 private and public service delivery points. Bivariate analysis was used to determine the influence of distance from the SDP on contraceptive use. Results of the study revealed that the percentage of modern contraceptive use among rural married women decreased from 41.2% to 22.6% as the distance from the service delivery posts increased from less than 2 kilometers to more than 6 kilometers (p-value<0.01). Women who live close to health facilities that offer a wide range of contraceptive options were more likely to use modern contraceptive than women who live farther from health delivery posts with limited options (Shiferaw et al., 2017). Their findings support earlier research that examined the relationship between spatial proximity to health delivery points and modern contraceptive use in Ghana.

However, Achana et al. (2015) also found a non-lineal relationship between spatial proximity to the nearest health facility and contraceptive use suggesting that women do not necessarily have their contraceptives services at the nearest facility. Similarly, Skiles et al. (2015) used kernel density estimation to examine the effect of service environment (distance only and distance and supply reliability) on injectable contraceptive demand and use in Malawi. Their study found that rural women with most access in both measures (distance and supply reliability) had over a 7% higher chance of using injectable contraceptives than women with less access (Skiles et al., 2015). In Urban areas, women with a reliable supply of contraceptives were 18.3% higher for birth spacing than women with least distance and supply access (Skiles et al., 2015). In rural areas, physical proximity and product availability are important determinants of contraceptive use.

In a longitudinal survey study, Digitales, Psaki, Soler-Hampejsek, and Mensch (2017) explored the correlates of contraceptive use and health facility choice among young women in Malawi. The Malawi Schooling and Adolescents Longitudinal Study (MSAS) followed 1,337 females aged 14 to 17 years from 2007 to 2013. The researchers found out that the presence and characteristics of nearby facilities and availability of contraceptive methods did not appear to affect contraceptive use (Digitales et al., 2017). They argue that type of facility (private, government or non-government) and whether the contraceptive method was provided free of charge appears to determine a women's decision to obtain and use contraceptive methods (Digitales et al., 2017). The current research study will identify access related factors influencing contraceptive use and suggest interventions seeking to reduce gaps and inequalities in access to family planning services in Ethiopia.

Women Empowerment. Ethiopian women play a principal role in child bearing and management of family affairs (Yared, 2012). Women make up almost half of the Ethiopian population; however, their socioeconomic and political participation is low. Women are underrepresented in educational, leadership, managerial positions, and other public sectors (Ademe & Singh, 2015). Stereotype, lack of affirmative action, poor support system, and patriarchy are factors responsible for women's low participation in the public sector (Ademe & Singh, 2015). This results in poor reproductive health outcome of women in Ethiopia (Ademe & Singh, 2015; Yared, 2012). Women are the drivers of economic growth and poverty alleviation. Excluding women's participation in the public sector have deleterious effect on societal development (Onarheim, Iversen, &

Bloom, 2016).

However, the association between women's empowerment and contraceptive use has not been adequately explored in Ethiopia. Using the 2008 Nigerian Demographic and Health Surveys (NDHS), Solanke, Ogunjuyigbe, and Shobanke (2015) examined the association between women's empowerment and contraceptive use. They used a chi-square and binary logistic regression model. Results of their study revealed that empowered women were more likely to use contraceptives than unempowered women (Solanke et al., 2015). For example, compared to women who had no control over their own healthcare and women who did not participate in household daily purchases, women who had full control over their own healthcare and those who had full participation in the household daily purchases were 68% and 148 % more likely to use contraceptives (OR = 1.6824, $p<0.01$ and OR = 2.74875, $p<0.01$) respectively.

Ameyaw, Appiah, Agbesi, and Kannor (2017) used the 2014 Ghana Demographic and Health Survey (GDHS) to examine the relationship between contraceptive use and women's empowerment. They used the Planned Behavioral Theory (PBT), bivariate, multivariate analyses. In bivariate analysis, they found an association between women's empowerment and contraceptive use. Their bivariate analysis revealed that women who were not deciding alone on their own healthcare, on large household purchase, and visiting family members were less likely to use contraceptives (OR = 0.92, CI = 0.80 - 1.07; OR = 0.96, CI = 0.82 - 1.11; OR = 0.63, CI = 0.93 - 1.25) respectively. However, at the multivariate level of analysis, women who were not deciding alone on health (OR = 1.26, CI = 1.18 - 1.68), large household purchases (OR = 1.30, CI = 1.08 - 1.55) and

visiting family members (OR = 1.32, CI = 1.12 - 1.57) were more likely to use contraceptives than their counterparts (Ameyaw et al., 2017).

Ameyaw et al. (2017) reported results consistent with previous studies conducted in Sub-Saharan African countries (Kibira, Ndugga, Nansubuga et al., 2014; Do & Kurimoto, 2012). Previous studies found a positive association between women's empowerment and contraceptive use. Sexually and economically empowered women were more likely to use contraception than less empowered women (Kibira et al., 2014). The odds of using contraception among empowered women were twice compared to women who had no power over reproductive health and knew less about their reproductive and sexual rights (Kibira et al., 2014). They suggested the need for improving women's reproductive health rights to increase contraceptive use in Uganda (Kibira et al., 2014). However, women's reproductive rights have not been addressed in this study because DHS did not collect data on women's reproductive rights. It is important to address barriers of women empowerment in order to implement successful family planning program in Ethiopia.

Conclusion

The historical development of contraceptive methods goes back to the ancient Egyptian, Greeks, Roman, Latin American, and Islamic civilizations (Potts & Campbell, 2009). Historically, human beings have tried many birth control methods to prevent pregnancy such as spermicidal agents, birth control suppositories, breath hold during ejaculation, and wiping the sperm, and coitus interruptus (Potts & Campbell, 2009). Those methods are ineffective ways of controlling human fertility. Exploring the

historical development of contraception is important to better understand the predictors of contraceptive use in Ethiopia.

The Christian church has been using biblical references to morally reject the use of contraceptive devices. Historically, contraceptive use has been associated with prostitution and abortion. However, Hollinger (2013) argues that there is no direct biblical teaching about contraception, and no compelling evidence that supports contraception is abortive and for prostitution (Hollinger, 2013). Similarly, Hollinger (2013) argues that the Quran does not forbid birth control. The need for artificial means of birth control began in the 19th century with Malthusian theory and Margaret Sanger's family planning movement. In the Ethiopian context, the first family planning program was established in 1966 with the formation of Family Guidance Association of Ethiopia (FGAE). During the early phase of the program, government officials, religious and community leaders opposed family planning program due to a negative attitude toward contraception and pronatalist view of the government (Yared, 2012). In 1993, Ethiopia adopted a national population policy to expand family planning coverage and reduce total fertility rates. Since then, the contraceptive prevalence rate has increased from less than 6% in 2000 to 36% in 2016 (CSA & ICF, 2016). However, the total fertility rate has slightly decreased from 5.5 children in 2000 to 4.6 children per women in 2016 (CSA & ICF, 2016). While contraceptive use increased by 30 percent, fertility rates decreased only by 16% (CSA & ICF, 2016). Research shows that women may have barriers that prevent them from using contraception although they have a high desire to delay their birth (Delbiso, 2014). Using the social-ecological model, this study will explore the

predictors of contraceptive use at the individual, interpersonal, community, and societal levels of influence.

At the individual level of influence, women's age, marital status, religion, and education are important determinants of contraceptive use. Few studies have reported that contraceptive use increases with age, while others have found the opposite. In a cross-sectional study conducted in Kenya, Malalu et al. (2014) found that for every unit increase in age, there was a 7% increase in chance of using modern contraceptive methods (Malalu et al., 2014). Ideally, contraceptive use should be consistent among women of all reproductive age groups. However, researchers found low contraceptive use among young and older women (Asiimwe et al., 2014). Older women are more reluctant to use contraception than their counterparts (Haq et al., 2017). Marital status is another determinant of contraceptive use. According to Malalu et al. (2014), the likelihood of contraceptive use among married women was three times more than single women (Malalu et al., 2014). On the contrary, Andi et al. (2014) found low modern contraceptive use among married women compared to single or never married women in Uganda ($p < 0.01$). Researchers argue that married women depend on their husband's approval for modern contraceptive use and unmarried women do not seek approval from any one concerning contraceptive use, as a result, they are more likely to use contraception (Andi et al., 2014).

The impact of religion on contraceptive use is poorly understood in Ethiopia. Researchers found an association between religion and contraceptive use and Christians are more likely to use contraception than Muslims in Nigeria and Ethiopia (Osuafor &

Mturi, 2013; Walelign et al., 2014). Less religious Orthodox and Muslim women are more likely to use contraceptive methods than more religious (Walelign et al., 2014). There are variations in contraceptive use among Christian denominations. Researchers argue that Catholic churches teach against contraceptive use. But Agadjanian (2013) found a high prevalence of modern contraceptive use among Catholic and, to a lesser extent, traditional Protestants in Mozambique.

Finally, education is another important predictor of contraceptive use. Educated women were more likely to have favorable attitudes towards family planning, have greater knowledge of contraceptive use, and are more likely to visit health clinics, as a result, were more likely to use modern contraceptives than uneducated women (Gordon et al., 2011). Similar findings were reported in Kenya and Angola (Kimani et al., 2013; Weidert et al., 2016). However, the impact of woman's education varies according to context, region, culture, and level of development (Larsson & Stanfors, 2014). Addressing predictors of contraceptive use at the individual level is important to tailoring a family planning program in Ethiopia.

At the interpersonal level of influence, partner's attitude and opposition are important predictors of contraceptive use. In a male dominated culture, women have less control over their health including contraceptive use (Tilahun et al., 2013). Men are the primary decision makers regarding women's reproductive health including contraceptive use (Mboane & Bhatta, 2015). Negative attitudes towards contraception was based on the belief that contraceptive methods are unreliable, cause cancer, decrease sexual pleasure, increase promiscuity, and have no significant effect (Raselekoane et al., 2016).

Blackstone and Iwelunmor (2017) found no association between men's perception of contraception as a woman's business and modern contraceptive use over no method (Blackstone & Iwelunmor, 2017). Moreover, spousal approval or disapproval affects contraceptive use. Women whose partners disapprove contraception are less likely to use modern contraceptive than women whose partners approve contraception (Ezeanolue et al., 2015; Kiene et al., 2013). Increased modern contraceptive use was reported with the partner's approval in Ethiopia (Tilahun et al., 2013), Kenya (Irani et al., 2014), Uganda (Kabagenyi et al., 2014), and Angola (Prata et al., 2017). Interpersonal communication training and counseling on family planning related issues are important measures to improve contraceptive use among women of reproductive age group.

At the community level of influence, place of residence and wealth index are significant predictors of contraceptive use. The proportion of contraceptive use was higher in urban areas than rural areas in Ethiopia, Uganda, and India (Ferede, 2013; Paul et al., 2015; & Islam, 2017). However, the inconsistent finding was reported in Kenya (Kimani et al., 2013). They found no statistically significant association, suggesting that urban areas are not necessarily a conducive environment for high contraception use (Kimani et al., 2013). They suggested a need for further research to understand the factors for poor contraceptive acceptance rates in the two urban areas in Kenya (Kimani et al., 2013). Findings of the study will provide useful information to implement family planning interventions relevant to the local context and community in Ethiopia. Wealth index is another major determinant of contraceptive use. Researchers reported a high prevalence of modern contraceptive use among women in the richest wealth quintile

compared to the poorest after controlling the effect of religion, education, and place of residence (Adebowale et al., 2014). Similar findings were reported in Ethiopia Guatemala, and Mozambique (Tiruneh et al., 2016; Grace, 2010; & Dias and de Oliveira, 2015). However, inconsistent findings were reported in Bangladesh (Islam, 2017). Islam (2017) found high contraceptive use among women with low wealth index than women with high wealth index, attributed to greater awareness created by government and non-government organizations among women with lowest wealth index category (Islam, 2017). Improving women's socioeconomic status and investing in the education of the poor is an urgent public health need to improve contraceptive use.

At the societal levels of influence, access to contraception and women's empowerment are important predictors of contraceptive use. Physical access to contraceptive service delivery points (SDP's) may or may not have a significant effect on contraceptive use. Some researchers found positive associations between easy access to contraception and a greater chance of contraceptive use (Ross & Hardee, 2013). However, Achana et al. (2015) found a non-linear relationship between spatial proximity to the nearest health facility and contraceptive use in Ghana, suggesting that women do not necessarily have their contraceptives services at the nearest facility. Similar findings were reported in Malawi (Skiles et al., 2015). They found high injectable contraceptive use among rural women with most access in both measures (distance and supply reliability) than women with less access (Skiles et al., 2015). Similarly, findings were reported in Malawi (Digitales et al., 2017). The presence and characteristics of nearby

facilities and availability of contraceptive methods did not appear to affect contraceptive use (Digitales et al., 2017).

The current study will fill the gap and inconsistencies reported in previous studies. Women's empowerment is an important determinant of contraceptive use. Research shows that empowered women were more likely to use contraceptives than unempowered women in Nigeria (Solanke et al., 2015). Comparable results were reported in Ghana and Uganda (Ameyaw et al., 2017, Kibira et al., 2014). However, women's reproductive rights have not been addressed in this study because DHS did not collect data on women's reproductive rights. In addition, the DHS collected limited data on women's psychological, social, and cultural factors influencing contraceptive use. This makes it difficult to explore a full array of factors influencing contraceptive use. However, this study will capture selected individual, interpersonal, community, and societal factors influencing contraceptive use from a social-ecological perspective. Addressing those barriers are important for implementing successful family planning programs.

Definition of Key Terms

Contraception: Any method used to delay or prevent pregnancy is contraception. There are two types of contraception: traditional and modern. Hubacher and Trussell (2015) defined modern contraceptive methods as "product or medical procedure that interferes with reproduction from the acts of sexual intercourse" (Hubacher & Trussell, 2017, p.220). Modern contraceptive methods can be either temporary or permanent methods. Temporary methods include condoms, hormonal contraceptives, Intra uterine

contraceptive device (IUD), and implants. Permanent methods of contraception include surgery (tubal ligation for women and vasectomy for men). Traditional methods include withdrawal, breast–feeding and the rhythm method. The concept of contraception has been improperly categorized as modern and traditional methods. Hubacher and Trussell (2015) stated that modern methods should not be equated with higher efficacy. Hubacher and Trussell (2015) clearly defined modern methods of contraception and methods that do not fit under the definition of modern should be categorized as non-modern methods. According to Hubacher and Trussell (2015), modern methods of contraception include male and female sterilization, intrauterine devices and systems, subdermal implants, oral contraceptives, male and female condoms, injectable, emergency contraceptive pills, patches, diaphragms and cervical caps, spermicidal agents (gels, foams, creams, suppositories, etc.), vaginal rings, and sponge (Hubacher & Trussell, 2015). Non-modern contraceptive methods include fertility awareness approaches, withdrawal, lactational amenorrhea, and abstinence (Hubacher and Trussell, 2015).

Ever use of contraceptive method: DHS survey defines ever use of contraceptive method as the number of women who use any method (CSA & ICF, 2016).

Contraceptive Prevalence Rate (CPR): DHS survey defines CPR as the percentage of married women who currently use any method of contraception. This includes all women ages 15 to 49 years both currently married or women living in a consensual union and unmarried sexually active women (single, divorced, widowed, and separated) and who had sexual intercourse within the last 30 days (CSA & ICF, 2016).

Age: As an important determinant of contraceptive use, age is measured by categorizing into 5-year groups: 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49 years old (DHS, 2015). It helps family planning program planners better tailor interventions to improve modern contraceptive use (Prata, Bell, Weidert et al., 2016).

Marital status: DHS defined marital status of individuals as ever in union, married, living with partner, widow, divorced, no longer living together/ separated (DHS, 2015, CSA & ICF, 2016).

Level of education: According to DHS, level of education is defined as no education, primary education, secondary education, and higher education (DHS, 2015).

Religion: DHS categorized religion as Orthodox, Catholic, Protestant, Muslim, Traditional, and others (DHS, 2015).

Men's attitude toward contraceptive use: DHS defined men's attitude toward contraceptive use whether men agree or disagree for the following statements: contraception is woman's business, childbearing is a woman's concern, and women who use contraception become promiscuous (DHS, 2015).

Partner's or husband's opposition to contraceptive use: According to DHS partner's or husband's opposition to contraceptive use was coded as yes or no (DHS, 2015).

Place of residence: DHS categorized place of residence as rural and urban (DHS, 2015).

Wealth index: DHS categorized women based on wealth index as poorest, poorer, middle, richer, and richest (DHS, 2018). Wealth index (WI) is defined by DHS as the

composite indicator of all assets and income of individual household members (DHS, 2015).

Access to contraception: DHS categorized access to contraception as yes or no (DHS, 2015).

Women empowerment: According to DHS, women empowerment was measured by categorizing person who usually decides on women's health as women alone, women and husband/partner, women and significant others, husband/partner alone, someone else, or other (DHS, 2015).

Assumptions

This study assumes that the study participants were willingly participating in the survey. The Ethiopian Demographic and Health Surveys are nationally representative household surveys carried out every five years to provide information to researchers and stakeholders on demographic, reproductive health, and family planning. The sample is designed to represent the target population, women age 15 to 49 (CSA & ICF, 2016). The 2016 Ethiopian Demographic Health Survey (EDHS) sample was representative at the national, regional levels, and local rural and urban areas (CSA & ICF, 2016). The second assumption is that the surveyors collect nonbiased data and participants provided honest and accurate responses to the survey questions. Finally, it is assumed that the EDHS survey questions, instruments, and methods are reliable and valid measures of data collection and measure correctly the variables they are intended to measure. It is also assumed that the dependent variable occurs after the independent variables to determine whether the factors are predictive or consequence of the outcome variable. This

assumption is based on years of use of EDHS data in multiple published research studies. These assumptions are essential for conducting this research using EDHS secondary data sources. These assumptions are important for the research study and analysis of data to reach conclusions about the target population.

Scope and Delimitations

This study will be limited to the quantitative analysis of secondary data on selected socioeconomic and demographic variables and contraceptive use among women age 15 to 49 in Ethiopia. In addition to quantitative analysis, a qualitative analysis could have been helpful to explain the determinants of contraceptive use and add women's lived experience to the figures. In addition, DHS data are collected for a different purpose. Data collected for another purpose, and variables defined or categorized differently may not answer the specific research question. DHS are cross-sectional, and variables measured at the same time can only show association rather than causal relationships between predictor variables and contraceptive use in Ethiopia. In addition, DHS data are limited to reliance on self-reporting data on contraceptive use. They are subjected to underreporting bias. It is difficult to assess whether self-directed contraceptives such as pills and condoms are correctly used.

Moreover, DHS data are more susceptible to error due to recall bias or memory relapse. Older women may not remember whether they ever used modern contraceptives a long time ago due to memory relapse. Another potential bias that may limit the study includes sampling and non-sampling errors (ICF, 2012). Sampling or standard errors (SE) are the measure of the variability in the sampling distribution (Trochim, 2001). Sampling

or standard errors can be evaluated quantitatively using standard deviation [SD] (Trochim, 2001). The greater the SD of the sample of the population is the greater the SE of the study (Trochim, 2001). SE is also related to sample size (Trochim, 2001). The greater the sample size of the study is the smaller the SE and vice versa (Trochim, 2001). Non-sampling errors are the most important sources of error that occur during data collection and processing (ICF, 2012). It includes coverage errors, non-response error or refusal, failure to locate the correct household, misunderstanding of interview questions by either the interviewer or the respondent, and data entry errors. Unlike sampling errors, non-sampling errors are difficult to control or assess quantitatively (ICF, 2012). It is, therefore, important to minimize such errors in the survey implementation phases. According to ICF (2012), non-sampling errors can be minimized by using a stratified two-stage household sampling design.

Ethiopia has 11 regional states. Some small regions have small populations and others have large populations that potentially overrepresent or underrepresent the sample. This unweighted survey distribution does not accurately represent the population (CSA & ICF, 2016). However, EDHS data are mathematically adjusted to represent the population. Women from small regions contribute a small amount to the national survey and vice versa. The total national sample size was 15,683 women, which has not been changed after weighting. However, the distribution of women has been changed to represent the entire population. The DHS collect limited data on women's psychological, social, and cultural factors influencing contraceptive use. Exploration of the full array of factors influencing contraceptive use would be difficult. However, this study will capture

the most important individual, interpersonal, community, and societal factors to explore the predictors of contraceptive use in Ethiopia. In some extreme cases, exclusion of some areas due to extreme inaccessibility, violence, or instability is necessary. However, these issues need to be addressed at the beginning of the survey prior to sampling.

Significance and Potential for Social Change

Significance of Study

The significance of this research is that the findings could potentially add useful evidence to improve family planning program interventions designed to increase contraceptive use among women age 15 to 49 in Ethiopia. This research is an original contribution to the field of family planning. There are several published studies exploring the predictors of contraceptive use at the individual level in Ethiopia. None of these published studies have explored the determinants of contraceptive use using the social-ecological model. Findings of this study may help public health planners, policymakers, researchers, and communities to implement evidence-based family planning programs that will bring effective and sustainable positive social change on contraceptive use. According to Ali et al. (2014) and Tilahun et al. (2013), family planning plays a vital role in the reduction of infant, child, and maternal mortality as well as reducing high fertility rates and rapid population growth. By reducing unwanted pregnancy, family planning can also reduce high-risk pregnancies, unsafe abortions, and unintended pregnancies (Ali et al., 2014; Tiruneh et al., 2016). Moreover, increases in contraceptive use reduced maternal, infant, and child mortality rates in developing countries by 40, 10, and 21% respectively in the past two decades by reducing only unintended pregnancies (Cleland et

al., 2012). However, contraceptive use or family planning is beyond improving maternal and child health. It can unlock their potential and transform the lives of their families, communities, and society. Contraceptive use can improve girls and women's educational attainment, employment, socioeconomic status, and empowerment (Canning & Schultz, 2012; Habumuremyi & Zenawi, 2012; Onarheim, Iversen, & Bloom, 2016). Finally, unintended pregnancy can be prevented with contraceptive use, a cost- effective public health intervention (Aremu, 2013).

Social Change

The potential social change implication of this study is based on the association between the socioecological determinants and contraceptive use. Results of the study can potentially help address socioeconomic and demographic disparities in contraceptive use and tailor family planning program interventions to reduce the burden of unintended pregnancy, maternal and child mortality and rapid population growth. It will assist policymakers and family planning program managers to effectively evaluate and design programs and strategies for improving maternal and child health. Long-term investments in women's reproductive health and family planning have economic benefits and can reduce poverty because the health of mothers can affect the health of future generations (Onarheim, Iversen, & Bloom, 2016). Contraceptive use is essential for a healthy pregnancy. It has health benefits to the mother, child, families, communities, and society at large. In addition, delaying or spacing pregnancy using contraception has positive socioeconomic benefits and effects on women's education, empowerment, workforce participation thereby improving their income, family stability, mental health, and their

child's wellbeing (Sonfield, Hasstedt, Kavanaugh, & Anderson, 2013; Onarheim, Iversen, & Bloom, 2016). Improving women's education can lead to greater women's and family's economic independence, stability, earning power, and narrowing gender pay gap (Sonfield et al., 2013). Furthermore, empowering women's control over their reproductive health can boost economic growth and development (Beekle & McCabe, 2006; Onarheim, Iversen, & Bloom, 2016). Societal investments in women's reproductive health will result in better overall population health and more productive workforce for generations.

Summary

Unintended pregnancy is a global public health problem. It is the major cause of maternal and child mortality and morbidity. Ethiopia has the highest rate of unintended pregnancy in Africa. It has significant consequences to the mother, child, and health care system (Habte et al., 2013). Contraception methods are effective interventions for preventing unintended pregnancy and high fertility. In the past 15 years, Ethiopia has experienced a steady increase in modern contraceptive use; however, this did not result in a proportional decline in total fertility rates and population growth. In this study, the researcher will address the determinants of contraceptive use using the socioecological model. Section 2 will cover the research design, method, data collection, threats of validity, and ethical considerations.

Section 2: Research Design and Data Collection

Introduction

The purpose of this study is to assess the association between individual, interpersonal, community, and societal levels of influence and contraceptive use among women age 15 to 49 years in Ethiopia. In this section, the research design and rationale for the choice of design will be described. This section will also provide a detailed explanation of the research methodology used in the study. Next, data collection, instrumentation, and operationalization of the constructs of the socioecological model (individual, interpersonal, community, and societal) will be discussed. Finally, threats to validity and ethical considerations pertaining to the protection of data will be summarized.

Research Design and Rationale

This study will be a cross-sectional quantitative research study used to examine the association between individual factors (age, marital status, education, and religion), interpersonal factors (husband's attitude and opposition), community factors (type of residence and wealth index), and societal factors (access and empowerment) and contraceptive use among women of reproductive age between 15 and 49 in Ethiopia. The dependent variable in this study is current contraceptive use, which is defined as a dichotomous (yes/no) response in terms of whether women currently used any methods of contraception to delay pregnancy. The independent variables are age, marital status, education, religion, husband's attitude and opposition, residence, wealth index, access to

contraception, and women's empowerment. Age is measured in 5-year groups: 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49 years old.

The following categories pertained to marital status: never in a union, married, living with a partner, widow, divorced, no longer living together, or separated. Level of education was defined as no education, primary education, secondary education, and higher education. Religion was categorized as Orthodox, Catholic, Protestant, Muslim, Traditional, and other. Men's attitudes towards contraceptive use was measured in terms of whether men agree or disagree with the following statements: contraception is woman's business, childbearing is a woman's concern, and women who use contraception become promiscuous. A partner's or husband's opposition to contraceptive use was coded as yes or no. Place of residence was categorized as rural and urban, and wealth index was categorized as poorest, poorer, middle, richer, and richest. Access to contraception was categorized as yes or no. Finally, empowerment was measured as women alone, women and husband/partner, women and others, husband/partner alone, someone else, or others who usually decide on women' health and contraceptive use.

The study will be a cross-sectional study design. The rationale for choosing this design is because a cross-sectional design is the method of choice for survey research. The use of an existing DHS data provides a practical option for conducting a cross-sectional study when time and resources are limited such as that in dissertation research (Johnston, 2014). According to Johnson (2014), analysis of secondary data can apply the same basic or rigorous research principles as primary data analysis as long as the original data collection methods were appropriate. In a cross-sectional study, the researcher

measures the dependent and independent variables at the same time (Setia, 2016). Cross-sectional study designs are widely used to estimate the prevalence of risk factors by socioeconomic status of a population. It is an ideal choice for this study because it allows the measurement of both the outcome and the independent variables in the study at the same time. Cross-sectional study designs are useful for maintaining or modifying an existing or designing a new family planning program in Ethiopia.

The most suitable method of statistical analysis for this study are descriptive statistics, chi-square, univariate, bivariate, and logistic regression model. The rationale for using a logistic regression model is because of its relevance to examine the association between binary dependent and multiple independent variables. The logistic regression model is used to predict and make inferences about the effect of multiple independent variables on a dependent variable. The model provides an objective approach for studying effects of covariates on binary outcomes (contraceptive use or non-use to delay or avoid unintended pregnancy) and addresses both categorical and continuous covariates, without imposing any subjectivity to categorize a continuous covariate (Hongyue et al., 2017).

Methodology

In this section, the study population and sampling techniques will be discussed. In addition, access to secondary data, instrumentation, and operationalization of the constructs of the social-ecological model will be explored. Finally, threats to validity, and ethical considerations will be explained.

Study Population

Ethiopia is the oldest and most independent country in the Horn of Africa. The capital city of Ethiopia is in Addis Ababa. Ethiopia has the second largest population in Africa. The total population of Ethiopia is over 107 million, ranking second in Africa next to Nigeria and 12th in the world (World Population Review, 2018). The population of Ethiopia is growing at the rate of 2.6% per annum (Yared, 2012). The majority or 84% of the Ethiopian population lives in a rural area, where agriculture is the main source of subsistence (Yared, 2012).

Women make up 49.5% and men make up 50.5% of the total Ethiopian population (Central Statistical Authority, 2007). Women of reproductive age between 15 and 49 constitute 23.4% of the total population (Yared, 2012). Ethiopian women play a vital role in childbearing and management of family affairs as they take on most of the responsibilities in this area (Yared, 2012). Women are underrepresented in socioeconomic, educational, leadership, managerial, and political roles. This results in poor health outcomes for women in Ethiopia (Ademe & Singh, 2015; Yared, 2012).

The target population for the study was women between 15 and 49 who participated in the 2016 Ethiopian Demographic and Health Surveys. The inclusion criteria for this research study involved Ethiopian women between the ages of 15 and 49 who were permanent residents of their household or visitors who stayed in the household right before the survey. Women less than 15 or over 49 and men under 15 or over 59 years were excluded from the study.

Sampling and Sampling Procedures

The sampling frame used for the 2016 EDHS was the Ethiopian Population and Housing Census (PHC) conducted in 2007 by the CSA. It is a preexisting sampling frame used to estimate sample size (CSA & ICF, 2016). Data were collected from January 18, 2016, to June 27, 2016. The ICF/DHS program provided technical assistance while USAID, Ethiopian government, and other agencies provided funding for the implementation of the survey.

The sampling frame is a complete list of 84,915 enumeration areas (EAs) created by the PHC. An enumeration area is a geographic area covering 181 households (CSA & ICF, 2016). Ethiopia is divided into nine regional states and two administrative cities. Each region was stratified into urban and rural areas producing 21 sampling strata. Samples of enumeration areas were selected using a two-stage sampling technique. In the first stage, a total 645 EAs (202 in urban and 443 in rural areas) were selected with probability proportional to enumeration area size. In the second stage of selection, 28 households per cluster were selected with equal probability systematic selection from the household listing. All women age 15 to 49 and men age 15 to 59 who were permanent residents of their household or visitors who stayed in the household the night before the survey were eligible to be interviewed. In the 2016 EDHS, a total of 18,008 households were selected for interview, and 16,650 households were successfully interviewed, with a response rate of 97.6%. Of these 16,583 eligible women and 14,795 eligible men, 15,683 women and 12,688 men successfully completed the interview with a response rate of 94.6

and 85.8% respectively. The 2016 EDHS women dataset had 15,683 respondents between 15 and 49 years.

The sample size needed for the study is limited to 3,863 participants based on the G*Power calculations for Statistical Power Analysis for a multiple regression analysis using the F tests with 0.95 power (1-β err prob), 0.05 α err prob and 0.02 effect size. The sample size needed for the study is based on previous studies, the power needed for the predictor variables, and the overall fit and precision of the multiple logistic regression model (Kelley & Maxwell, 2003). To achieve the power of 0.95 and a small effect size of 0.02, a sample size of 3,863 is required to detect a significant association between the dependent and independent variables.

Access to Secondary Data

The data for this study was obtained from the DHS program official database. The procedure to gain access to the 2016 EDHS data was detailed at the DHS website (dhsprogram.com). DHS datasets can be freely downloaded from this website after registration and creating a user ID and password. DHS requires users to provide contact information, research project title, and a description of the data analysis. Dataset access is only granted for legitimate research study purposes. The DHS Program will normally review all data requests within 24 to 48 hours and provide notification if access has been granted. Once access is granted, users can download datasets, readme files, interview questionnaires, codebooks, and manuals. Permission to use the DHS data are clarified in the readme file. No dataset should be passed on to other researchers without the written consent of the DHS Program. Reports and publications based on the requested data must

be sent to the DHS Program Data Archive in pdf format. DHS data is a nationally representative cross-sectional survey conducted every five years in more than 40 developing countries.

Instrumentation and Operationalization of Constructs

Instrumentation

The DHS Program is a USAID-funded project implemented by ICF International. The first Ethiopian Demographic Health Survey (EDHS) was conducted in the year 2000. The primary purpose of the survey was to measure the levels and patterns of the demographic and health indicators of Ethiopia. EDHS is a national representative survey conducted every five years to provide current and valid and reliable information on the demographic and health indicators of Ethiopia. The survey includes household, women's, and men's Questionnaires. These questionnaires were confirmed to reflect the demographic and health issues relevant to Ethiopia.

Operationalization

The following table summarizes the operational definitions of the dependent and independent variables.

Table 2

Operational Definitions of Dependent and Independent Variables

Variable Name	Type of variable	Levels of measurement	Categorization and Operational Definition
Contraceptive use	Dependent	Categorical	Use or non-use of any method to delay or space pregnancy
Age	Independent	Ordinal	15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49 years
Marital status	Independent	Categorical	Ever in union, married, living with partner, widow, divorced, no longer living together, or separated
Level of education	Independent	Ordinal	No education, primary education, secondary education, and higher education
Religion	Independent	Categorical	Orthodox, Catholic, Protestant, Muslim, Traditional, and others.
Men's attitude toward contraceptive use	Independent	Categorical	Agree or disagree on: contraception is woman's business, childbearing is a woman's concern, and women who use contraception become promiscuous.
Partner's opposition to contraceptive use	Independent	Categorical	Yes or No
Place of residence	Independent	Categorical	Urban or Rural
Wealth Index	Independent	Ordinal	Poorest, poorer, middle, richer, and richest
Access to contraception	Independent	Categorical	Yes or No
Women empowerment	Independent	Categorical	Women alone, women and husband/partner, women and others, husband/partner alone, someone else, or others

Data Analysis Plan

Statistical analysis for this study was performed using a Software Package for

Social Sciences (SPSS) version 25. The statistical analysis included descriptive and inferential statistics. The researcher conducted simple descriptive statistics of the demographic and socioeconomic variables. The variables were recoded and modified to answer the research question. Descriptive univariate analyses were performed to examine the frequency distributions of the variables. Bivariate analysis was employed to explore the relationships between the independent variables and contraceptive use. Chi-square test of independence was performed for categorical variables. Statistically significant differences were determined using chi-square at $p < 0.05$. Only the independent variables that were found to have a statistically significant association with contraceptive use in the bivariate analysis were included in the multiple logistic regression model. The following section details the statistical analyses that were used to answer each research question.

RQ1: Is there an association between individual factors (age, marital status, religion, and education) and contraceptive use among women age 15 to 49 in Ethiopia?

$H_0$1: There is no association between individual factors (age, marital status, religion, and education) and contraceptive use among women age 15 to 49 in Ethiopia.

H_a1: There is an association between individual factors (age, marital status, religion, and education) and contraceptive use among women age 15 to 49 in Ethiopia.

RQ1 includes two categorical independent variables, two ordinal independent variables and a categorical dependent variable. Multiple logistic regression, including odds ratio (OR) and 95% confidence interval (CI), will be used to assess the association between individual factors and contraceptive use after controlling for wealth index in Ethiopia.

RQ2: Is there an association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women age 15 to 49 in Ethiopia?

H_02: There is no association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women age 15 to 49 years in Ethiopia.

H_a2: There is an association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women age 15 to 49 years in Ethiopia.

RQ2 includes two categorical independent variables and a categorical dependent variable. Multiple logistic regression, including OR and 95% CI, will be used to assess the association between interpersonal factors and contraceptive use.

RQ3: Is there an association between community factors (type of residence and wealth index) and contraceptive use among women age 15 to 49 in Ethiopia?

H_03: There is no association between community factors (type of residence and wealth index) and contraceptive use among women age 15 to 49 in Ethiopia.

H_a3: There is an association between community factors (type of residence and wealth index) and contraceptive use among women age 15 to 49 in Ethiopia.

RQ3 includes one categorical independent variable, one ordinal independent variable and a categorical dependent variable. Multiple logistic regression, including OR and 95% CI, will be used to assess the association between community factors and contraceptive use after controlling for maternal age.

RQ4: Is there an association between societal factors (access to contraception and women empowerment) and contraceptive use among women age 15 to 49 in Ethiopia?

H_04: There is no association between societal factors (access to contraception and women empowerment) and contraceptive use among women age 15 to 49 in Ethiopia.

H_a4: There is an association between societal factors (access to contraception and women empowerment) and contraceptive use among women age 15 to 49 in Ethiopia.

RQ4 includes two categorical independent variables and a categorical dependent variable. Multiple logistic regression, including OR and 95% CI, will be used to assess the association between societal factors and contraceptive use.

RQ5: Is there an association between individual, interpersonal, community, and societal factors and contraceptive use among women age 15 to 49 in Ethiopia?

H05: There is no association between individual, interpersonal, community, and societal factors and contraceptive use among women age 15 to 49 in Ethiopia.

Ha5: There is an association between individual, interpersonal, community, and societal factors and contraceptive use among women age 15 to 49 in Ethiopia.

RQ5 combines all the individual, interpersonal, community, and societal factors and contraceptive use. Multiple regression, including OR and 95% CI, will be used to assess the association between individual, interpersonal, community, and societal factors and contraceptive use.

Based on the literature review and the application of the model by the CDC for the prevention of violence in the United States, the predicting variables for contraceptive use have been split to follow the social-ecological model. In this study, maternal age and wealth indexes are potential confounding variables or extraneous factors that correlate directly or indirectly with the dependent and independent variable in the statistical model.

Those two confounding variables are identified as confounders from literature review and previous epidemiological studies (Islam, 2017; Silva, 1999). According to Silva (1999), age, gender, income, and place of residence are potential confounders in practically all studies.

The most important considerations when controlling confounding variables are based on the social-ecological model of the relationship between predicting factors and contraceptive use. The selected confounders meet the necessary conditions to be confounders that can be measured, their effects can be removed or adjusted in the study design and analyses phases. The association between the dependent and independent variables can be reported by holding age and wealth index constant in statistical analysis. One statistical method for controlling confounding variables is to run a multiple logistic regression. In multiple logistic regression model, covariates include both the independent and confounding variables and the true association between dependent and independent variables after controlling for the confounding variable will be accurately reported. Logistic regression model is useful for estimating odds ratios, therefore can be used in the cross-sectional study (Silva, 1999). The advantage of logistic regression model is that it does not require the researcher to define which explanatory variable is the exposure and which ones are the potential confounders, since all explanatory variables are treated in the same way (Silva, 1999). In the initial phase of this research, cross-tabulation based on stratification will be used to better know the data, detect errors, and inconsistencies (Silva, 1999). In the second phase of the statistical analyses, regression models will be used to adjust simultaneously for multiple confounders. The presence or absence of

confounding will not be evaluated by statistical test of significance but by observing the degree of discrepancy between the crude and adjusted estimates in the regression model.

Threats to Validity

DHS data are the gold standard for public health program evaluation and monitoring in developing countries. DHS are nationally-representative household surveys that provide data for a wide range of monitoring and impact evaluation indicators in the areas of demographic and health indicators. The validity of a survey represents what it intends and claims to represent (Crosby, 2013). There are two types of validity: internal and external. Internal validity refers to the rigor of measurement. It is "the extent to which the study evaluates the hypotheses" (Crosby, 2013, p.133). It can be underestimated by faulty testing instrument or material, and interference of unnoticed factors (Walliman, 2011).

External validity, on the other hand, refers to "the extent to which the results of the study can be extended beyond the sample used in the study (Crosby, 2013, p. 133). It refers to the generalizability to the population and across contexts, to other persons, times and places (Frankfort-Nachmias, Nachmias, & DeWaard, 2015; Trochim, 2001). It can also be compromised by faulty sampling and unnoticed interfering factors (Walliman, 2011). Examples of threats of validity include bias from self-reported answers; surveys being administered in artificial settings; ways in which options are categorized or can constrain answers; and bias or errors in question formulation, data entry, and analysis. Under ideal conditions, a research study should have high internal and high external validity.

Ethical Considerations

Human Subjects

In general, DHS data are collected anonymously. They make an effort to ensure the confidentiality of the respondent (Adetunji & Shelton, n.d). There are several ways of protecting human subjects. DHS data are transformed and coded to protect the anonymity and privacy of the respondents. No names and addresses were disclosed in DHS data files. They are completely devoid of such information, and the researcher does not have full access to the codes (Tripathy, 2013). DHS staff always ensures the respondent's privacy is protected (Adetunji & Shelton, n.d). A consent form is provided to the participant describing the purpose of the survey, the duration, the confidentiality of their answers, and their right to refuse participation in the survey.

Ethical Issues

Under the DHS, the goal is to adhere to the highest ethical standards and obey the rules of the US Government as they apply to research involving human subjects. DHS has an independent Institutional Review Board (IRB) that reviews each proposal to ensure that international research conforms to US laws (Adetunji & Sheldon, n.d). DHS contractors recognize the importance of maintaining acceptable ethical standards for the success and quality of the surveys (Adetunji & Shelton, n.d). The survey instrument used for EDHS data collection was approved by the Ethiopian Federal Ministry of Health National Ethics Committee and the IRB of ICF Macro Inc. in Calverton, USA. Permission to use the survey data for this research study was obtained from the ICF

Macro Inc. The current research plans will also undergo review from the Walden University IRB.

Summary

To summarize, this research is a cross-sectional quantitative study exploring the association between individual, interpersonal, community, and societal levels of influence and contraceptive use among women age 15 to 49 years in Ethiopia. Both descriptive and inferential statistical analysis will be used to analyze the data. Only the independent variables that are found to have a statistically significant association with contraceptive use in the bivariate analysis will be included in the multiple logistic regression model. In section three, the results and findings of the study will be discussed.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this study was to evaluate whether contraceptive use was associated with individual characteristics (age, marital status, religion, and education), interpersonal factors (partner's attitude and opposition), community factors (place of residence and wealth index), and societal factors (access to contraception and women's empowerment) among women aged 15 to 49 in Ethiopia. In this study, five research questions were addressed:

RQ1: Is there an association between individual factors (age, marital status, education, and religion) and contraceptive use among women aged 15 to 49 in Ethiopia?

RQ2: Is there an association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women aged 15 to 49 in Ethiopia?

RQ3: Is there an association between community factors (place of residence and wealth index) and contraceptive use among women aged 15 to 49 in Ethiopia?

RQ4: Is there an association between societal factors (access to contraception and women's empowerment) and contraceptive use among women aged 15 to 49 in Ethiopia?

RQ5: Is there an association between individual, interpersonal, community, and societal factors combined, and contraceptive use among women aged 15 to 49 years in Ethiopia?

The null hypothesis was that there are no associations between individual, interpersonal, community, and societal factors, and contraceptive use among women aged 15 to 49 in Ethiopia. The alternative hypothesis was that there was an association between

individual, interpersonal, community, and societal factors and contraceptive use among women aged 15 to 49 in Ethiopia. The social-ecological model was used as a framework for this study.

In this section, the results of the secondary analysis of the 2016 EDHS data will be presented. Data validation was performed using SPSS version 25. The datasets were merged, and multiple imputations were performed to address missing data. I randomly selected 25% of the cases. The variables were recoded, categorized, and manipulated to fit the variables in the research questions. Descriptive statistical analyses were performed. I conducted univariate, bivariate, and logistic regression analyses on the independent variables to search for statistically significant predictors of contraceptive use in Ethiopia.

Data Collection of Secondary Data Set

The overall goal of the 2016 EDHS was to estimate key demographic and health indicators in Ethiopia. More specifically, the 2016 EDHS measured levels of contraceptive knowledge and practice among women aged 15 to 49 and men aged 15 to 59. In the 2016 EDHS, interviewers used tablet computers to record responses during interviews. The tablets were equipped with Bluetooth technology to enable remote electronic transfer of files between interviewers and editors. A total of 18,008 households were selected for the sample, of which 17,067 were occupied. Of those occupied households, 16,650 were successfully interviewed, resulting in a response rate of 98%. Among those interviewed households, 16,583 eligible women were identified for individual interviews. Interviews were completed with 15,683 women, resulting in a response rate of 95%. Similarly, a total of 14,795 eligible men were identified in the

sampled households, and 12,688 were successfully interviewed, yielding a response rate of 86%.

Discrepancies

There were some discrepancies due to the use of this secondary data set. Upon review of the data, there were significant missing values in some variables. The proposed sample size was not adequate to conduct logistic regression analysis without addressing the missing values. I conducted multiple imputations of variables in the datasets with one or more missing values to replace the missing values with substituted values, which Stuart, Azur, Frangakis, and Leaf (2009) noted is effective in dealing with missing data in a large dataset. The reason using multiple imputation technique for dealing with missing data is because of its improved performance over alternative approaches Then, I randomly selected 25% of all cases. Based on the discrepancy between the proposed and actual sample size needed, I modified the sample size to $N = 3,863$ cases and revised the research plan to be a simple logistic regression model. A simple logistic regression model was used because the dependent variable was dichotomous and coded as yes or no.

Univariate Analysis

Descriptive Characteristics of the Sample Population

A total sample of 3,863 women aged 15 to 49 and men aged 15 to 59 were included in the study. The sampled population was predominantly women aged 15-29, married, and were either Orthodox Christian or Muslim with no education or primary education. Of the sampled population, 36.99% reported the use of contraceptives to delay or avoid pregnancy in Ethiopia. Conversely, 63.01% reported nonuse of contraceptives to

delay or avoid getting pregnant. Table 3 depicts the sample size and socioeconomic and demographic characteristics of the study population.

Table 3

Demographics of the Sample Population (n = 3863)

Variable	Frequency	Percent
Age Groups		
15-19	822	21.28
20-24	696	18.02
25-29	721	18.66
30-34	571	14.78
35-39	479	12.40
40-44	323	8.36
45-49	251	6.50
Marital Status		
Never in a union	1026	26.56
Married	2380	61.61
Living with a partner	53	1.37
Widowed	116	3.00
Divorced	227	5.88
Separated	61	1.58
Religion		
Orthodox	1552	40.18
Catholic	30	0.78
Protestant	682	17.65
Muslim	1563	40.46
Traditional	19	0.49
Other	17	0.44
Education		
No education	1793	46.41
Primary	1290	33.39
Secondary	502	13.00
Higher	278	7.20
Contraception is Woman's Business, man should not worry		
Disagree	2341	68.69
Agree	909	26.67
Don't know	158	4.64
Missing values	455	

(*table continues*)

Women who use contraception become promiscuous		
Disagree	2277	66.75
Agree	944	27.70
Don't know	189	5.55
Missing values	455	
Reason not using: husband/partner's opposition		
No	3379	87.47
Yes	29	0.75
Missing	455	11.78
Type of Place of Residence		
Urban	1320	34.17
Rural	2543	65.83
Wealth Index Combined		
Poorest	952	24.64
Poorer	513	13.28
Middle	454	11.75
Richer	532	13.77
Richest	1412	36.55
Reason not Using: Lack of Access/ too far		
No	3399	87.99
Yes	1	0.23
Missing	455	11.78
Decision maker for using contraception		
Mainly respondent	179	4.63
Mainly husband, partner	2685	69.51
Joint decision	510	13.20
Other	1	0.03
Missing	488	12.63
Contraceptive use to delay or avoid pregnancy		
No	2434	63.01
Yes	1429	36.99

Bivariate Analysis

A bivariate analysis was conducted to evaluate whether the respondents' demographic and socioecological variables were associated with contraceptive use to

delay or avoid pregnancy in Ethiopia. The researcher conducted a Chi-square test on contraceptive use and age in 5-year groups, current marital status, highest educational level, religion, partner's attitude (contraception is woman's business, women who use contraception become promiscuous), husband or partner's opposition, place of residence, wealth index, lack of access or too far to service delivery points, and decision maker for contraception use. Seven out of eleven independent variables revealed a significant association with contraceptive use. Variables associated with contraceptive use were age in 5-year groups, $\chi 2$ (6, N = 3863) = 366.13, $p < .01$; current marital status, $\chi 2$ (5, N = 3863) = 570.27, $p < .01$; highest educational level, $\chi 2$ (3, N = 3863) = 12.55, $p < .01$; religion, $\chi 2$ (5, N = 3863) = 250.42, $p < .01$; place of residence, $\chi 2$ (1, N =3863) = 31.37, $p < .01$; wealth index, $\chi 2$ (4, N = 3863) = 220.44, $p < .01$; and decision maker for using contraception, $\chi 2$ (3, N = 3375) = 1435.75, $p < .01$.

Variables that were not significantly associated with contraceptive use are contraception is woman's business, $\chi 2$ (2, N = 3408) = 5.28, p = .071; women who use contraception become promiscuous, $\chi 2$ (2, N = 3408) = 5.21, p = .074; husband or partner's opposition, $\chi 2$ (1, N = 3408) = 1.95, p = .162; and lack of access/ too far, $\chi 2$ (1, N = 3408) = 0.8, p = .370. The complete results of all bivariate analyses were shown in table 4.

Table 4

Crosstabulation of Predictors of Contraceptive Use of the Sample Population (n = 3863)

Predictor Variables	No (Observed/Expected)	Yes (Observed/ Expected)	Chi square/df *Sig./ n*
Age Groups			
15-19	739.00/517.93	83.00/304.07	$\chi 2$ (6) = 366.13
20-24	440.00/438.54	256.00/ 257.46	$p<0.01$
25-29	366.00/454.29	355.00/ 266.71	*n= 3863*
30-34	288.00/359.78	283.00/211.22	
35-39	254.00/ 301.81	225.00/177.19	
40-44	184.00/203.52	139.00/119.48	
45-49	163.00/158.15	88.00/92.85	
Marital Status			
Never in a union	956.00/646.46	70.00/379.54	$\chi 2$ (5) = 570.27
Married	1222.00/1499.59	1158.00/880.41	$p<0.01$
Living with a partner	23.00/33.39	30.00/ 19.61	*n*=3863
Widowed	84.00/73.09	32.00/42.91	
Divorced	122.00/143.03	105.00/83.97	
Separated	27.00/38.43	34.00/22.57	
Religion			
Orthodox	759.00/977.88	793.00/574.12	$\chi 2$ (5) = 250.42
Catholic	23.00/18.90	7.00/11.10	$p<0.01$
Protestant	439.00/429.71	243.00/252.29	*n*= 3863
Muslim	1184.00/984.82	379.00/578.18	
Traditional	17.00/11.97	2.00/7.03	
Other	12.00/10.71	5.00/6.29	
Education			
No education	1158.00/1129.73	635.00/663.27	$\chi 2$ (3) =12.55
Primary	819/812.80	471.00/477.20	$p<0.01$
Secondary	307.00/316.30	195.00/185.70	*n*=3863
Higher	150.00/175.16	128.00/102.84	
Contraception is Woman's Business, man should not worry			
Disagree	1478.00/1506.40	863.00/834.60	$\chi 2$ (2) =5.28
Agree	613.00/584.93	296.00/324.07	$p=.071$
Don't know	102.00/101.67	56.00/56.33	*n*=3408
Women who use contraception become promiscuous			
Disagree	1437.00/1463.93	838.00/811.07	$\chi 2$ (2) =5.21

Agree	636.00/607.45	308.00/336.55	p=.074
Don't know	120.00/121.62	69.00/67.38	n=3408
Reason not using: husband/partner's opposition			$\chi 2$ (1) =1.95
No	2139.00/2142.61	1240.00/1236.39	p=0.162
Yes	22.00/18.39	7.00/10.61	n=3408
Type of Place of Residence			$\chi 2$ (1) =31.37
Urban	752.00/831.71	568.00/488.29	p<0.01
Rural	1682.00/1602.29	861.00/940.71	n=3863
Wealth Index Combined			
Poorest	787.00/599.84	165.00/352.16	$\chi 2(4)$ =220.44
Poorer	320.00/323.23	193.00/189.77	p<0.01
Middle	264.00/286.06	190.00/167.94	n=3863
Richer	293.00/335.20	239.00/196.80	
Richest	770.00/889.67	642.00/522.33	
Reason not Using: Lack of Access/ too far			$\chi 2(1)$ =.80
No	2154.00/2155.29	1245.00/1243.71	p=0.370
Yes	7.00/5.71	2.00/3.29	n=3408
Decision maker for using contraception			$\chi 2(3)$ =1435.75
Mainly respondent	0.00/111.59	179.00/67.41	p<0.01
Mainly husband	2104.00/1673.85	581.00/1011.15	n=3375
Joint decision	0.00/317.94	510.00/192.06	
Other	0.00/0.68	1.00/0.38	

Logistic Regression Analysis

Logistic regression analyses were performed on all variables using the individual, interpersonal, community, and societal factors and all variables combined simultaneously. Statistical analyses of each of the predictor variables that correspond with each research question will be presented. The outcome variable was 'ever used or tried anything to delay or avoid getting pregnant (yes/no).' The main purpose of the

logistic regression analyses was to determine whether the predictor variables explain the dichotomous outcome, ever used or tried anything to delay or avoid getting pregnant (yes or no). The predictor variables were age, current marital status, religion, education, partner's attitude (as measured by 'contraception is women's business' and 'woman who use contraception become promiscuous'), husband or partner's opposition, place of residence, wealth index, lack of access or distance to service delivery points, and decision maker for using contraception.

Results

Binomial logistic regression analyses were conducted to test the association between the independent variables in the research question and dependent variable, contraceptive use among women aged 15 to 49 in Ethiopia. Each component of the regression model (individual, interpersonal, community, and societal factors) corresponds to research questions 1-4. Results of the overall logistic regression model are presented under research question 5.

RQ1

RQ1: Is there an association between individual factors (age, marital status, religion, and education) and contraceptive use among women aged 15 to 49 in Ethiopia?

$H_0 1$: There is no association between individual factors (age, marital status, religion, and education) and contraceptive use among women aged 15 to 49 in Ethiopia.

$H_a 1$: There is an association between individual factors (age, marital status, religion, and education) and contraceptive use among women aged 15 to 49 in Ethiopia.

A logistic regression analysis was performed to investigate the association between the dependent variable, contraceptive use, and the predictor variables (age, marital status, education, and religion) among women aged 15 to 49 years in Ethiopia. A total of 3,863 cases were analyzed and the full model significantly predicted contraceptive use, χ^2 (3,852, N = 3,863) = 42.775, $p < .01$. The model explained 18% of the variance in contraceptive use. Table 5 gives coefficients and the Wald statistic and probability values for each of the predictor variables. This shows that age, current marital status as Married, religion as Traditional, and education reliably predicted contraception use in Ethiopia. The values of the coefficients reveal that a unit increase in 5-year age group was significantly associated with an increase in the odds of using contraception by a factor of 1.18 (95% CI [1.13, 1.23]), an increase of one unit in highest educational level was associated with an increase in the odds of using contraception by a factor of 1.63 (95% CI [1.58, 1.68]), being married was associated with a decrease in the odds of contraception use by a factor of .20 (95% CI [0.00, 0.40]), and being of traditional religion was associated with an increase in the odds of using contraception by a factor of 6.69 (95% CI [6.19, 7.19]). The null hypothesis was rejected in favor of the alternative hypothesis. Therefore, there is an association between age, marital status, education, religion, and contraceptive use.

Table 5

Logistic Regression Model for Individual factors

Independent Variables	B	S.E.	Wald	Sig.	Exp(B)	95% CI Lower Bound	95% CI Upper Bound
Age in 5-year groups	0.17	0.02	60.54	0.000	1.18	1.13	1.23
Highest educational level	0.49	0.04	128.3	0.000	1.63	1.58	1.68
Current marital status: Married (1)	-1.6	0.09	319.8	0.000	0.20	0.00	0.40
Religion: Traditional (1)	1.9	0.75	6.39	0.011	6.69	6.19	7.19
Constant	-2.86	0.76	14.34	0	0.06	0.00	

Model $\chi 2=42.78$, $p<0.01$, n=3863

RQ2

RQ2: Is there an association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women aged 15 to 49 in Ethiopia?

$H_0 2$: There is no association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women aged 15 to 49 in Ethiopia.

$H_a 2$: There is an association between interpersonal factors (partner's attitude and opposition) and contraceptive use among women aged 15 to 49 in Ethiopia.

A logistic regression analysis was performed with contraception use as the dependent variable and partner's attitude and opposition as predictor variables. A total of 3,863 cases were analyzed and the full model did not significantly predict contraception use, χ^2 (3,022, N = 3,863) = 0.290, p = .865. The model accounted for 0% of the variance in conception use. Table 6 gives coefficients and the Wald statistic and probability values for each of the predictor variables. This shows none of the predictors reliably predicted contraception use with statistical significance. As a result, the null hypothesis was

maintained. There is no association exists between interpersonal factors (contraception is woman's business, women who use contraception become promiscuous, and husband or partner opposition) and contraceptive use in Ethiopia.

Table 6

Logistic Regression Model for Interpersonal Factors

Independent Variables	B	S.E.	Wald	Sig.	Exp (B)	95% CI	
						Lower Bound	Upper Bound
Contraception is woman's business, man should not worry: Agree (1)	0.02	0.14	0.01	0.909	1.02	1.00	1.04
Women who use contraception become promiscuous: Agree (1)	0.04	0.13	0.08	0.779	1.04	1.00	1.08
Reason not using: husband/partner opposed (1)	0.65	0.47	1.96	0.161	1.92	1.87	1.97
Constant	-1.24	0.47	6.93	0.008	0.29	0.00	0.58

$\chi 2$=0.29 p=0.865, n= 3863

RQ3

RQ3: Is there an association between community factors (type of residence and wealth index) and contraceptive use among women aged 15 to 49 in Ethiopia?

$H_0$3: There is no association between community factors (type of residence and wealth index) and contraceptive use among women aged 15 to 49 in Ethiopia.

H_a3: There is an association between community factors (type of residence and wealth index) and contraceptive use among women aged 15 to 49 in Ethiopia.

A logistic regression analysis was performed with contraception use as the dependent variable and type of residence and wealth index as predictor variables. A total of 3,863 cases were analyzed and the full model in support of the alternative hypothesis (Ha3), significantly predicted contraception use, χ^2 (3,853, N = 3,863) = 252.302, $p < .01$. The model accounted for between 5% and 7% of the variance in conception use with 96.47% of the contraception non-users successfully predicted. Table 7 gives coefficients and the Wald statistic and probability values for each of the predictor variables. This shows that type of residence and wealth index reliably predicted contraception use. The values of the coefficients reveal that an increase of one unit in wealth index combined was significantly associated with an increase in the odds of contraception use by a factor of 1.51 (95% CI [1.00, 2.02]), and being from an urban type of place of residence was associated with an increase in the odds of contraception use by a factor of 1.78 (95% CI [1.70, 1.860]). Therefore, the null hypothesis was rejected in favor of the alternative. There is an association between community factors, wealth index and type of place of residence, and contraceptive use in Ethiopia.

Table 7

Logistic Regression Model Community Factors

Independent Variables	B	S.E.	Wald	Sig	Exp(B)	95% CI	
						Lower Bound	Upper Bound
Wealth index combined	0.41	0.03	172.72	0	1.51	1.00	2.02
Type of place of residence (1)	0.58	0.1	32.89	0	1.78	1.70	1.86
Constant	-2.28	0.16	195.7	0	0.10	0.00	0.20

$\chi 2$= 252.302, $p<0.01$, n= 3863

RQ4

RQ4: Is there an association between societal factors (access to contraception and women empowerment) and contraceptive use among women aged 15 to 49 in Ethiopia?

H_04: There is no association between societal factors (access to contraception and women empowerment) and contraceptive use among women aged 15 to 49 in Ethiopia.

H_a4: There is an association between societal factors (access to contraception and women's empowerment) and contraceptive use among women age 15 to 49 in Ethiopia.

A logistic regression analysis was performed with contraception use as the dependent variable and lack of access and decision maker for using contraception as predictor variables. A total of 3,863 cases were analyzed and the full model did not significantly predict contraception use, $\chi 2$ (2,917, N = 3,863) = 305.414, $p > .05$). The model accounted for between 10% and 14% of the variance in contraceptive use with 100.00% of the contraception non-users successfully predicted. Table 8 gives coefficients and the Wald statistic and probability values for each of the predictor variables. This shows none of the predictors reliably predicted contraception use. Therefore, the null hypothesis is maintained. There is no association between societal factors (access to contraception and decision-making power) and contraceptive use in Ethiopia.

Table 8

Logistic Regression Model for Societal Factors

Independent Variables	B	S.E.	Wald	Sig.	Exp(B)	95% CI Lower Bound	95% CI Upper Bound
Reason not using: lack of access/too far (1)	0.03	0.87	0	0.975	1.03	1.00	1.06
Decision maker: Mainly Respondent (1)	-22	2141.42	0	0.992	0.00	0.00	0.10
Constant	21.31	2141.42	0	1	0.992	2E+09	1.8E+09

$\chi 2$= 305.414, p>0.05, n= 3,863

RQ5

RQ5: Is there an association between individual factors (age, marital status, religion, and education) interpersonal factors (partner's attitude and opposition), community factors (place of residence and wealth index), and societal factors (access to contraception and women empowerment) and contraceptive use among women aged 15 to 49 in Ethiopia?

$H_0$5: There is no association between individual factors (age, marital status, religion, and education) interpersonal factors (partner's attitude and opposition), community factors (place of residence and wealth index), and societal factors (access to contraception and women empowerment) and contraceptive use among women aged 15 to 49 in Ethiopia.

H_a5: There is an association between individual factors (age, marital status, religion, and education) interpersonal factors (partner's attitude and opposition), community factors (place of residence and wealth index), and societal factors (access to

contraception and women's empowerment) and contraceptive use among women aged 15 to 49 in Ethiopia.

A logistic regression analysis was performed with contraception use as the dependent variable and individual (i.e., age, education, marital status: married, religion: traditional), community (i.e., type of place of residence: urban, wealth index), and societal (decision maker for using contraception: mainly respondent) as predictor variables. All interpersonal factors and one variable from the societal factors that were not significantly associated with contraceptive use in the bivariate analysis were excluded in the model. A total of 3,863 cases were analyzed and the full model in support of hypothesis 5, significantly predicted contraception use, $\chi 2$ (3,799, N = 3,863) = 852.651, $p < .01$. The model accounted for between 27% and 36% of the variance in conception use, with 86.51% of the contraception non-users successfully predicted. Table 9 gives coefficients and the Wald statistic and probability values for each of the predictor variables. This shows that factors such as individual (i.e., age, education, marital status: married) and community (i.e., type of place of residence: urban, wealth index combined) reliably predicted contraception use. The values of the coefficients reveal that an increase of one unit in age in five-year groups was associated with an increase in the odds of contraception use by a factor of 1.13 (5% CI [1.00, 1.26]), an increase of one unit in highest educational level was associated with an increase in the odds of contraception use by a factor of 1.15 (95% CI [1.00, 1.30]), an increase of one unit in wealth index combined was associated with an increase in the odds of contraception use by a factor of 1.65 (95% CI [1.15, 2.15]) being married was associated with a decrease in the odds of

contraception use by a factor of 0.15 (95% CI [0.00, 0.30]), being from an urban type of place of residence was associated with an increase in the odds of contraception use by a factor of 1.56 (95% CI [1.50, 1.61]). Therefore, the null hypothesis was rejected in favor of the alternative. There is an association between individual and community factors and contraceptive use in Ethiopia.

Table 9

Logistic Regression Model for Statistically Associated Predictors in the Bivariate Analysis

Statistically Significant Variables in the Bivariate Analysis						95% CI (odds ratio)	
	B	S.E.	Wald	Sig.	Exp(B)	Lower Bound	Upper Bound
Age in 5-year groups	0.13	0.03	19.09	0.000	1.13	1.00	1.26
Highest educational level	0.14	0.06	5.03	0.025	1.15	1.00	1.30
Wealth index combined	0.5	0.05	120.97	0.000	1.65	1.15	2.15
Current marital status: Married (1)	-1.9	0.12	265.66	0.000	0.15	0.00	0.30
Religion: Traditional (1)	16.81	1852.68	0	0.993	20050674.2	2E+07	2E+07
Type of place of residence (1)	0.45	0.15	9.2	0.002	1.56	1.50	1.61
Decision maker for using contraception: Mainly Respondent (1)	-33.1	2628.07	0	0.990	0	0.00	0.00
Constant	-7.02	12896.2	0	1.000	0	0.00	0.00

Summary

In summary, the results of the 2016 EDHS as it pertains to contraceptive use and socioecological predictors of contraceptive use among women aged 15 to 49 years in Ethiopia were presented. Both bivariate and logistic regression analysis were used to evaluate the relationship between individual, interpersonal, community, and societal factors and contraceptive among women aged 15 to 49 years in Ethiopia. In the bivariate analysis, seven out of eleven independent variables revealed a significant association with contraceptive use. Variables statistically associated with contraceptive use were age in 5-year groups, current marital status, highest educational level, religion, place of residence, wealth index, and decision maker for using contraception. Variables that were not significantly associated with contraceptive use were contraception is woman's business, women who use contraception become promiscuous, husband or partner's opposition, and lack of access or too far to service delivery points. In the logistic regression analysis, individual factors and community factors reliably predicted contraception use among women aged 15 to 49 years in Ethiopia. In the next and final section of the study, the findings of the research, their potential application to professional practice, and the implications for social change will be discussed.

Section 4: Application to Professional Practice and Implication for Social Change

Introduction

Contraceptive use and family planning coverage in Ethiopia is very low. To improve contraceptive use and family planning programs, I examined the association between maternal socioecological determinants and contraceptive use among women aged 15 to 49 in Ethiopia. This study was designed to provide evidence about the association between socioecological factors and contraceptive use at multiple levels of influence. A quantitative analysis of secondary data from the 2016 EDHS dataset was conducted. In the univariate, bivariate, and multivariate analysis of the data, SPSS version 25 was used.

Interpretations of the Findings

Age

The significant association between age and contraceptive use confirmed Malalu et al. (2014) who found for every unit increase in age, there was a 7% increased chance of using modern contraceptive methods. This study revealed that an increase of one 5-year age group was associated with an increase in the odds of using contraception by a factor of 1.18 (95% CI [1.13, 1.23]). Young women aged 15 to 19 were less likely to use contraception compared to women age 20 to 29 years. The study findings indicate a need for targeted family planning interventions among young women aged 15 to 19 in Ethiopia.

Marital Status

Marital status was associated with contraceptive use in Ethiopia. According to the current study, being married was associated with a decrease in the odds of contraception use by a factor of .20 (95% CI [0.00, 0.40]). This association between being married and low contraceptive use confirmed with the findings of Andi et al. (2014). Andi et al. (2014) found low modern contraceptive use among married women compared to single or never married women in Uganda ($p < .01$). They argued that married women in Uganda highly depend on their husbands' approval for modern contraceptive use (Andi et al., 2014). In other words, Andi et al. (2014) argued that non-married women do not seek approval from any one concerning contraceptive use. This study finding indicates low levels of contraceptive use among married women in Ethiopia as well.

Religion

Religion was associated with contraceptive use in Ethiopia. For example, having traditional religious views was associated with an increase in the odds of contraception use by a factor of 6.69 (95% [CI 6.19, 7.19]). The current study confirmed with Agadjanian (2013) study who to found high contraceptive use among traditional Protestants in Mozambique. Agadjanian (2013) argued that traditional religious women who exchange information and experience regarding contraception with visiting nurses and health care providers tends to use modern contraception than other non-traditional religious women. Qualitative research is needed to better understand why some religions influence contraceptive use in Ethiopia.

Education

Education was associated with contraceptive use in Ethiopia. According to the current study, an increase of one unit in highest educational level was associated with an increase in the odds of contraception use by a factor of 1.63 (95% *CI* [1.58, 1.68]). My study confirmed with the finding of Haq et al. (2017). They found that women who attained primary education and secondary or higher levels of education were more likely to use contraceptives than women having no education (Haq et al., 2017). This was because educated women have a greater opportunity for new ideas and information regarding new birth control methods and better access to family planning services (Haq et al., 2017).

Partner's Attitude and Husband's Opposition

Partner's attitude toward contraception was assessed using two thoughts: contraception is woman's business and women who use contraception become promiscuous. Both variables were not significantly associated with contraceptive use in Ethiopia. This study confirmed the findings of Blackstone and Iwelunmor (2017) who found no association between men's perception of contraception as a women's business and modern contraceptive use over no method. Blackstone and Iwelunmor (2017) argued that the study design was limited due to the cross-sectional nature of the study. In cross-sectional study, survey data collection can be prone to social desirability bias and response bias. Blackstone and Iwelunmor (2017) found negative association between promiscuity and women's use of modern contraceptives. The current study disconfirmed the finding that women were less likely to use contraception when men viewed contraceptives as an enabler for promiscuity versus no method.

Husband or partner's opposition was not statistically associated with contraceptive use. Ezeanolue et al. (2015) found women whose partners disapprove of contraception were less likely to use modern contraceptives than women whose partners approve contraception. Adelekan et al. (2014) found that more than 56% males approved of contraception and 46% allowed contraceptive use. However, these studies were limited to cross-sectional data, and unable to establish a temporal and causal relationship between partner attitudes and contraceptive use. The current study findings suggest the need for family planning researchers to conduct further research to better understand how partner opposition impacts contraceptive use among women of reproductive age in Ethiopia.

Place of Residence

Place of residence was significantly associated with contraceptive use in Ethiopia. For example, being from an urban residence was associated with an increase in the odds of using contraception by a factor of 1.78 (95% *CI* [1.70, 1.86]) in Ethiopia. Ferede (2013) found women living in more urbanized regions of Ethiopia were more likely to use modern contraceptives than women living in more rural areas.

Wealth Index

Wealth index was significantly associated with contraceptive use. This significant association with contraceptive use in the current study confirmed other research. For example, Adebowale et al. (2014) found 82.4% rate of modern contraceptive use among women in the richest wealth quintile compared to 66.8% in the poorest after controlling the effects of religion, education, and place of residence. According to Yigzaw et al.

(2015), contraceptive use was more than double among the richest women with a relative index of inequality compared to the poorest women in Ethiopia. However, Islam (2017) found high contraceptive use among women with low wealth index as compared to women with high wealth index in Bangladesh. The current research extends the knowledge of wealth index as a possible predictor variable of contraceptive use and justifies further research regarding this variable. Wealth index was found to be inconsistently related to levels of contraceptive use.

Access to Contraception

Access to contraception was not significantly associated with contraceptive use in Ethiopia. Achana et al. (2015) found that women who live two or more kilometers away from the nearest CHPS were less likely to use contraceptive methods compared to those who live within two kilometers of the facility. Similarly, Shiferaw et al. (2017) found high contraceptive use among women who live close to health facilities that offer a wide range of contraceptive options compared to those who live farther from health delivery posts with limited options. Achana et al. (2015) found a nonlinear relationship between spatial proximity to the nearest health facility and contraceptive use, suggesting that women do not necessarily have their contraceptive services at the nearest facility. These inconsistent findings suggest the need for further research.

Women Empowerment

Women empowerment was not significantly associated with contraceptive use in the logistic regression analysis. This non-significant association between decision-making power, or women empowerment, and contraceptive use disconfirmed the findings

of Solanke et al. (2015) who found that empowered women were more likely to use contraceptive than un-empowered women. Similarly, Ameyaw et al. (2017) found that high contraceptive use among women who were not deciding alone on healthcare and contraceptive use than their counterparts. Sexually and economically empowered women were more likely to use contraception than less empowered women (Kibira et al., 2014). The odds of using contraception among empowered women were double compared to women who had no power over reproductive health and knew less about their reproductive and sexual rights (Kibira et al., 2014). Previous studies found a positive association between women's empowerment and contraceptive use. The current findings suggest the need for further research about decision making power or women empowerment and contraceptive use improve contraceptive uptake among women of the reproductive age group in Ethiopia.

Socioecological model

Applying the socioecological model to this study, evidence was found that individual factors (age, marital status, education, and religion) and community factors (place of residence and wealth index) were significantly associated with contraceptive use in Ethiopia. According to the constructs of the socioecological model, health behavior or prevention were influenced not only at the individual but at the community levels of influence. The effective use of the socioecological constructs in the family planning program design could potentially improve contraceptive use across different age groups, marital status, level of education, religious beliefs, place of residence, and wealth index in Ethiopia. The effective tailoring of the socioecological construct driven family

planning program toward individuals and communities based on consideration of age groups, marital status, level of education, religious beliefs, place of residence, and wealth index could potentially enhance contraceptive use in Ethiopia.

Limitations of the Study

The data used for this study was secondary data originally obtained as part of the 2016 Ethiopian Demographic and Health Surveys. Secondary data can create limitations to a study, as the data were not originally collected for the purpose of this research. Other limitations included reporting and recall bias, particularly for age or other retrospective data relying on memory of a past event. Data quality checks were conducted continuously in order to improve instruments, to assure trained field personnel, to use concurrent data entry and editing, and to provide feedback to interviewers during field administration of the instrument. As long as the biases are fairly random, the aggregate estimates of indicators will be fairly adequate, but individual-level data will have to be interpreted more carefully, especially when making causal interpretations. The disadvantage of using a standardized questionnaire is that there are limited opportunities to adapt the questionnaire to be locally relevant. Additions, deletions and changes are made in every DHS survey, but the number of modifications is limited in order to maintain comparability, limit complexity of the survey, and keep the length of the questionnaire within limits. DHS do not always report availability, utilization and frequency of utilization of health services and health care delivery as well as health services accessibility. In addition, no data on quality of care are collected.

Recommendations

This secondary data analysis looked at the 2016 Ethiopian Demographic Health Surveys data. Cross-sectional surveys were subject to reporting and recall biases. The use of a standardized questionnaire was characterized by limited opportunities to adapt locally relevant survey questions. In-depth interviews and focus group discussions would have been important to qualitatively analyze participants' responses. Another consideration for future research is evidenced by the inconsistency and contradictions in the associations between socioecological predictors and contraceptive use. More research is needed to improve the knowledge of contraceptive use in Ethiopia because cross-sectional study designs are limited to a single point in time. Cohort study designs could provide robust evidence that socioecological predictors can play a causal role in contraceptive use. Lastly, mixed methods, the use of qualitative and quantitative data analysis could provide more information how interpersonal factors (partner's attitude and opposition) and societal factors (access to contraception and women's empowerment) affect contraceptive use that could potentially advance contraceptive research in Ethiopia.

Implications for Professional Practice and Social Change

This study provides important information to professional practice in family planning, maternal and child health, and reproductive health. The study findings could be potentially used to develop and test family planning program strategies to improve contraceptive uptake across women of different demographic and socioeconomic status. The findings of this study could also be used to develop family planning program interventions targeting the improvement of contraceptive coverage among women within

high-risk age groups such as aged 15 to 19 years, uneducated, unmarried, being a traditional religious believer, hard to reach and poor rural women. Evidence found from this research could be used to enhance the knowledge of family planning program planners.

For example, the study of contraceptive use by age group has significant implications for public health planners to tailor better family planning program intervention to improve contraceptive use among young women aged 15 to 19 years in Ethiopia. There is a growing body of evidence that shows the need to pay attention to the psychological and socioeconomic needs of young women aged 15 to 19 to increase contraceptive prevalence (Darroch et al., 2016). New knowledge discovered from this study could provide insights into family planning researchers and planners to tailor interventions that increase contraceptive use among high-risk young girls and mothers aged 15 to 19 years.

The research from the current study is an original contribution to the field of family planning. The study found an increase of one in five-year age group was associated with an increase in the odds of contraception use by a factor of 1.13 (5% *CI* [1.00, 1.26]). School based family planning programs and education should be designed to increase contraceptive use among young women aged 15 to 19 years in Ethiopia. An increase of one in highest educational level was associated with an increase in the odds of contraception use by a factor of 1.15 (95% *CI* [1.00, 1.30]). Less educated women were less likely to use contraception than other groups. Programs designed to increase contraceptive use among less educated women should be integrated with community-

based family planning services. Further, an increase of one in wealth index combined was associated with an increase in the odds of contraception use by a factor of 1.65 (95% *CI* [1.15, 2.15]). Women with less wealth index combined were less likely to use contraceptive than other groups. Family planning programs should target poor women with limited access to contraception methods. Being married was also associated with a decrease in the odds of contraception use by a factor of 0.15 (95% *CI* [0.00, 0.30]). Interventions designed to increase contraceptive use among married women should be integrated with reproductive health services and couples counseling services. In addition, being from an urban type of place of residence was associated with an increase in the odds of contraception use by a factor of 1.56 (95% *CI* [1.50, 1.61]). Women in rural Ethiopia were less likely to use contraception than other groups. To increase contraceptive use among hard- to- reach rural women, community-based contraception distribution programs should be implemented.

Those findings will provide baseline information for future researchers, public health planners, policymakers, researchers, and communities to implement evidence-based family planning programs that will bring effective and sustainable positive social change on contraceptive use.

Family planning is an effective public health intervention that plays a vital role in the reduction of infant, child, and maternal mortality, unwanted or unintended, high-risk pregnancies, unsafe abortion, as well as reduce high fertility rates and rapid population growth (Ali et al., 2014; Aremu, 2013; Tilahun et al., 2013). Moreover, increased contraceptive use reduces maternal, infant, and child mortality rates in developing

countries by 40, 10, and 21% respectively in the past two decades by reducing only unintended pregnancies (Cleland et al., 2012). However, contraceptive use or family planning is beyond improving maternal and child health. It can unlock women's potential and transform their life, families, communities, and society. Contraceptive use can improve girls and women's educational attainment, employment, and socioeconomic status (Canning & Schultz, 2012; Habumuremyi & Zenawi, 2012; Onarheim, Iversen, & Bloom, 2016). Current evidence shows that family planning improves health, reduces poverty, and empowers women (Bongaarts et al., 2012). Family planning facilitates fertility decline, improves health, and boosts economic development.

The potential social change implications of this study are based on the association between the socioecological determinants and contraceptive use. Results of the study can potentially help address socioeconomic and demographic disparities in contraceptive use among young women aged 15 to 19, less educated, married, of traditional regions, rural, poorest socio-economic status and tailor family planning program interventions to reduce their burden of unintended pregnancy, maternal and child mortality and rapid population growth in Ethiopia. It will assist policymakers and family planning program managers to effectively evaluate and design those targeted family planning programs and strategies for improving maternal and child health in Ethiopia.

Long-term investment in women's reproductive health and family planning can have an economic benefit and reduce poverty because the health of mothers can affect the health of future generations (Onarheim, Iversen, & Bloom, 2016). Contraceptive use is essential for a healthy pregnancy as it has health benefits to the mother, child, families,

communities, and society at large (Peyman & Oakley, 2009). In addition, delaying or avoiding pregnancy using contraception has positive socioeconomic benefits and effects on women's education, empowerment, workforce participation thereby improving their income, family stability, mental health, and their child's wellbeing (Sonfield, Hasstedt, Kavanaugh, & Anderson, 2013; Onarheim et al., 2016). Improving women's education can lead to greater women's and family's economic independence, stability, earning power, and narrowing gender pay gap (Sonfield et al., 2013). Furthermore, empowering women to control their reproductive health can boost economic growth and development (Beekle & McCabe, 2006; Onarheim et al., 2016). Societal investment in women's reproductive health will result in better overall population health and a more productive workforce for generations.

Conclusion

Using data from the 2016 Demographic Health Survey in Ethiopia, this study examined the socioecological factors associated with contraceptive use among women aged 15 to 49 years in Ethiopia. In the bivariate analysis, seven out of eleven independent variables revealed a significant association with contraceptive use: age in 5-year groups, current marital status, highest educational level, religion, place of residence, wealth index and decision maker for using contraception. Variables that were not significantly associated with contraceptive use were 'contraception is woman's business,' 'women who use contraception become promiscuous,' husband or partner's opposition, and lack of access/ too far to service delivery points. In the logistic regression analysis, individual factors such as age, education, and marital status (married) as well as community factors

such as the type of place of residence (urban) and wealth index combined reliably predicted contraception use among women aged 15 to 49 years in Ethiopia.

Contraception use to delay or avoid pregnancy remains a major public health priority, and more research is needed to further enhance the knowledge gaps in the predictors of contraceptive use in Ethiopia. Furthermore, based on conflicting evidence found in previous research, there is a need for further research to decrease the contradictory evidence found in the literature on the predictors of contraceptive use. Although contraceptive use to delay or avoid pregnancy is the most cost-effective public health intervention, there is still low contraceptive use in Ethiopia. Evidence discovered from this study could potentially be used to enhance family planning programs designed to improve contraceptive use, reduce unintended pregnancy, and reduce total fertility rates and rapid population growth in Ethiopia. Results of the study could also potentially enhance family planning programs and contribute to positive social change by improving the lives of women, families, communities, and societies by increasing contraceptive use among young women aged 15 to 19 years, uneducated, unmarried, poor, and rural women and reducing unintended pregnancy in Ethiopia.

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