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Factors Predicting Obstetric Fistula Among Women 15-49 Years Old in Uganda

Fatmata Fofanah
Walden University

Walden University

College of Health Professions

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Fatmata Fofanah

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Review Committee
Dr. Peter Anderson, Committee Chairperson, Public Health Faculty
Dr. Hebatullah Tawfik, Committee Member, Public Health Faculty
Dr. Sanggon Nam, University Reviewer, Public Health Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
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Abstract

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Fatmata Fofanah

MSN, American Sentinel University, 2015

MS, University of Charleston, 2015

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Obstetric fistula is among the public health issues that are preventable and treatable, as evidenced by its elimination in industrialized nations. The aim of this quantitative, cross-sectional study was to use Andersen's behavioral model of health services utilization to examine the factors that predict the likelihood of experiencing obstetric fistula among women ages of 15 and 49 living in Uganda. Demographic risk factors (marital status, age at first pregnancy, level of education and income, and religious affiliation), medical risk factors (access to health care, distance from hospital, parity, and number of antenatal visits), the mode of delivery (C-section), and location of delivery were tested for the likelihood of experiencing obstetric fistula (dependent variable). Descriptive statistics revealed that 1.3 % of the study population had fistula. The logistic regression analysis showed that married women are more protected than their counterparts (AOR = 0.515, 95% CI [0.121-2.198], $p = 0.370$). Similarly, women who had access to health care were less likely to develop obstetric fistula (AOR = 0.661, 95% CI [0.282-1.554], $p = 0.343$). Chi-square test for these variables were significant ($p = 0.012$) but nonsignificant based on the multivariate logistic regression. Parity was the only variable that showed significance in the regression analysis (AOR = 3.424, 95% CI [1.000-11.716], $p = 0.050$). Thus, there is a need for more study in this area to further investigate these relationships. However, the study can be a catalyst in generating knowledge on the predictive factors for the development of obstetric fistula among this population and reduce how it affects the women among rural Ugandan communities, improving their lives and the lives of their families and communities leading to positive social change.

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Dedication

First and foremost, I want to express my sincere gratitude to God Almighty for guiding me through this journey. My dissertation work is dedicated to my loving husband, Abubakar Sidique Fofanah, my loving children (Gibril Abubakar Fofanah, Abubakarr Sidique Fofanah, Saidu Fofanah, Isatu Fofanah, and Bintu Fofanah), my loving mother Bintu Foday Kamara, and my late dad, Saidu Tarawally. You guys were my loudest cheerleaders on the bleachers! I would also like to express a very special feeling of gratitude to my daughter Bintu who never left my side throughout the whole process. Finally, I dedicate my dissertation work to my family and friends.

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Section 1: Foundation of the Study and Literature Review

More than 2 million women are affected by obstetric fistula worldwide (Barageine et al., 2014; Delamou et al., 2016; Lufumpa et al., 2018; Mselle & Kohi, 2015; United Nations Population Fund [UNFPA], 2018). In sub-Sahara Africa, there is an estimated life prevalence of obstetric fistula of 1.60 per 1,000 women of reproductive age to 3.0 cases per 1,000 (Delamou et al., 2016). Obstetric fistula refers to the development of a hole between the vagina and the bladder or the vagina and the rectum, which can either be referred to as vesico-vaginal fistula or recto-vaginal fistula or both (Lufumpa et al., 2018). Obstetric fistula occurs as a result of an obstructed prolonged labor due to lack of access to high quality obstetric emergency care in a timely manner (UNFPA, 2018). The result of this hole is leakage of urine, feces or both, in women who suffer from the condition (UNFPA, 2018).

Researchers have agreed that obstetric fistula is among the worst forms of maternal morbidity mostly in developing nations (Barageine et al., 2014; Changole et al., 2018; Saeed et al., 2014; Thorpe, 2017; Watt et al., 2014). Women with obstetric fistula are left to live their day-to-day lives faced with social discrimination, isolation, and loss of control due to constant leakage of urine and/or feces (Bashah et al., 2018; Khisa et al., 2017; Mohamed et al., 2018; Mselle & Kohi, 2015; UNFPA, 2018). The women could be driven to further poverty due to abandonment by husbands and families (UNFPA, 2018). Women with obstetric fistula also suffer symptoms such as skin ulceration, foot drop, infertility, and depression (Khisa et al., 2017).

Regular collection of good quality and relevant data at all three levels—individual, community, and country—is the best method of assessing the resources needed to address the burden obstetric fistula poses on affected women (Tuncalp et al., 2015). It is suggested that not only do cultural barriers prevent women with obstetric fistula from seeking assistance with their condition, but they bear the blame for the development of the condition (Changole et al., 2018; Mubukayi et al., 2016; Wall, 2012). This study could provide several positive social changes including creating obstetric fistula awareness among the at-risk population, women between the ages of 15 and 49 in Uganda. This study could guide policy makers and public health officials to implement appropriate decisions in preventing the development of obstetric fistula. My study could also provide targeted approach for the population at risk that could reduce or prevent the health threats for obstetric fistula development in Uganda.

Problem Statement

Obstetric fistula is among public health issues that are preventable and treatable, as evidenced by its elimination in industrialized nations (UNFPA, 2018). Studies show that more than 2 million women are affected by obstetric fistula worldwide (Barageine et al., 2014; Delamou et al., 2016; Lufumpa et al., 2018). The prevalence and incidence of obstetric fistula also continues to rise in sub-Saharan Africa with 50, 000 to 100,000 new cases every year (UNFPA, 2018). In 2005, Uganda was reported the third-highest prevalence of fistula worldwide, and an estimated 140,000 women were living with fistula by 2009 (Bomboka et al., 2019). Two percent of Ugandan women presented with symptoms of genital tract fistula in 2011 (Goh & Krause, 2016). However, though the

data on which to base projection of future needs of these vulnerable women of Uganda are available, more work still needs to be done on this subject. Literature exists on this topic (Changole et al., 2017; Delamou et al., 2016; Drew et al., 2016; Kaplan et al., 2017; Khisa et al., 2017; Phillips et al., 2016; Wilkinson et al., 2018), but among the studies on the predictive factors for the likelihood of developing obstetric fistula, none of the studies examined these predictive factors among women 15 to 49 years old living in Uganda (Andargie et al., 2017). However, the burden of maternal morbidity and mortality has been related to predictive factors including sociodemographic factors (Wall et al., 2017). A better understanding of those factors could guide public health policy and practices that improve health care quality (Wall et al., 2017). Preventing obstetric fistula can mean that women would not undergo surgical procedures that could carry risks and may also be costly (Lufumpa et al., 2018). My study could lead to understanding the epidemiology of obstetric fistula and its determinants, which could be of help in designing appropriate interventions based on scientific evidence. Through my study I also identified the factors associated with the predictive factors in Uganda using multiple logistic regression models.

Purpose of the Study

The aim of this quantitative, cross-sectional study was to examine the factors that predict the likelihood of experiencing obstetric fistula among women ages 15 through 49 living in Uganda using data on confirmed fistula cases in the country. I addressed the impact of the independent variables—demographic risk factors (marital status, age at first pregnancy, level of education and income, and religious affiliations of participants),

medical risk factors (access to health care, distance from hospital/nearest health facility, parity, number of antenatal visits), the mode of delivery (C-section), and the location of delivery—on the likelihood of experiencing obstetric fistula (dependent variable). The covariate for this study was the geographical location of participants, which includes the type of residence (rural or urban) of the respondents. The study could be beneficial in shedding light on the role these independent variables play in the likelihood of experiencing obstetric fistula among the target population. The study may provide information that can be used by maternal health care provider including nurses, physicians, policy makers, and other stakeholders to promote the effectiveness of existing programs. The study could also serve as an addition to the understanding of sociocultural norms and risky behaviors that could lead to the development obstetric fistula among women 15 to 49 years old in Uganda. Even more important, the study can provide evidence for targeted interventions to reduce or even prevent the likelihood of developing obstetric fistula among this population.

Research Questions and Hypotheses

Research Question 1: What is the association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations.) and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants?

$H_0$1: There is no association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the

likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants.

H_a1: There is an association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location.

Research Question 2: What is the association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits) and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants?

$H_0 2$: There is no association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits,) and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants .

$H_a 2$: There is an association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits) and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Research Question 3: What is the association between mode of delivery (C-section and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants?

$H_0$3: There is no association between mode of delivery (C-section) and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants.

H_a3: There is no association between mode of delivery (C-section) and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Research Question 4: What is the association between location of delivery and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants?

$H_0$4: There is no association between location of delivery and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants.

H_a4: There is an association between location of delivery and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Conceptual Framework: Andersen's Behavioral Model

Andersen's behavioral model was first developed in the 1960s and aims to discover conditions that facilitate or impede the utilization of health care (Andersen, 1995). The key constructs in my study were demographic risk factors, medical risk factors, mode of delivery, and location of delivery that were guided be the model to explain the predictive factors for the likelihood of developing obstetric fistula. Andersen's model proposes that access to and use of health services by an individual is a

function of three characteristics including predisposing factors, enabling factors, and need factors (Azfredrick, 2016). The predisposing factors in this study were age at first pregnancy, marital status, parity and religious affiliations. Level of education and income (wealth indicators) were the enabling factors, and the need factors represented medical risk factors such as access to health care, location of delivery, and the mode of delivery.

Andersen's behavioral model has been used in many settings including African countries (Alexander et al., 2015; Azfredrick, 2016; Babitsch et al., 2012; Jahangir et al., 2012; Li et al., 2016; Petrovic & Blank, 2015). For instance, Azfredrick (2016) utilized this model in in southeastern Nigeria to examine the use of reproductive health services by adolescent girls. This model was therefore appropriate to use in Uganda. Antenatal care (ANC)/access to healthcare, one of the independent variables that was examined in the study, is a strategy used to encourage pregnant women to utilize health services during which process specific interventions are put in place to assist in anticipating a desired outcome of the pregnancy: a healthy mother and healthy baby. In the same process, pregnancies that require further interventions could be identified and necessary steps taken to attain a healthy outcome. Andersen's model is about presenting the different parts of the health care system, sociodemographic, socioeconomics, and the utilization of health services (Andersen, 1995).

The Nature of the Study

A quantitative approach with a the cross-sectional design was used to determine whether demographic factors (marital status, age at first pregnancy, level of education and income, religious affiliation), medical risk factors (access to healthcare, distance

from hospital/nearest health facility, parity and number of antenatal visits), mode of delivery (C-section), and location of delivery were associated with the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda. The 2016 Uganda Demographic Health Survey (UDHS) secondary data set collected at National level in Uganda between the periods of June 20, and December 16, 2016 on obstetric fistula patients was used to examine these risk factors associated with the likelihood of developing obstetric fistula among women 15 to 49 years old in the country (Creswell, 2009). The method was appropriate for this study because it aligned with the research question and purpose, it was efficient, and less time was required. The Ugandan Ministry of Health/Uganda Bureau of Statistics (UBOS) is a reputable source of data because standardization and comparability of surveys across the districts in the country and time is ensured (DHS, n.d.). To ensure external validity, the DHS primary data collection procedures were statistically correct to enable generalization of findings of the study and minimize threats (DHS, n.d.; Frankfort-Nachmias & Leon-Guerrero, 2015). The researchers ensured that the sample surveyed in each region contributed to the size of the national sample in proportion to the size of the region. The researchers also minimized threats to validity by ensuring that the data were collected and verified by different stakeholders at various levels. They employed trained supervisors, team leaders, interviewers, and reserve interviewers, to minimize external validity threats at field level. Thus, the UBOS coordinated, implemented and monitored the entire survey process. This study further addressed the threats to external validity by generalizing the findings that apply only to similar population groups and settings (DHS, n.d.).

The Walden Institutional Review Board (IRB) was contacted via email to inquire about ethical procedures regarding data collection methods. The board recommended starting conversations with the country of study to ascertain what is needed to obtain their approval. Authorization to use the data from the UBOS was obtained by providing them a brief description of the study using their website. Approval was obtained to use the UDHS data, which can be obtained from the ICF Macro Website. Prior to data collection, the data originators sought informed consent from all the study participants after detailed explanation and description of all related issues to the study were accessed by the respondents. Consenting participants demonstrated their consent prior to the commencement of the interview, while respondents who were eligible but unwilling to participate in the study were excluded (UBOS-ICF, 2018). Therefore, after obtaining ethical clearance from Walden's Institutional Review Board (IRB), I utilized this reliable and credible data, which contains all my variables of interest for this study, according to the UDHS data dictionary. Reliability of the secondary data source and accuracy was ensured by using this data.

The statistical analysis involved the employment of multiple regression analysis to determine levels of prediction among the variables. The covariate in this study was geographical location of participants because it might impact the relationship between the independent variables and the dependent variable. Women residing in the rural areas may have little or no access to quality emergency obstetric care versus their counterparts in the urban areas.

Data Collection

The 2016 DHS data collected by the UBOS over a 6-month period between June 20 and December 16, 2016, Ministry of Health, in Uganda and combined survey data presented itself as the best secondary data for this study analysis (Creswell, 2009). These included records from antenatal, postnatal clinics, and other visits to health care establishments. This is information gathered by the UBOS and other credible non-governmental organizations providing health care to the Ugandan community and is available to the public (World Health Organization [WHO], 2019). I utilized the figure of 18,506 eligible women as my population size for this study period. The sample for this study was all the people that have been interviewed with fistula. This was the number of the people diagnosed with obstetric fistula in the DHS data that meet my criteria. That is, women between the ages 15 to 49 living in Uganda within the time period of the survey and after accounting for missing values via multiple imputation. These include the women who were included in the different surveys taken by health clinics and entities including the UBOS and Ministry of Health of Uganda.

Data Analysis

I used secondary DHS data set from the UBOS. Data were analyzed statistically conducting a descriptive analysis of women 15–49 years old in Uganda. Variables were assessed using frequency distributions to determine their distribution level and to ensure that the differences can be understood clearly (Laerd Statistics, 2013). Multivariate logistic regression analysis was used to determine the effect of the independent variables

or the predictive risk factors of obstetric fistula for women between the ages of 15 and 49 in Uganda on the dependent variable (obstetric fistula; Laerd Statistics, 2013).

Variables and Measures

Dependent or the Response Variable

I measured the dependent variable (obstetric fistula) as presence of obstetric fistula = 1 and absence of obstetric fistula = 0 (categorical, nominal). These were tested via multiple logistic regressions.

Explanatory or Independent Variables

The predictor/explanatory variables included demographic factors, medical risk factors, mode of delivery, and location of delivery. Independent or predictor variables were variables which were presumed to have an impact on or determine an outcome variable. Therefore, my study's measured independent variables were demographic risk factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), medical risk factors (access to healthcare, distance from nearest health facility, parity, and number of antenatal visits), mode of delivery (C-section), and location of delivery (categorical, nominal).

Marital status was measured as never in union = 0, married =1, living with partner = 2, widowed = 3, divorced = 4, no longer living together/separated = 5, and missing value = 9 (categorical). Age in years at first birth was measured as 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 45–49 (continuous). Level of education was measured as no education = 0, primary = 1, secondary = 2, more than secondary = 3, don't know = 8, and missing = 9 (categorical). Respondents' income was measured as not paid = 0, cash only

= 1, cash and in-kind = 2, and in-kind (categorical). Religious affiliation was measured as No religion = 0, Anglican = 1, Catholic = 2, Muslim = 3, Seventh Day Adventist = 4, Orthodox = 5, Pentecostal/Born Again/Evangelical = 6, Baha'i = 7 , Baptist = 8, Jewish = 9, Presbyterian = 10, Mammon = 11, Hindu = 12, Buddhist = 13, Jehovah's Witness = 14, Salvation Army = 15, Traditional = 16, and Other = 96.

Access to healthcare was measured as getting medical help for self is no problem = 0, big problem = 1, not a big problem = 2, and missing value = 9. Distance to hospital/nearest health care facility was measured as *getting help for self: distance*, with the following options: no problem = 0, big problem = 1, not a big problem = 2, and missing value = 9. Parity of respondents was measured as responses to having another pregnancy: no = 0, yes = 1, missing = 9, not applicable = (NA). Number of antenatal visits was measured as No antenatal visits = 0, don't know = 98, missing = 99, not applicable = (NA). Mode of delivery measured as delivery by C-section no = 0, yes = 1, and missing value = 9.

Location of delivery measured as place of delivery: home =10, respondent's home = 11, other home = 12, public sector = 20, government hospital = 21, government health center = 22, other public sector = 26. private sector = 30, private hospital/clinic = 31, other private sector = 36, other = 96, missing = 99, not applicable = (NA). Finally, geographical location of respondent included the type of residence (rural or urban) of the respondents. This variable was selected for inclusion as potential covariate because it might influence the relationship between the independent variables and the dependent variable. It was measured as urban = 1 and rural = 2.

I used multivariate logistic regression model to answer my three research questions. Multivariate logistic regression was a good fit to answer my research questions because it can accommodate more than two explanatory variables in a model (Gertsman, 2015). It was also a good fit for assessing binary/categorical variables, and it helped me to test the association between my dependent variable and independent variables while adjusting for confounders (Gertsman, 2015). I used statistical analysis to compare characteristics of women 15 to 49 years old among each other using the chi-square tests for categorical data, and a two-sided p-value < 0.05 was considered statistically significant. Moreover, bivariate and multivariate logistic regression models were performed using SPSS version 25.0 for Windows (IBM), software to estimate odds (ORs) for associations between potential risk factors for obstetric fistula with 95% confidence intervals (CIs). I evaluated significant variables in bivariate analysis in multiple logistic regression models. *P*-values of less than 0.05 were considered to indicate statistical significance.

Literature Review

Obstetric fistula is among the major public health issues that have affected Uganda, a poor nation in East Africa. It has been estimated that nearly 100,000 new cases occur each year (UNFPA, 2018). Some estimates indicate that up to 2 million women's quality of life have been affected by obstetric fistula (Browning et al., 2014). A simple and sensitive method of determining the predictive factors that place women at risk of developing obstetric fistula could help to reduce the rate of injury (Browning et al., 2014). Facility-based studies have taken a dominant role in identifying epidemiological

evidence regarding risk factors for developing obstetric fistula (Maheu-Giroux et al., 2016). Sociodemographic characteristics, including marital status, age at first pregnancy, religious affiliation, level of education and income, and parity (i.e., number of full-term pregnancies) have been reported as predictive factors of this condition (Andargie & Debu 2017; Barageine et al., 2014; Basheer & Pumpaibool; 2014; Chandra-Mouli et al., 2018; Heller, 2017; Quedraogo et al., 2017).

Though there is literature on this topic (Changole et al., 2017; Khisa et al., 2017; Kaplan et al., 2017; Wilkinson et al., 2018; Phillips et al., 2016; Delamou et al., 2016; & Drew et al., 2016), there are still gaps, especially regarding these factors that predict the likelihood of developing obstetric fistula among women 15 to 49 years old living in Uganda such as demographic risk factors (marital status, age at first pregnancy, level of education and income, and religious affiliation, medical risk factors (access to health care, distance from hospital/nearest health facility, parity, and number of antenatal visits), mode of delivery (spontaneous virginal delivery, C-section), and location of delivery. Lack of this information among this target population could lead to the likelihood of developing obstetric fistula. This study addressed this gap by utilizing validated data on women diagnosed with obstetric fistula and data from existing health systems to fully quantify the extent to which particular cultural and social behaviors contribute to the prevalence of obstetric fistula in these individuals. By understanding and addressing the various behavioral risks of the target group, age-specific interventions that mitigate its prevalence could be informed (Delamou et al., 2016). The results could also decision makers in this area to organize the most appropriate health intervention programs to

combat/reduce the prevalence of obstetric fistula, as well as better manage those already affected (Delamou et al., 2016). Thus, the purpose of the study was to provide information that can be used by maternal health care nurses, physicians, policy makers, and other stakeholders to promote effectiveness of existing

This section of the literature review includes (a) a description of the literature search strategy, and review of the theoretical frame work of the study; (b) a review of studies that present demographic characteristics of the target group that may increase the risk for the likelihood of developing obstetric fistula; (c) a synthesis of the research studies; and (d) summary of the type of research approaches utilized in this literature, summaries of search results, and a description of a gap in research that the study addressed.

Literature Search Strategy

This literature review was aimed at providing the context and support of the need to do an inquiry into the issue of obstetric fistula and also analyze scholarly thinking about the topic. I used peer-reviewed articles that are available on the factors that affect the development of obstetric fistula in the study population, and I focused on impact of the independent variables demographic factors (marital status, age at first pregnancy, level of education and income, religious affiliations), medical risk factors (access to healthcare, distance from the nearest health facility, parity, number of antenatal visits), mode of delivery (C-section), and location of delivery on the dependent variable (obstetric fistula) to answer the research questions.

I conducted an online search to find studies on obstetric fistula in sub-Saharan Africa, Asia, and other parts of the world that are faced with this issue using the study variables. Due to limited papers found within Uganda, the search was widened to the whole world. Additionally, even though results from this search were restricted to articles published from January, 2012 and August, 2019, dates of some articles used for this review were extended to dates further back. Unpublished materials from the Ministry of Health Uganda, UBOS, and local partners were also included in the literature search.

Furthermore, I evaluated existing studies and ascertained gaps in the literature regarding obstetric fistula in sub-Saharan Africa. I also explored the literature on the theoretical bases for my study. Therefore, for this literature review, I searched electronic databases through the Walden University Library including MEDLINE with full text, CINAHL Plus with full text, ProQuest & Medical Collection, and Google scholar. I also identified articles from academic, government, and other institutional websites including WHO, Centers for Disease Control and Prevention (CDC), and the Ministry of Health of Uganda.

Inclusion and Exclusion Criteria

Studies written in English that discuss interventions to prevent obstetric fistula in the sub-Saharan African region, along with their associated barriers and facilitators were included in this literature review (Lufumpa et al., 2018). Moreover, research articles that defined majority of the study population as women between the ages of 15 and 49 were included. Articles written in languages other than English were excluded.

Key Search Terms

After identifying the databases to search, I used the following key words to search for relevant literature: *obstetric, fistula, sub-Saharan, women,* and *prevention*. I also searched for keywords or combination of keywords including *marital status, Behavioral Model, level of education, prenatal care, antenatal care (ANC), access to health care, use of health services, facility-based delivery, traditional birth attendants , Andersen's Behavioral Model, parity, religious affiliation, geographical setting, Uganda,, Obstetric Fistula, Women, 15-49 years old, Pregnancy, Vesicovaginal fistula, Rectovaginal fistula, Sociocultural, primiparous, mode of delivery, cephalopelvic disproportion, C- section, spontaneous vaginal delivery, Uganda Bureau of Statistics, medical risk factors, nulliparous, primiparous,* and *multiparous status*.

Data Extraction

For this study, I reviewed independently extracted data on obstetric fistula, such as the country or region, data source, study participants, study design, study period, the theories used, strength and limitations, and obstetric fistula risk behavior as well as cultural behaviors that promote the development of obstetric fistula (Cowgill et al., 2015). Because peer-reviewed journals are organized and well written, making it easier to read and analyze, I ensured that all data were obtained mostly from such articles. Also, to obtain quality results, I ensured that data were mostly from peer-reviewed articles. They are also known to be widely used by renowned researchers and can have diverse information about specific studies at hand, and they are more valid and reliable (Voight & Hoogenboom, 2012).

Conceptual Framework

Although obstetric fistula has been eliminated in developed nations where people can access emergency obstetric care due to availability, it remains prevalent in many low-resource nations, including Uganda (Cowgill et al., 2015). Marital status, age at first pregnancy, level of education and income, and religious affiliation are among the several major health determinants that may promote the likelihood of developing obstetric fistula (Banke-Thomas et al., 2013). Medical risk factors (access to health care, distance from hospital/nearest health facility, parity, and number of antenatal visits), mode of delivery (C- section), and location of delivery could also be contributing factors to this major public health issue among the target population (Franz et al., 2017; Gleason et al., 2018; Pappa et al., 2019; Perlman et al., 2018). The application of a sound theoretical framework was required to investigate the predictive factors for the likelihood of developing obstetric fistula in this proposed cross-sectional study.

Determinant and intervention theories have been employed by various researchers to determine which variables to measure and the relationship that exist between those variables (Creswell, 2009; Glanz et al., 2015). Theories reviewed for this study included Thaddeus and Maine's 18 Three Delays Model, which postulates that delay is understood as having three phases (Baker et al., 2017). As researchers continue to make efforts to create frameworks to understand obstetric fistula, the three-phase delay model is another framework from which to understand women's experiences with obstetric fistula. The three-phase delay model identifies three sequential phases that lead to delay in seeking care (Safer et al., 1979). The first phase is the appraisal delay, which is the length of time

it takes the individual to appraise a symptom as an actual sign of an illness. The second phase is the time it takes to make the decision to seek health care from the time of illness. The third phase refers to the time frame within which the decision was made to seek health care until the care is received in a health care facility (Safer et al., 1979).

The next theory reviewed was the ecological model, which has been used by researchers to inform their studies because it is multifaceted with a relationship with personal, situational, and sociocultural factors (Gebresilase, 2014). The four explicit assumptions in the ecological model are necessary to combat obstetric fistula. The first assumption states that there are multiple components of the physical and social environment. It also points to personal attributes that impact health. The second assumption refers to the multidimensional aspect of the environment, and the third assumption refers to the varying levels of interactions between humans and their environment. The fourth assumption indicates that there is feedback across different levels of the environment and groups of people (Gebresilase, 2014). However, universal standards for selecting test procedures or criteria for validation is lacking in the ecological model along with environmental models rendering it the most common problem of these models (Rykiel, 1996). From my review, I realized that even with the available theories to use, not all of them and their concepts are appropriate for every single setting and behavior. Therefore, I selected Andersen's behavioral model.

Andersen's Behavioral Model of Health Service Utilization

In this study, I used Andersen's behavioral model of health service use to examine the association between demographic factors, medical risk factors, and mode of delivery,

and the likelihood of developing obstetric fistula among Ugandan women age 15 to 49. The model is appropriate in presenting the role that these factors have in the utilization of health services and hence the likelihood of developing obstetric fistula among the study population. According to Andersen's model, predisposing factors refer to the basic characteristics of the population, enabling factors are conditions that individual and social efforts may change, and need factors are most associated with health services utilization and reflect the characteristic of the condition (Kim & Lee, 2016), in this case at-risks pregnancy.

Predisposing characteristics refer to demographic characteristics of the individual including age, marital status, or gender that may contribute to biological needs of the individual for health care services utilization. Additionally, social structure may contribute to the need for health services due to the status of the individual, group membership, or their identity in their communities along with available resources in the physical environment. Individuals' health beliefs including their attitudes, values, and knowledge about health and health services may also impact their health choices. Therefore, the predisposing factors in this study include age at first pregnancy, marital status, parity, and religious affiliation.

Andersen (1995) referred to enabling factors as personal, familial, and community resources that must be present for an individual to utilize healthcare services. Availability of health care healthcare facilities, having a regular source of care (antenatal visits), region (distance from the hospital/nearest health facility), and availability of transportation are all enabling factors in healthcare utilization (Andersen, 1995).

However, there is also the expanded enabling vulnerable domain including the availability and use of public assistance and social services. Level of education and income are additional enabling factors for this study.

According to Andersen (1995), included in the need domain are both perceived need (self-perceptions) and objective appraisals (evaluated needs). Andersen also contended that perceived needs have been helpful in the explanation of care-seeking behaviors and adherence with medical adherence. However, objective appraisals are more important when it comes to the amount and type of treatment an individual needs after seeking the attention of a health care provider. The need factors for this study are medical risk factors such as access to health care, and the mode of delivery including caesarean delivery, and location of labor.

As in previous studies, I investigated the relationship between variables/predictive factors and the development of obstetric fistula among women 15 to 49 years old in Uganda (Chiavarini et al., 2014). The adoption of Andersen's behavioral model in this study was appropriate because it incorporated the distinction between various individual determinants like the predisposition of the patient, demographic risk factors (marital status, age at first pregnancy, parity) the ability of that patient to seek emergency obstetric services, (level of education and income) and possibly the level of risk such as medical risk factors (access to healthcare, distance from the hospital/nearest health facility, number of antenatal visits), mode of delivery(need for C-section), and the location of delivery (Chiavarini et al., 2014). If a person has access to regular source of

perinatal care, it reflects that potential accessibility of healthcare, demographic, social and attitudinal variables are complemented (Chiavarini et al., 2014).

Relevance of the Andersen Behavioral Theory. The relevance of Andersen's model is demonstrated by its use by other researchers. For instance, Jahangir et al. (2012) conducted a study to determine whether the utilization of clinical preventive services is associated with need, enabling, predisposing, and behavioral factors in Argentina, which the results supported. Similarly, a more recent study utilizing Andersen's model to investigate the use of health services by 3,065 adolescent girls from 33 secondary schools in southeast Nigeria indicated that the model can predict epidemic factors such as demographic risk factors (Azfredrick, 2016). Furthermore, a study in Australia was guided by the model to examine how Australian parents conceptualized the preventive health care of their children and its impact on access to preventive services (Alexander et al., 2015). The researchers noted that birth order of children, cultural health beliefs of parents, their personal health practices, and their relationships with health care providers, along with associated health service costs, determined the access of parents to preventive health care services (Alexander et al., 2015). Petrovic and Blank (2015) also used the Andersen and Newman behavioral model of health service to understand human behavior, development, and psychology to answers the questions that surround patient behavior within the patient-physician dyad among older people living with HIV and cardiovascular disease.

Given that inadequate utilization of health care serves as a contributory factor to the development of obstetric fistula, the basis for using the Andersen model of behavioral

utilization of health services is that it can be used in many areas of health services usage. However, it is important to keep in mind that the determinants of these preventive services (number of antenatal visits), must be analyzed taking into account the health system context in Uganda, as it is in any other health service (Jahangir et al., 2012). This literature review has revealed how Andersen and Newman (2005) broke down the components in a way that all three factors have to be present for the behavior to occur. The predisposing factors can be viewed as demographic variables including age, while level of education and social relationship (Marital status) are considered social factors. I examined the association between the independent variables in my study; Demographic risk factors (marital status, age at first pregnancy, level of education and income, religious affiliation, and parity), medical risk factors (access to health care, distance from nearest health facility, and number of antenatal visits), mode of delivery (C-section), and location of delivery, and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda.

The Andersen's Behavioral Model of Health Care Services' Utilization is very relevant to my study. It will guide the study design, analysis, and result interpretation of the association between the demographic risk factors (marital status, age at first pregnancy level of education and income, religious affiliation), medical risk factors (access to healthcare, distance from the nearest health facility, number of antenatal visits, and parity), mode of delivery (C- section), and location of delivery and obstetric fistula. It also helped provide extensive analysis of the risk factors of obstetric fistula by use of statistical test methods.

Literature Review of Key Variables and Concepts

Predisposing Factors

Predisposing factors are factors that reflect the propensity of individuals to utilize health services available to them (Li, Nong, Wei, Feng, & Luo, 2016). Babitsch et al. (2012) referred to those factors as demographic characteristics or risk factors. Also, Babitsch et al. (2012) referred to mental factors that include attitudes, values, knowledge about health and health services as examples of predisposing factors. Similarly, Li et al. (2016) used sociological factors like age, gender, ethnicity, marital status, and the size of the family in their study to examine the influencing factors related to the utilization of health services in individuals living in rural Guangxi, China, using the Andersen's model of health services utilization. Babitsch et al. (2012) also referred to the demographic and social composition of communities, cultural norms, collective and organizational values, and political perspectives are considered the contextual factors that predispose individuals to the use of available health services.

Obstetric Fistula and Marital Status

Researchers have identified marital status as a significant predictor of the likelihood of developing obstetric fistula (Andargie & Debu, 2017; Barageine, Tumwesigye, Byamugisha, Almroth, & Faxelid, 2014; Otoo-Oyortey, Norman, King, & Mahdi, 2014). In a recent study to examine factors associated with the prevalence of obstetric fistula in Ethiopia, Andargie and Debu (2017) found that women whose first marriage fell between the ages of 15 and 19 years old were 87.4% less likely to develop obstetric fistula than those whose first marriage was at an age ranging below 15 years of

age. In the same study the researchers indicated that women who first married at age ranging between 20 to 24 years old were 81% less likely to experience obstetric fistula that those who were married before the age of 15 when controlling for other variables in the logistic model. Also, in their study aimed at examining the risk factors for obstetric fistula in West Uganda, Barageine et al. (2014) indicated a significant association between being single and developing obstetric fistula compared to being married. In a qualitative study using 20 women who had previously had repair of obstetric fistula in Malawi, Drew et al. (2016) found 80% of the study population to be married prior to the development of the fistula.

Similarly, a literature review of both quantitative and qualitative data from relevant obstetrics and gynecology websites and journals to gather evidence on causes and consequences of obstetric fistula in Ethiopia, by Tollosa and Kibret (2013) revealed a statistically significant association between marital status and experience of obstetric fistula (p-value<0.001). In another study, Lufumpa et al. (2018) found that cultural practices around marriage played a key role in the perpetuation of obstetric fistulas sub-Saharan Africa. The researchers also found that dowries decreased with age of the bride in some cultures which served as an incentive for parents to give their daughters in marriage at a younger age. Furthermore, Delamou et al. (2016) examined the estimated proportions of failure of fistula closure and incontinence among women undergoing obstetric fistula repair in Guinea. The researchers found that majority of the obstetric fistula patients were married (n = 523, 69.4 %).

In addition, Basheer and Pumpaibool (2014) revealed age at first marriage as a significant factor in the occurrence of obstetric fistula in Kebbi State, Nigeria. In their study of fistula and socio-demographic characteristics, Basheer and Pumpaibool (2014) found age at first marriage to be a significant factor in the occurrence of vesico vaginal fistula. Almost all of the women with vesico vaginal fistula got married within the age range between 12 and 15 years old in Kebbi state, Nigeria. The importance of child marriage in this case is the fact that a girl is more likely to get pregnant and deliver a baby that she is not physically and psychological prepared for, when that girl is married at a very young age (Pandya & Bhanderi, 2015). Even more important, Pandya and Bhanderi (2015) found that there is an increased rate of maternal morbidity and mortality in such young mothers. Despite the information provided by these researchers, they still did not provide information on how marital status can impact obstetric fistula among women 15 to 49 years old in Uganda. Such information is vital for understanding the association between obstetric fistula and marital status, and it needs to be further understood. Therefore, in my study, I propose to test the association between marital status and obstetric fistula fully and provide more insight into the relationship between these two to prevent fistula.

Obstetric Fistula and Age at First Pregnancy

Several studies have indicated a relationship between age at first pregnancy and obstetric fistula. Andargie and Debu (2017) and Chandra-Mouli et al. (2018) examined the determinant factors associated with obstetric fistula in Ethiopia and found that age at first birth had negative significant association with the incidence of obstetric fistula using

a logistic model ($p<0.001$). It was also indicated in this study that women who had their first birth within ages between 15 and 19 were 51.9% less likely to develop obstetric fistula than their counterparts whose first birth occurred at an age of <15 years. The likelihood further decreased in women whose first birth fell within the age range of 25 years and above at 86% less likely to experience fistula than those whose first birth was at an age range <15 years.

Similarly, Basheer & Pumpaibool (2014), revealed a significant relationship (p-value < 0.001) between respondents' age and occurrence of vesico vaginal fistula in their study out of Kebbi State, Nigeria. The age groups of 15-26 years were those mostly affected by vesico vaginal fistula, while majority of those between 27 and 38 years did not have vesico vaginal fistula (Basheer & Pumpaibool, 2014). In their findings, the researchers clearly stated this fact by the indication of significant association between the occurrence of VVF and age at first delivery among the age group of 14-17 years (Basheer & Pumpaibool, 2014).

Despite the fact that these researchers have revealed significant association between age at first pregnancy and obstetric fistula, to my knowledge, there is still little or no information on the association between age at first pregnancy and obstetric fistula among women 15 to 49 years old in Uganda. Also, the necessary information to guide the target group from developing this condition is not provided. This study will therefore test the association between age at first pregnancy and the development of obstetric fistula. Having such information available could enhance the functioning of behavioral change programs especially the attitude towards child marriage prevention intervention activities.

Obstetric Fistula and Level of Education/Income

Several researchers including, Andargie and Debu (2017), Barageine et al. (2014) and Otoo-Oyortey et al. (2014), agreed that the educational level of the study population plays a role in the development of obstetric fistula. Similarly, Adefris et al. (2017); Keya, Sripad, Nwala, & Warren (2018); Lufumpa et al. (2018); WHO, (2019) identified an association between income and the likelihood of developing obstetric fistula in several different studies. In a systematic review to determine what barriers and facilitators to interventions to prevent the development of obstetric fistulas among women in sub-Saharan Africa, Lufumpa et al. (2018) found that the characteristics of areas where fistulas are most prevalent are low levels of education and financial instability. These communities are found to be far from educational and health facilities, and rely on subsistence farming (Lufumpa et al., 2018). Also, Keya et al. (2018) found that most women who had lived with obstetric fistula were homemakers, some with small family business or farms in both Nigeria and Uganda. They came to this conclusion in their study to explore financial, transportation, and opportunity cost associated with fistula management and repair in these countries.

Similarly, in a study to examine reasons for delay in decision making and reaching health facility among patients with obstetric fistula and organ prolapse in Gondar University hospital, Northwest Ethiopia, Adefris et al. (2017) found lack of economic empowerment among most women in rural Ethiopia as the most frequently mentioned reason for delay in seeking treatment. WHO (2019) agreed with these researchers by asserting that women who are disproportionately affected by obstetric

fistula are the poorest women in the community, whose voices are hardly heard by the people that matter. Lufumpa et al. (2018) also found financial limitations as a barrier to accessing preventive health interventions in five barriers to intrapartum care within the West African communities (Lufumpa et al., 2018). They also highlighted limited financial resources as the most frequently noted barrier to intrapartum care within the West African communities (Lufumpa et al., 2018).

Moreover, in their case study, Barageine et al. (2014) examined risk factors for obstetric fistula and revealed that a significant proportion of both cases and controls generally lacked any form of education or had low-level education (primary). Thus, the result indicated that while post primary level of education served as a protective factor for those that attain that level, low education of women in the same society was a risk factor for the development of obstetric fistula among the study population (Barageine et al., 2014).

Similarly, Andargie and Debu (2017) indicated an association between educational status and the incidence of obstetric fistula. They showed that women with primary, secondary and higher education were less likely to develop the condition than those with no education in Ethiopia, using data source from the Ethiopian DHS conducted in 2005 (Andargie & Debu, 2017). Andargie and Debu (2017) found an 89.3% less likelihood for a woman with primary education to develop obstetric fistula than those with no education (OR=0.107; 95% CI: 0.068-0.17). Andargie and Debu (2017) also found those with secondary and higher educated women with 80% less likely to experience obstetric fistula than those with no education (OR= 0.200; 95% 0.123-0.324).

Also, Basheer and Pumpaibool (2014) revealed a relationship between level of education and the occurrence of vesico vaginal fistula (p-value <0.001). Thus, the level of education of the study population could contribute to the likelihood for developing obstetric fistula.

A mixed-method study conducted in Niger in an eighteen month period to investigate treatment outcomes of 100 Nigerian women with obstetric fistula found 89% of the this study population had no formal education (Heller, 2017). Similarly, in another part of Niger, Quedraogo, Payne, Nardos, Adelman, and Wall (2017) reported a large number of poorly educated women with 94% of the group being illiterate with only 23% having any formal education. Furthermore, Delamou et al. (2016) used data extracted from medical records of fistula repairs between January 1, 2012 and September 30 in a retrospective study to examine the overall proportions of failure of fistula closure and incontinence among women with fistula undergoing repair. The findings of this study indicated that the majority of the sample population (691, 91.6%) had no formal education (Delamou et al., 2016). While these researchers have shown a link between level of education and income, and the development of obstetric fistula, this has not been ascertained by assessing this link in the development of this condition among the study population in Uganda. In this study I will test the association between level of the respondents' education and income, and the likelihood of developing obstetric fistula and provide more insight into this relationship. Also, my study could provide stronger evidence for the association between level of education and the likelihood of experiencing obstetric fistula among women 15 to 49 years old in Uganda.

Obstetric Fistula and Religious Affiliation

Researchers have linked the religious denomination of a women and the likelihood of developing obstetric fistula (Drew et al., 2016). In a study conducted to better understand the long-term quality of life and outcomes among women who have had fistula repair at the Fistula Care Center in Lilongwe, Malawi (Drew et al., 2016) and a link between religious affiliation and obstetric fistula was revealed. While women that belonged to Christianity and Islam (most common religious affiliation), were in lesser percentage, 55% of the study population belonged to other unpopular religious affiliations (Drew et al., 2016). Out of the 20 women 1(5%) was a protestant, 7(35%) belonged to the Catholic Church, and only 1(5%) was a Muslim (Drew et al., 2016).The conclusion here is that religious leaders from the prominent religious denominations can be influential in health education intervention programs because according to this study, women from less prominent denominations were affected more than those from the two prominent religious affiliations. Also, Mubukayi et al. (2016) conducted research in the Democratic Republic of Congo to examine factors that would assist in the prevention and early detection of at-risk pregnant women for obstetric fistula, and reported that 87% of the participants that have no fistula were more likely to be those with the same religious affiliation as their spouses. They also concluded that prominent religious denomination leaders are among influential people in health education intervention programs.

While there is an increasing trend observed in the prevalence of obstetric fistula among women 15 to 49 years in the sub-Saharan Africa, which requires understanding of the risk factors, there is need to establish the predictive factors that have increased the

risk of obstetric fistula among these women. Thus, while Drew et al. (2016) and Mubukayi et al. 2016 revealed in their studies that there is a link between religious affiliation and obstetric fistula they still did not provide information on how to use this information to prevent the likelihood of developing obstetric fistula among the study population. In my study I will test the association between religious affiliation and the likelihood of developing obstetric fistula among women 15 to 44 years old in Uganda. The information from my study could provide guidance to develop programs that could focus on addressing this particular issue. This study could provide stronger evidence for the association between religious affiliation and the likelihood of developing obstetric fistula among the study population.

Predisposing Factor (Age)

Pandya and Bhanderi (2015); Chandra-Mouli et al. 2018; Tebeu et al. (2012); UNFPA (2018); Devkota et al. (2018) agreed that age is a significant determinant of maternal and child outcome during pregnancy. Furthermore, report from UNFPA (2018) contended that about 90 percent of births in adolescent girls (15-19 years old) in developing nations occur among girls who are already married. While child marriage represents a host of health risks to these married girls whose bodies may not be ready for motherhood, it is often a precursor to early pregnancy (UNFPA, 2018). More importantly, access to sexual and reproductive health services is generally low in low income countries which makes complications from pregnancy and childbirth deadly (UNFPA, 2018). Also, Devkota et al. (2018) agreed that age is a contributory actor in the development of obstetric fistula because adolescent pregnancies have higher risks of

complications at childbirth for both mother and the unborn child. Additionally, not only does 95% of adolescent pregnancy occur in low-resource nations like Uganda, child and maternal mortality in those low-income nations is also caused by adolescent pregnancy (Devkota et al., 2018).

There is no doubt that these researchers have revealed an association between age at first pregnancy and obstetric fistula. However, to my knowledge, there is still little or inadequate information on the association between age at first pregnancy and obstetric fistula among women 15 to 49 years old in Uganda. Also, the researchers did not provide the necessary information to guide the target group from developing this condition. This study will test the association between age at first pregnancy and the development of obstetric fistula. Having such information available could enhance the functioning of behavioral change programs especially the attitude towards child marriage prevention intervention activities.

Predisposing Factors: Religious Affiliation

Watt et al. (2014); Walton, Akram, and Hossain (2014) indicated the significance of religious affiliation to health services utilization hence obstetric fistula development. Watt et al. (2014) reported reliance of participants on God and their religious affiliation to help them in times of difficulty. As Watt et al. maintained, religious affiliation and religious organizations are important in African communities both as social structures and sources of influence on how community members behave and what they believe in. As Watt et al. stated, with this commitment and engagement of populations in these communities, potentially missed opportunities should be caught to use these religious

leaders to sensitize the community about the awareness about obstetric fistula. In a similar way, using 14 Muslim women as participants located in Wichita, Kansas, Chicago, Illinois, and New York, New York, Walton, Akram, and Hossain (2014) suggested that Muslim women have preferences including making autonomous health care decisions, having a female health care provider, belief in the use of prayer, and being comfortable with the use of physical touch in medicine. In another study in Somalia the researchers reported on how some sub-Saharan African religious practices and cultures may cause powerlessness and dependency of women on their husbands (Mohamed, Ilesanmi, & Dairo, 2018). Mohamed et al. (2018) further explained how women especially those affected by obstetric fistula still struggle to survive and often wait for husbands for support or in some cases, their extended families because that's the way of life in such cultures. My study will examine an association between religious affiliation and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda.

Uganda, like other East African nations is where the Islamic and Christian communities are growing fastest in the world (Manguvo & Mafuvadze, 2015). These religious affiliations base their beliefs on books with verses that also dwell on the causes of disease or afflictions (Manguvo & Mafuvadze, 2015). While preventive measures to a disease or condition are crucial in public health, abiding by those preventive measures is central to a desirable outcome in combating that condition as in the case of obstetric fistula (Manguvo & Mafuvadze, 2015). Manguvo & Mafuvadze (2015) highlighted the significance of consulting both traditional leaders and religious leaders at all stages of

prevention intervention programs. Understanding these religious and traditional beliefs could be used as a guide to intervene in the development of obstetric fistula. My study will investigate the association between religious affiliation and the likelihood of developing this condition among the study population. Moreover, this study could provide stronger evidence that could guide intervention programs regarding this issue.

Also, the goal of health care providers to provide competent and quality care to their patients could be impeded by their assumptions regarding the cultural needs of various religious groups which could be detrimental to the patient in some instances which could lead to neglect, poor clinical decision making, and lacking the cultural understanding needed to provide competent and quality care (Mohamed et al. 2018; Watt et al., 2014). Therefore, it is crucial to explore health beliefs of the community particularly Muslim women to expose health beliefs perceived to be essential to the identity of these women (Drew et al., 2016; Mohamed et al. 2018).

Drew et al. (2016); Mubukayi et al. 2016 revealed a link between religious affiliation and obstetric fistula in their respective studies. However, they failed to provide information on how to use this information to prevent the likelihood of developing obstetric fistula among the study population. In my study I will test the association between religious affiliation and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda. The information from my study could provide guidance to develop programs that could focus on addressing this particular issue.

Obstetric Fistula and Access to Health Care

While access to skilled obstetric care is without a doubt referred to as a major tool to combat maternal morbidity and mortality, Mselle & Kohi (2015) identified women with obstetric fistula as those with poor access to obstetric care. Harrison et al. (2015); Kaplan et al. (2017); Lufumpa et al. (2018); Mselle & Kohi (2016) discovered access to health care to be associated with obstetric fistula. In fact, Harrison et al. (2015); Lufumpa et al. (2018); Mselle & Kohi (2015); agreed that improving high quality health care and emergency obstetric services could reduce the prevalence of obstetric fistula in low-income nations.

According to Umar, Kennedy, Tawfik, & Okenu (2017), the main purpose of all stages of natal care(antenatal, natal, and postnatal) is the provision of health promotion services such as health education, preventive measures in pregnancy, and detection and diagnosis of complications in pregnancy including obstructed labor. In order to accomplish this goal, there has to be access to quality health care. Umar et al. (2017) were in line with this study by maintaining that detecting and putting interventions in place to prevent abnormalities such as obstetric fistula is among other health promotion services offered during those visits.

Moreover, Keya, Sripad, Nwala, & Warren (2018) found a link between access to health care and the likelihood of developing obstetric fistula. These researchers conducted a qualitative approach in Ebony in Nigeria, Hoima and Masaka in Uganda between June and December, 2015, and discovered that women who suffer from multiple cost barriers often are less likely to access health care, and often seek emergency

obstetric care too late. Also, in a study in Tanzania, Mselle & Kohi (2016) found that 82% of the participants lived in rural areas, and had no primary education consisting 88% of the study population, and 100% of them were not employed. What all these studies have in common are inability to access quality health care due to distance and lack of money or source of income. While there is no guarantee that a pregnant woman will receive effective interventions in maternal health, the likelihood of receiving effective maternal health interventions during those visits increases for pregnant women that comply with this recommendation by the WHO (United Nations Children's Fund [UNICEF], 2018). Harrison et al. (2015) found poor access to quality health care to be among to root causes of the development of obstetric fistula.

One of the ways to prevent obstructed labor is timely and adequate prenatal care. Obstructed labor is what results in obstetric fistula formation. It occurs when the fetus cannot make its way through the birth canal due to the route being impeded (WHO, 2018). Obstructed labor is more common in the low-resource nations where adequate health care delivery facilities are inadequate, women have small statue and pelvis due to lack of good nutrition, and socioeconomic and cultural norms that frown at traditional antenatal care (ANC) and delivery (WHO, 2018). The WHO also refers to this condition as a leading cause of maternal mortality and that it accounts for 1 to 5 deaths/1000 live births. Emergency C- Section is required when obstructed labor occurs without which the mother may lose the baby and develop obstetric fistula at the same time (WHO, 2018). Given that the quality (timeliness, frequency, and content) of prenatal care is linked to poor maternal morbidity and mortality, and poor birth outcomes, it is recommended by

medical and public health professionals (Sidebottom, Hellerstedt, Harrison, & Jones-Webb, 2017).

Moreover, while Sidebottom et al. (2017) pointed to several known maternal risk factors such as poor prenatal care, adequate and timely prenatal care still remains a vital indicator of desired birth outcomes, maternal morbidity and mortality as well as infant deaths. Also, Harrison et al. (2015) found ANC follow up as one of the significant predictive factors for the prevalence of obstetric fistula using logistic regressions in Ethiopia. However, even though, these researchers went through great length to point out the significance of access to health care to that of positive pregnancy outcome, more work needs to be done to shed a much brighter light on the association between those two in Uganda. My aim is to examine and draw the attention of responsible parties to this important topic by clearly depicting the association between those, backed by statistical test result and explanation.

Obstetric Fistula and Distance from Hospital/Nearest Health Facility

Lyimo & Mosha (2019); Barageine et al. (2014); (Changole et al. (2018) discovered an association between obstetric fistula and distance from hospital or emergency comprehensive obstetric care. Lyimo & Mosha (2019) concluded that inaccessibility or unaffordability of public transportation to access a health care facility is among the causes of delay in seeking treatment among women with fistula. Many women reached treatment centers using motorcycles or walked long distances, and some even used other means of transportation. However, a woman who is already in labor that may have already been prolonged may, not have a chance if an emergency obstetric care

center is distance away. In a case study conducted in Western Uganda to compare background factors of women with obstetric fistula (cases) and those without (controls), Barageine et al. (2014) found that significantly more of the obstetric fistula patients in their study were living far from the nearest comprehensive Emergency Obstetric Care facilities in relation to the controls. The median distance between the patients and the controls was 17.5 km and 5 km respectively.

In their study in the region of Central Malawi to explore labor and childbirth experiences of women with obstetric fistula with their focus on accessibility of care in that region, Changole et al. (2018) found inaccessible health facilities as one of the risk factors for fistula formation. The study indicated that 15 out the 25 participants lived far from the nearest health facility, with most living 10 to 30 km away, and found it impossible to arrive in time, especially when labor is in progress. However, even though, these researchers have come up with these risk factors, more work is still needed to identify such predictive factors among women aged 15-49 years in Uganda and come up with recommendations for health policy decision making bodies and other responsible parties.

Obstetric Fistula and Parity

Researchers have identified a relationship between primiparous status and obstetric fistula (Jokhio et al., 2014). In a study in rural Pakistan using a population-based sample to estimate prevalence of obstetric fistula researchers reported a higher proportion of the sample population with obstetric fistula being primiparous (Jokhio et al., 2014). This finding is consistent with the retrospective study of Lilungulu, Gumodoka, Nassoro,

Soka, and Stephen (2018) using hospital records of obstetric fistula women that had their repair during the 2013 and 2014 period to examine predictors of obstetric fistula and factors that contribute to the development of this condition as well as birth outcomes of women undergoing repair at Dodoma Regional Referral Hospital in Tanzania. In this study, 47 (90.2%) out of the 52 women in the study were primiparous while only 5(9.6) were multiparous (Lilungulu et al., 2018). However, while their research to report a 6-month postoperative follow-up of 384 patients from the Danja Fistula Center aimed at investigating effect of parity on obstetric fistula, the report by Ouedraogo et al. (2017) made on parity contradicts reporting that over 50% (56.5%) of the study population sustained obstetric fistula during their subsequent deliveries compared to the 43.5% that sustained their injuries during their first delivery.

Despite the fact that these researchers have established a link between parity and the likelihood of experiencing obstetric fistula they failed to provide the exact information on whether multiparity or primiparity has a negative impact on the relationship. Thus, data gaps exist on the association between parity and the development of obstetric fistula in Uganda. In my study I will test the association between parity and the development of obstetric fistula while distinguishing one from the other. Therefore, this study could contribute to filling such knowledge gaps by providing clear information to guide intervention measures to prevent the development of obstetric fistula.

Obstetric Fistula and Number of Antenatal Visits

Yismaw, Alemu, Addis, & Alene (2019) and Andargie & Debu (2017) agreed that there is an association between ANC visits and obstetric fistula. Andargie & Debu (2017)

found follow up of ANC during pregnancy among the significant determinant factors of obstetric fistula in Ethiopia, in a study conducted to examine the determinant factors, associated with the prevalence of this condition in Ethiopia. The frequency of ANC visits was shown to have a statistically significant association with the incidence of fistula ($p<0.001$) in their analysis. In fact, they discovered that the odds of women experiencing the condition among those who had ANC for 7 days and or more during their pregnancy was 87.1% less likely to occur compared to those who had no ANC visit (OR=0.129; CI:0.053-0.310).

Similarly, in a study conducted to estimate the average recovery time of obstetric fistula and to identify its determinants, in Gondar University teaching hospital in Northwest Ethiopia, Yismaw et al., (2019) found that having history of ANC was one of the significant determinate variables which shorten the recovery time of obstetric fistula. The recovery rate for those who had ANC follow-up was higher than their fellow patients that had none by 95% (AHR =1.95, 95% CI = 1.39-2.73). From this analysis, they concluded that patients who had ANC visits experienced shorter recovery time than their counterparts that had no antenatal visits. While these two studies have different objectives, and the participants were at different stages of the condition, they both pointed to ANC to be helpful in both preventing the condition and shortening the recovery time from fistula repair surgery, even after occurrence of obstetric fistula (Andargie & Debu, 2017;Yismaw et al., 2019). My study will focus on examining this variable as a predictive factor before the occurrence of obstetric fistula. By doing so, the result of the study could shed light on these hidden factors in the communities.

Mode of Delivery (C-section)

Bashah, Worku, Yitayal, & Azale, (2019); Delamou et al. (2017); Franz et al. (2017); Lilungulu et al. (2018); found an association between mode of delivery and obstructed labor, hence obstetric fistula. Several factors are taken into consideration by health care providers/obstetric attending prior to recommending a mode of delivery in a clinical setting (Franz et al., 2017). Among these are fetal presentation, parity, the estimated weight of the fetus, and the patient's preference of mode of delivery (Franz et al., 2017). Lilungulu et al. (2018) reported that most of the fistulae reported during their retrospective analysis of hospital-based data conducted in Dodoma, was associated with prolonged difficult spontaneous vaginal delivery with only two associated with C-section and hysterectomy.

Also, mode of delivery was linked to obstetric fistula by Delamou et al. (2017) in a longitudinal study to examine the recurrence of fistula, pregnancy, and still birth following female genital repair in Guinea. They found that nine of the 50 women delivered by elective C-section, by the time of their follow-up post-surgery, 12 had stillbirths, and seven delivery-related fistula recurrences (Delamou et al., 2017). Handelzalts et al. (2018) also found a link between mode of delivery and childbirth experience in a study to examine the possible association between mode of delivery, childbirth experience, sexual functioning, and sexual satisfaction. In this study not only did the researchers found a significant link between childbirth experience and mode of delivery, but they concluded that the result of emergency C-section and instrumental

delivery in a worse childbirth than that of vaginal deliveries or an elective C-session (Handelzalts et al., 2018).

Thus, based on this result mode of delivery may lead to maternal morbidities that may be long term. Also, important to note is the proposition of the researchers; that differences in childbirth experience may not depend on the nature of the procedure but the difference lies between planned or unplanned. Planned refers to elective C- section or virginal delivery and unplanned refers to emergency C-section and instrumental (vacuum/forceps) deliveries (Handelzalts et al., 2018). This study outcome is in line with that of Handelzalts et al. (2017) in which they reported a more positive childbirth experience perceived by women who had a planned delivery than their counterparts that delivered by unplanned interventions in a study to compare the impacts of 'planned' delivery versus 'unplanned' delivery.

Furthermore, in a scoping review of studies reporting on pregnancy and childbirth in women post obstetric fistula repair in sub-Saharan Africa, that Delamou et al. (2016) conducted and searched relevant articles published between January, 1970 March, 31, 2016, they found 208 out of 459 women delivered by elective C-section, (45.3%), 176 women by emergency C- section (38.4%), and 75 women delivered by virginal delivery (16.3%). Also, while the evidence from this study does not offer precise estimates of the incidence of pregnancy and outcomes of pregnancy after fistula repairs, fistula recurrence was found to be a common maternal complication in included studies (Delamou et al., 2016). However, while these researchers have done an extensive work on this topic relating to mode of delivery and its impact on childbirth experience, much has not been

found on the relationship between mode of delivery and the likelihood of developing of obstetric fistula among Ugandan women aged 15 to 44. I used this study utilizing confirmed data from the UBOS to examine this association.

Obstetric Fistula and Location of Delivery

Andargie & Debu (2017); Khisa, Omoni, Spitzer, & Nyamongo (2017); Ouedraogo, Payne, Nardos, Adelman, & Wall (2017) found that place of delivery has a significant link with the incidence of obstetric fistula. In their study to examine the determinant factors associated with the prevalence of obstetric fistula in Ethiopia, Andargie & Debu (2017) found that women who delivered their babies in health centers were 80.3% less likely to experience obstetric fistula compared to their counterparts who delivered their babies from home, adjusting for other variables in the model. Also, in a study aimed at documenting the experiences of women who suffer from fistula in Kenya, Khisa et al. (2017) identified place of delivery as one of the six emergent themes predicting occurrences of obstetric fistula.

Moreover, in their quest to report a 6-month postoperative follow-up of patients from Danja Fistula Center in Niger, and assess factors associated with successes or failures with such operations, Ouedraogo et al. (2017) discovered that only 64 (18%) of the 384 patients in the study delivered at home. However, even though the rest of the participants (300, 82%) delivered at a health center, they arrived there too late. While these researchers have documented their insights on the impact of the location of delivery and the development of obstetric fistula this link has not been fully identified and adequately documented in

Obstetric Fistula and Geographical Location of Participants

Andargie & Debu (2017); Kumar et al. (2018); Mselle & Kohi (2016), found a link between geographical location of participants and the development of obstetric fistula. In a study to examine the determinant factors associated with the prevalence of obstetric fistula in Ethiopia, Andargie & Debu (2017) found that women who reside in the rural areas of Ethiopia had the higher prevalence of obstetric fistula compared to women who lived in urban area (21.2%).

In a study that used 16 Tanzanian women's stories to illustrate the challenges that cause them failure to access adequate obstetric care in a timely manner, Mselle & Kohi (2016) that most of the participants with obstetric fistula (82%) lived in rural areas prior to developing obstetric fistula. Furthermore, Kumar et al. (2018) conducted a retrospective study to analyze 311 patients with genitourinary fistulas after obstetric surgeries between January 2005, and January, 2018. They discovered that majority (90.4%) of the fistula patients were from the rural areas (Kumar et al., 2018). While these researchers did a great job in adequately documenting this vital link, not much has been said about this association in Uganda.

Definition of Variables

Dependent Variable

Obstetric Fistula: Obstetric fistula refers to the development of a hole between the vaginal and the bladder and/or rectum as a result of prolonged obstructed labor (Lufumpa et al., 2018).

Independent Variables

Demographic Risk Factors

Marital Status: Refers to being in or not being in a matrimonial relationship at the time of pregnancy. Their status regarding divorce, separation, cohabitation, or widowed is also considered (Delamou et al., 2016)

Age at first pregnancy: This refers to the number of years a woman has lived from the time of birth to the time she got pregnant (Andargie & Debu, 2017).

Level of education: The level of formal education the woman has attained (Barageine et al., 2014).

*Income**:*** Income is the earnings or other financial sources of an individual

Religious Affiliation: The denomination (Islam or Christianity) that the participant belongs to and their religious affiliation at the time of the obstetric fistula (Watt et al., 2014).

Medical Risk Factors

Access to health care: Involves all steps including gaining entry into the care delivery system, being able to access the location where health care services are provided, and being able access a health provider whom the patient trusts and can communicate with (Healthy People 2020, 2019).

Distance from the hospital: This refers to straight-line distance and drive-time to the nearest health facility (Jordan, Roderick, Martin, & Barnett, 2004).

Parity: Refers to the number of live births a pregnant woman had prior to developing obstetric fistula (Lilungulu et al., 2018).

Number of Antenatal visits: Number of visits to an obstetrician or a health care provider during pregnancy.

Mode of Delivery

Spontaneous Vaginal Delivery: A delivery is referred to as a spontaneous vaginal delivery when a pregnant woman goes into labor with or without the use of drug or techniques to induce labor, and delivers the baby in the normal delivery manner without vacuum extraction, forceps, or a cesarean section (Dresang & Yonke, 2015).

C- section: Refers to the delivery of a fetus through an abdominal and uterine wall incision after fetal viability (Kattel, 2018).

Location of Delivery

The location of delivery is the place where the actual delivery occurred, while duration is the length of time it takes the pregnant woman to go through all the stages of labor to the delivery of the placenta. Active labor may last for four to eight hours or even more, with the cervix dilating at approximately one centimeter per hour (Mayo Clinic, 2019).

Definition of Terms

Incidence: The occurrence of new cases of a condition (obstetric fistula) in a given population in a given time period (Maxwell, 2009)

Prevalence: The proportion of the population that have obstetric fistula (Maxwell, 2009).

Research Problem: This refers to the problem prompted the researcher to conduct the study (Creswell, 2014)

Risk factors: are any attributes, characteristics, or exposures that an individual may have that may increase the likelihood of experiencing a disease or an injury (WHO, 2019).

Significance of the study: Reflects how important the problem is for different audiences that may benefit from reading or applying the study (Creswell, 2009)

Target population: The specific set of individuals that is the target of study that the researcher is interested in investigating (Frankfort-Nachmias & Leon-Guerrero, 2015; Maxwell, 2009)

Socioeconomic Status: The ability of the ability of the individual to pay for health care services (Aschengrau & Seage III, 2014)

Rectovaginal Fistula: Refers to a hole between the vagina and the rectum as a result of prolonged obstructed labor (Lufumpa et al., 2018).

Vesicovaginal Fistula: refers to a hole between the vagina and the bladder as a result of prolonged obstructed labor (UNFPA, 2018).

Assumptions

One of the assumptions of this study was that all the districts of Uganda, complied with the disease and events protocol for all obstetric fistula patients. A second assumption is that the maternal morbidity review committee reviewed all morbidities and submitted to the UBOS, and the ministry of health. Also, it is assumed that the UDHS secondary data were complete and accurate and that the study participants answered the questions without bias. Moreover, I assumed that all cases of obstetric fistula in the country during the study period between June 20 and December 16, 2016 were reported to the respective

facilities for care including surgical repair and participated in the survey. I also assumed that all cases of obstetric fistula will readily reveal their religious affiliations to the respective field workers. The final assumption is that the participants answered the questions truthfully and did not provide answers that were socially desirable.

Scope and Delimitations

The study provided information on the risk factors for the likelihood for developing obstetric fistula among childbearing women 15 to 49 years old in Uganda, and did not provide information on men, other populations and age groups or sub group in the country. While data was collected from maternal health surveillance in Uganda from June 20 to December 16, 2016 , the main area of focus was on how demographic factors (marital status, age at first pregnancy, level of education and income, religious affiliations), between medical risk factors (access to healthcare, distance from hospital/the nearest health facility, parity, and number of antenatal visits), mode of delivery (C-section), and location of delivery affect the development of obstetric fistula in Uganda among women 15 to 49 years old. Thus, the study assessed the relationship between the dependent variable (obstetric fistula) and the three independent variables; demographic factors (marital status, age at first pregnancy, level of education and income, religious affiliations), between medical risk factors (access to healthcare, distance from hospital/the nearest health facility, parity, and number of antenatal visits), and mode of delivery (C-section), and location of delivery. Also, since the study utilized data collected on obstetric fistula cases during the period of 2016 to 2017 in Uganda, the

findings of the study was only generalized to the population of Uganda, and may not be generalized to other parts of Africa.

I chose the cross-sectional design because the aim of the analysis is to establish the associations, not the cause-and-effect relationships or the reasons for these associations (Creswell, 2009). The study was limited to establishing the relationships between independent variables and the dependent variable. The study group was women of childbearing age between 15 to 49 years old. This group was chosen because of its chances to experience obstetric fistula and to minimize the likelihood of recall bias.

Among other theories most related to the study of obstetric fistula is the Ecological Model. The Ecological Model has been used by researchers to inform their studies because it is multifaceted with a relationship with personal, situational, and sociocultural (Gebresilase, 2014). The focus of the ecological model on multiple levels of influences offers this model the advantage of broadening its options for interventions (Glanz, Rimer, & Viswanath, 2015). However, universal standards for selecting test procedures or criteria for validation is lacking in the ecological model along with environmental models rendering it the most common problem of these models (Rykiel, 1996).

I chose the Andersen's Behavioral Model of Health Services' Utilization as the most appropriate model for this study because it could guide the study design, analysis, and result interpretation of the association between demographic risk factors (marital status, age at first pregnancy, level of education and income, religious affiliations) medical risk factors (access to healthcare, distance from hospital/the nearest health

facility) ,and Mode of delivery (C-section), and location of delivery, and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Limitations

The study has some limitations. First, the data set collected during the time period of June 20 and December 16, 2016 will be more than two years prior to the study. Changes may have happened since that time including reality on the ground in Uganda. There may also be a chance of sample selection bias due to focus on only women with obstetric fistula that can afford to travel and pay for treatment at the health care facilities, or be present for the survey. The varying levels of recall capacities of the respondents (who have different levels of education) may also have had negative impacts on the study findings.

Additionally, the UDHS data set that was used in the study is preexisting which may lead to studying a sample size that may not be representative of the general population **(**Creswell, 2009). This could be a threat to the external validity. With that in mind, I utilized the figure of 18,506 as my population size for this study period. My sample was all the women that have been interviewed with fistula. This was the number of the people diagnosed with obstetric fistula in the DHS data that meet my criteria. That is, women between the ages 15 to 49 living in Uganda within the time period of the survey, and after accounting for missing values via imputation. Further, the various manipulation of the data set over the years may affect the data set in a way that they may be hard to code.

Another limitation was that my chance to define variables may have been limited due to the use of secondary data, which may limit the strength of data analysis**.** This could lead to differential misclassification which in turn could result in false positive or false negative (Gertsman, 2015). Also, non-differential misclassification usually results in a bias towards the null, which may lead to inability to observe an association when it actually exists. To reduce this bias, the professionals were well-trained for the job. These professionals and other individuals interviewed patients or family members utilizing a standardized case investigation forms and measurement techniques (UBOS-ICF, 2018).

Significance

The significance of the study to the target population in the Ugandan community, who value the health of adolescent girls, is that these girls are particularly at risk of experiencing obstetric fistula and other maternal morbidities and mortalities. Also, the result of the study could provide new information that suggests how existing programs could be modified to increase effectiveness in the reduction of the incidence of this condition (Delamou et al., 2016). Once the level of risk factors including demographic factors (marital status, age at first pregnancy, level of education and income, religious affiliations), medical risk factors (access to healthcare, distance from hospital/the nearest health facility, parity, and number of antenatal visits), mode of delivery (C-section), and location of delivery, that explain the likelihood of experiencing obstetric fistula was identified and established among these women, culturally appropriate obstetric fistula intervention programs could be put in place in strategic areas of Uganda. The establishment of these risk factors could also contribute to the identification of the

reasons for poor performance of existing fistula programs in the nation, and could provide useful information to promote the efficiency of these programs by integrating findings from other studies (Ngongo et al., 2013). This study could serve as an addition to the limited body of knowledge on obstetric fistula in Uganda (Phillips et al., 2016).

Moreover, this study could foster positive social change as it could serve as a catalyst in generating knowledge on the predictive factors for the development of obstetric fistula among the target population, and how it affects the women who suffer from the condition among rural Ugandan communities. This in turn could assist health managers, policy makers, and providers of health services to understand these factors and the impact obstetric fistula has on the communities and the country as a whole. Therefore, if used appropriately, the findings of this study could guide policy makers and public health providers to design public health interventions aimed at providing quality care and protecting the health of girls and young women of the community.

The goal to improve maternal health is number five among the eight goals of the Millennium Development Goals (WHO, 2018). Once the differential risk factors that contribute to obstetric fistula formation have been understood, prevention opportunities for the affected population could be addressed (WHO, 2018). More importantly, the numerous challenges associated with the provision of fistula repair services in this nation could be minimized or even eliminated (WHO, 2018).

Summary and Conclusion

This first section covered the problem of obstetric fistula in low- resource nations such as sub-Saharan Africa with focus on Uganda. The section presented the description

of obstetric fistula and its impact on the target population. I also explored some of the social demographic factors that are likely to contribute to the likelihood of developing obstetric fistula in Uganda. In this section, I described the topic and delineated the problem statement, the study purpose, the main research questions to be explored and accompanying hypotheses, and the theoretical framework. Also, key discussions on the assumptions, scope and delimitations, and significance of the current research study, were presented at the end of the section.

The focus of this study was to address gaps in literature regarding risk factors for developing obstetric fistula among women 15 to 49 years old in the Uganda (Hirshfield, Downing, Horvath, Swartz, and Chiasson, 2018). The review of literature has revealed that the development of obstetric fistula could be based on predictive factors including, demographic risk factors (marital status, level of education, parity, age at first pregnancy, level of education and income, religious affiliations), medical risk factors (access to health care, distance to hospital/nearest health facility, parity, number of antenatal visits),, and mode of delivery (c- section), location of delivery and geographical location of the study population (Andargie & Debu, 2017; Adefris et al., 2017; Banke-Thomas et al., 2013; Bashah et al., 2018; Banke-Thomas, Wilton-Waddell, Kouraogo, & Mueller, 2014; Cantarutti et al., 2017;). Several studies identified marital status as a predictor of obstetric fistula (Drew et al., 2016; Tollosa & Kibret, 2013; Lufumpa et al., 2018). In the same review, while UNFPA (2018); Basheer and Pumpaibool (2014); Pandya and Bhanderi (2015) indicated a link between the development of obstetric fistula and age at first marriage, Andargie and Debu (2017) and

Chandra-Mouli et al. (2018) drew attention to the effect of age at first pregnancy on the development of obstetric fistula. The identification of a link between level of education and obstetric fistula development was another vital finding of this review that was useful (Barageine et al., 2014; Andargie & Debu, 2017; Ouedraogo et al., 2017; Delamou et al., 2016). Other findings included Drew et al. (2016); Mubukayi et al. (2016)'s discovery of the association between fistula and religious affiliation, and the connection Jokhio et al. (2014) Lilungulu, Gumodoka, Nassoro, Soka, and Stephen (2018); Ouedraogo et al. (2017) made between parity and obstetric fistula. The socioeconomic status of participants was also linked with obstetric fistula in this review (Tebeu et al., 2012; Harrison et al., 2015; Cantarutti et al., 2017; Adefris et al., 2017; Chiavarini et al., 2014; (Barageine et al., 2014).

The review revealed how researchers utilized key research methodologies to investigate factors that could contribute to the development of obstetric fistula including qualitative, quantitative, meta-analysis, and systematic review methods (Kaplan et al., 2017; Tebeu et al., 2012; Mselle & Kohi, 2015; Cowgill et al., 2015; Lufumpa et al., 2018; Walton et al., 2014). Also, this review shed light on the relationship between health services utilization (prenatal care) and maternal mortality and morbidity hence the development of obstetric fistula (Chiavarini et al., 2014). Additionally, review of Andersen's Behavioral Model of health Services Utilization (Andersen, 1995) revealed that more than four researchers agreed that the key to health services utilization is a function of their predisposition, including demographic, social and mental variables (Babitsch et al., 2012).

Furthermore, in this review the researchers discovered how the Andersen's Behavioral Model of health care utilization provides a broad theoretical framework for understanding the multiple factors that influence health behavior among certain population group in few studies (Li et al., 2016; Babitsch et al., 2012). Using this model these researchers were able to examine and break down the components, the predisposing, the need, and the enabling factors, in a way that all three factors have to be present for the behavior to occur (Jahangir, Irazola, & Rubinstein, 2012). I incorporated the elements of the Andersen's Model including the predisposing, need, and enabling factors into this study.

Section 2: Research Design and Data Collection

The purpose of this quantitative, cross-sectional study was to examine the predictive factors for the likelihood of experiencing obstetric fistula among women between 15 and 49 years old living in Uganda using data on confirmed fistula cases in the country. This study was designed to serve as a guide for policy makers to advance appropriate national policies toward reducing obstetric fistula among the study population and could also help the government of Uganda plan health services for the nation. This section of describes vital steps that I utilized to conduct the research such as the research design and its connection to the research questions and related constraints of the chosen design. This includes the methodology, the study population, sampling technique, measurement instruments, procedures, and data analysis plan. This section also highlights the steps to protect participants as well as the threats to internal and external validity and construct and statistical conclusion validity. It also describes steps utilized to protect and analyze data. The dissemination of the study results is also described in this section.

Research Design and Rationale

This quantitative, cross-sectional study examined the association between obstetric fistula and the predictive factors that could contribute to the development of the condition by using secondary data collected during the 2016 UDHS project from June 20 to December 16, 2016 and submitted to the Ministry of Health in Uganda/UBOS. The measured dependent/outcome variable for this study was the development of obstetric fistula, which was determined by diagnosed fistula cases. Demographic risk factors (marital status, age at first pregnancy, level of education and income, and religious

affiliations), medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits), mode of delivery (C-section), and location of delivery were the measured independent (predictor) variables. The analysis controlled for geographical location of participants as a confounder as shown in previous studies to be associated with the development of obstetric fistula (Andargie et al., 2017; Wall, 2012).

I employed the quantitative design for this study because it is cost and time effective. Compared to primary data collection and analysis, secondary data analysis was also efficient because it can be executed quicker, saving time and money and avoiding duplication (Creswell, 2009). The quantitative design can also mitigate personal bias and be used to provide valuable insight (Savela, 2018). Additionally, this design allowed me to analyze large data sets that could not be obtained from individually collected data set, as the availability of the data set is another advantage to the quantitative design (Creswell, 2009). Furthermore, the cross-sectional quantitative design is non-experimental and allowed me to study trends in the population by measuring differences, relationships, and association (Babbie, 2016; Creswell, 2014).

Methodology

Target Population and Size

Uganda is located in East-Central Africa, east of the Demographic Republic of Congo, west of Kenya with a population of about 40 million people (Central Intelligence Agency, 2019). Uganda has a problem with obstetric fistula, especially among women 15 to 49 years old (Bomboka et al., 2019); however, little data exist on predicting factors for

developing obstetric fistula among this population in Uganda. Since I focused my study on examining predictive factors associated with the development of obstetric fistula among women 15 to 49 years old in Uganda, I assessed the effect of demographic risk factors, medical risk factors, and mode of delivery on the development of this condition. The target population consisted of all women ages 15 to 49 with a diagnosis of obstetric fistula in the 2016 Ugandan DHS data set. All these individuals in the data set (N = 18,506) were included in my study. This population were at high risk for developing fistula, possibly due to demographic risk factors such as age at first pregnancy (Andargie & Debu, 2017).

Sampling and Sampling Procedures

The 2016 UDHS sampling frame was the census frame created for the 2014 National Population and Housing Census. This census frame is a complete list of all enumeration areas (EAs). An EA in Uganda is a geographical area covering an average of 130 households (UBOS-ICF, 2018). Information about the location of the EA, type of residence (urban or rural), and the estimated number of residential households is contained in the sample frame (UBOS-ICF, 2018). Though Uganda was administratively divided into 112 districts, these districts were grouped for this survey into 15 regions. The sample for the 2016 UDHS was designed to provide estimates of key indicators for the country as a whole, for urban and rural areas separately, and for each of the 15 regions (UBOS-ICF, 2018). The Lake Victoria, islands, the mountain districts, and greater Kampala were the three special areas that the estimates are also presented.

The selection and stratification of the 2016 UDHS sample was in two stages. The first stage comprised 697 EAs selected from the 2014 Uganda National and Population Health Census. This includes 162 EAs in urban areas and 535 in rural areas. The second stage sampling was constituted by household listings compiled in each of the 696 accessible selected EAs from April to October 2016, with some overlapping with fieldwork (UBOS-ICF, 2018). Institutional living arrangements including army barracks, police camps, hospitals, and boarding schools were excluded in the listings. Each large EA (households more than 300 households) that was selected for the 2016 UDHS was segmented to minimize the task of household listing (UBOS-ICF, 2018). However, only one segment was selected for the survey with probability proportional to segment size and the household listing was conducted only in the selected segmented (UBOS-ICF, 2018). Therefore, in total, the 2016 UDHS was a representative sample of 20,880 households (30 per EA or EA segment) that was randomly selected (UBOS-ICF, 2018).

Among the four questionnaires used for the 2016 UDHS survey were the household questionnaire, the woman's questionnaire, the man's questionnaire, and the biomarker questionnaire, which were adapted to reflect the population and health issues relevant to Uganda. Survey fieldworkers submitted their information through a self-administered fieldworker questionnaire. The questionnaires were translated into eight major languages in Uganda including Ateso, Ngakarimojong, Luganda, Lugbara, Luo, Runyankole-Rukiga, Runyoro-Rutoro, and Lusoga, after preparation in English (UBOS-ICF, 2018). I used a subset of the entire sample by considering only the information on women in the "the woman's questionnaire Q 730A to Q 730E."

Inclusion Criteria

My inclusion criteria for this study were that the women/patients were 15-49 years old, including both those who experienced and those that did not experience fistula, were alive and had data on recent obstetric fistula cases presented in the clinic/eligible for interview during the period of June 20 to December 16, 2016. I investigated the association between the outcome variable (obstetric fistula) and the independent variables (demographic risk factors, medical risk factors, and mode of delivery) through statistical analysis. The study population is women aged 15-49 years old sampled across Uganda.

Exclusion Criteria

The exclusion criteria that were used for this study included data in the clinics before June 20 and after December 16, 2016 because the study covered the periods of time between June 20 and December 16, 2016. Additionally, data on patients/participants who live in other countries besides Uganda were excluded because the study covered women between 15 and 49 years old living in Uganda within the time period of June 20 and December 16, 2016. Data on patients presenting with other forms of fistula that is not obstetric related were also excluded.

Procedures Used to Collect Data as Described in Secondary Data Materials

The source of data for addressing this quantitative research problem and answering the associated research questions was the 2016 UDHS collected by the UBOS. The DHS program is a 5-year project to assist institutions with the collection and analysis of data needed to plan, monitor, and evaluate population, health, and nutrition programs (U.S. Agency International Development, 2018). This database includes all obstetric

fistula incidence and case records for women ages 15 to 49 years old in Uganda. This data set was collected by using standard forms by interviewing women in English and other eight native Ugandan languages such as Luganda through interpreters during June 20 and December 16, 2016. I used the most current obstetric fistula data available from the 2016 UDHS data using the questions included in the Woman questionnaire Q 730A to Q 730E obtained by the UBOS and other organizations. Questions about experiencing constant leakage of urine or stool from the vagina during day and night were among the questions included in the questionnaire. For my study I used all the eligible women in the data set. However, my final sample included only those women who met my study criteria after I accounted for missing values via multiple imputations.

UBOS is a reputable source of data because standardization and comparability of surveys across the country and time is ensured. Furthermore, the technical team for UDHS comprised staff from UBOS and ICF, a 2-day training of trainers on March 17 and 18, followed by the pretest training between March 21 and April 8, 2016 (UBOS-ICF, 2018). These trainers in turn trained 45 participants to administer both paper and electronic household, women's, and men's questionnaires that were used for the study (UBOS-ICF, 2018). Not only are the professionals well-trained for the job, but standardized case investigation forms and measurement techniques were used. The DHS data are also considered accurate, reliable, and nationally representative (DHS Program, n.d.). Additionally, a range of data collection options that can be tailored to fit specific monitoring and evaluation needs of host countries is supported by the DHS Program

(DHS Program, n.d.). Though permission from the DHS program is required to access the data, the DHS data sets are available to researchers for free (DHS Program, n.d.).

For this study, I used data only from the 2016 UDHS, which is the most recent study conducted by the DHS in Uganda at the time period of my study (DHS Program, n.d.). The DHS survey collected information on a total of 18,506 women who were interviewed face-to-face on their background and reproductive health issues. All these eligible women in the survey were considered for this study. I used descriptive and binary logistic regressions techniques using demographic factors, medical risk factors, and mode of delivery as explanatory variables and presence of obstetric fistula as an outcome variable (Andargie & Debu, 2017).

I sought official approval from the UBOS because they own the data set, which granted me full access to use of the data set for my study and also to publish the findings of the study. To gain access to the UDHS data set, I was instructed to first register with the DHS program website and create a research project request interest and country. I received a notification that permission was granted to access the data set. The requested data can only be used for the current study. The instructions also maintained that a new request should be submitted if any other study is to be done using the data (DHS, n.d.). After official approval was granted by the Walden IRB, I retrieved the data set required and saved the files. To ensure availability of all required variables in the data set, I reviewed the data dictionary, codebook, and the data set. I also used descriptive studies to have a better understanding of the data. I also laid more emphasis on the accuracy, skewness, kurtosis, missing data, and outliers (Laerd Statistics, 2013).

Power Analysis

I used a G power analysis to calculate the required minimum sample size for this cross-sectional study, which was based on the parameters of effect size (0.15) medium, (alpha 0.05), power (0.08 or 80%), and number of predictors (12) that yielded a minimum sample size of about 205. Thus, a sample size of approximately 18,506 is sufficient to detect even a small association between the predictors and the outcomes. This procedure helped me to guarantee better representation of the general population (Creswell, 2014). The use of an appropriate sample in addition to high quality secondary data, such as data set obtained from the UBOS, can result in more reliable, valid, and generalizable results as well as save time (Creswell, 2014; Frankfort-Nachmias & Leon-Guerrero, 2015).

Instrumentation and Operationalization of Constructs

Implemented by the UBOS, the 2016 UDHS Program received its funding from the Ugandan Government, the U.S. Agency for International Development, UNICEF, and the UNFPA. Technical assistance and support was provided by ICF through the DHS program (UBOS-ICF, 2018). The primary purpose of the survey was to provide data needed for the monitoring and evaluation of population health as well as nutrition programs on a regular basis (UBOS-ICF, 2018). The UDHS is a nationally representative survey that is conducted every 5 years for providing current and valid as well as reliable information on demographic and health indicators of the Ugandan population (UBOS-ICF, 2018). Included in this survey are household, women's, and men's questionnaires that were confirmed to reflect relevant demographic and health indicators to Uganda.

Though the DHS questionnaires have changed extensively since the first phase, they are standardized, revised, and reviewed throughout the DHS program (DHS, n.d.). The woman's questionnaire used in the UDHS 2016 was sufficient to answer the research questions in this study. To determine the prevalence of obstetric fistula (dependent variable), respondents were asked if they experienced fistula. Respondents were also asked for their current marital status, age at first birth, highest level of education, and the type of earning from respondent's work. Responses were also examined regarding religious affiliation. Parity was determined when respondents were asked about the number of living children and current pregnancy/other such pregnancies. Access to health care and distance to nearest facility was determined by respondents answering *no problem*, *big problem*, *not a big problem*, or *missing value*. The number of antenatal visits was answered as *no antenatal visits*, *don't know*, *not applicable*, or *missing value*. To determine the mode of delivery, respondents were asked whether delivery was by C-section. Finally, I examined respondents' place of delivery and geographical location of participants. See Table 1 for a full list of the variables and how they were determined.

Operational Variables

Dependent Variables. The outcome/criterion variable is the presence of obstetric fistula. The outcome/response variable for the individual was represented and measured by participant's experience of obstetric fistula. It was dichotomized with 0 = *not experienced fistulas* and 1 = *experienced fistula*.

Independent Variables. The predictor/explanatory variables included demographic factors, medical risk factors, and mode of delivery. Independent or predictor

variables are variables that are presumed to have an impact or determine an outcome variable (Gertsman, 2015). Possible predictive factors for experiencing obstetric fistula in this study were grouped as demographic risk factors, medical risk factors, mode of delivery, and location of delivery.

Geographical Location of Respondent. This includes the type of residence (rural or urban) of the respondents. This variable was selected for inclusion as a covariate because it might influence the relationship between the independent variables and the dependent variable.

Table 1

List of Variables

Variable Name/Type	Categorization and Operational Definition	Levels of Measurement
Presence of Obstetric Fistula	Experience Fistula: Yes =1, No =0	Categorical
Demographic Variables		
Marital Status (Independent)	Never in union = 0, Married =1, Living with partner =2, widowed =3, Divorced =4, No longer living together/separated=5 missing value=9	Categorical
Age at First Pregnancy (Independent)	Age in years at First Birth measured as: 15-19 = 1, 20-24 = 2, 25-29 = 3, 30-34 = 4, 35-39 = 5, 40-44 = 6, 45-49 = 7	Ordinal
Level of Education of Respondent (Independent)	No education =0, primary =1, secondary =2, more than secondary =3, Don't know =8, missing value =9.	Ordinal
Respondents' Income (Independent)	Not paid=0, Cash only=1, Cash and in-kind= 2, In-kind only=3 or missing value =9.	Categorical
Religious Affiliations (Independent)	No religion =0, Anglican =1, catholic =2, Muslim =3, Seventh Day Adventist =4, Orthodox =5, Pentecostal/Born Again/Evangelical =6, Baha'i =7, Baptist =8, Jewish =9, Presbyterian =10, Mammon =11, Hindu =12, Buddhist =13, Jehovah's Witness =14, Salvation Army =15, Traditional =16, and Other =96.	Categorical
Parity of Respondents (Independent)	Other such pregnancies: No =0, Yes =1, Missing value =9, Not applicable =(na)	Categorical
Medical Risk Factors		
Access to Health Care (Independent)	Getting medical help for self No problem =0, Big problem =1, Not a big problem =2, or missing value =9	Categorical
Distance to Hospital/Nearest Health Care Facility (Independent)	'Getting medical help for self: Distance, with the following options: No problem= 0, Big problem=1, Not a big problem = 2, and Missing value = 9.	Categorical
Number of Antenatal (Independent)	Number of antenatal visits during pregnancy: No antenatal visits =0, don't know =98, missing =99, not applicable = (na).	Categorical
Location of delivery (Independent)	Place of delivery: HOME =10, Respondent's home =11, Other home =12, PUBLIC SECTOR =20, Government Hospital =21, Government Health Center =22, Other Public sector =26. PRIVATE SECTOR=30, Private hospital/clinic=31, Other private sector =36, Other=96, Missing=99, Not applicable=(na)	Categorical
Mode of Delivery (Independent)	Delivery by C- section: No =0, Yes =1, and missing value =9	Categorical
Geographical Location of Participants (Covariate)	Type of place of residence: Urban = 1, Rural = 2	Categorical

Note. This information was derived from the 2016 UDHS data codebook that was obtained from UBOS.

Secondary Data Type and Data Access

The 2016 UDHS data implemented by the UBOS between June 20 and December 16, 2016 is the source of data for this study (UBOS-ICF, 2018) I have requested access to the data collection tool to gain understanding of the different variables in the data set, and used it to refine the research questions to suite the data set. Upon receiving approval from the Walden University IRB of my proposal, I took the next level to download the data set for analysis. After that, the UBOS, and I signed a memorandum of understanding. In the memorandum of understanding, the right of access and use, disclosure, and other appropriate ethical considerations was spelled (Creswell, 2015).

I saved data information in Microsoft Word Document after downloading them, and converted to Microsoft excel. I then reviewed the data thoroughly to ensure that the number of records in the Microsoft Word files is in line with those in the Microsoft Excel files. Next, I reviewed the data to ensure that the conversion was accurately done. Moreover, to identify data elements like the type of variables and value, a special data code was generated to be utilized in Epi-Info software (Version 7.1). It is likely that new variables were created by combining data or grouping various data, which in turn was added to the data codebook. I also generated frequency tables, graphs, and charts for further data analysis. Furthermore, I maintained strict confidentiality of the data information, ensuring that data was available only to my chair and committee members.

Data Analysis Plan

Data analysis and interpretation was done using the Statistical Package for the Social Sciences (SPSS) software, Version 25.0 (IBM). I performed descriptive analysis to

describe the target population as well as understand the frequencies and percentages of all study variables. An association between any of the independent and dependent variable was determined by conducting bivariate analysis. Statistics Solutions (2018) indicated that logistic regression analysis describes and explain the relationship between one dependent binary variable and one or more ordinal, nominal, interval or ratio-level independent variables. Descriptive analysis, including the frequency and percentage distributions was used to describe demographic characteristics of the study participants, medical risk factors, mode of delivery, and location of delivery (Laerd Statistics, 2013). This analysis was used to determine whether all data met the appropriate assumptions. Using SPSS missing data was automatically excluded via multiple imputation when logistic regression model was created. Moreover, I accounted for missing data by utilizing multiple imputation using chained equations (Gerstman, 2015). The choice of multiple imputation for dealing with missing data in a data set is crucial to the validity of conclusions (Hughes, Heron, Sterne, & Tilling, 2019). More importantly, careful consideration of the reasons for missing data, the patterns of the data and availability of auxiliary information should be the basis of this choice (Hughes et al., 2019). After ensuring that the data is normally distributed as this helped choose the appropriate models for my data, I used the SPSS to perform multiple imputations. This was done by first choosing analyze, selecting two variables for the model and then specifying the number of imputations. The default was 5. The data set for the output was also be specified (Statistic How to, 2019). Also, I used univariate and multivariate logistic regression models to estimate odds ratios (ORs) for associations between potential risk

factors for developing obstetric fistula with 95% CIs. Multiple regression models were used to evaluate variables that appear significant in univariate analysis. P values of less than 0.05 were considered to show statistical significance (Gertsman, 2015). I used the OR to help explain the predictors (Gertsman, 2015). The mean and standard deviation were reported for ratio and interval variables.

It is important to perform the appropriate statistical test to determine the P value for the statistic. Field (2013) recommended that the null hypotheses should be rejected if a P value is significantly small, and the alternative hypothesis should be accepted, or vice versa. It is the significant level that shows the point for the decision to accept or reject the null hypothesis (Gertsman, 2015).

To examine research questions one, two, and three, and their associated hypotheses, chi square test was used to test for associations between possible risk factors of fistula development and the development of fistula among women ages 15 to 49 based on the categorical nature of the variables. The chi square test was used because the number of dependent variables for my study was one, and it was nominal in nature. Moreover, the nature of the independent variables is one with two or more levels, nominal or ordinal. The chi-square degrees of freedom (DF), sample size (n), chi-square value, and the probability value ($P \leq 0.05$) was used for the measurement of associations between proportions, and reporting associations with the dependent variable. I used the chi-square analysis to test the null hypothesis that implied that are no statistically significant associations between the risk factors for obstetric fistula and fistula. Their related hypotheses were stated in null and alternative forms.

Furthermore, the multivariate logistic regression model was used to answer each of my three research questions. Multivariate logistic regression is a good fit to answer my research questions because it could accommodate more than two explanatory variables in a model (Gertsman, 2015). Also, it was a good fit for assessing binary/categorical variables, and it helped me to test the association between my dependent variable and independent variables while adjusting for confounders (Gertsman, 2015). Also, multiple logistic regression provided opportunity for controlling for the impact of each of the independent variables on the dependent variable in my study. Furthermore, this model allowed for calculation of CIs, 95% which allows for generalization of study result to the whole population from which the survey data was obtained (Field, 2013). Fistula cases, and not a case, demographic risk factors, medical risk factors, and mode of delivery, in the data set were analyzed.

Moreover, the covariate selected for this study, the geographical location of participants which includes the type of residence (rural or urban) of the respondents, was analyzed. The rationale for selecting the geographical location of participants for inclusion as potential covariate is the fact that it might influence the relationship between the independent/explanatory variables and the outcome/dependent variable .Also, the geographical location of participants meets the necessary conditions to be a confounder that can be measured, as it is associated with exposure and outcome, it is important to adjust for this variable in the study design and analysis phases. Running a multiple logistic regression is one statistical method used for controlling confounding variables. In this model, covariates include both the independent and confounding variables and the

true association between dependent and independent variables after controlling for the confounding variable was accurately reported using adjusted ORs (Frankfort-Nachmias & Leon-Guerrero, 2015).

Research Questions and Hypotheses

Research Question #1: What is the association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Null Hypothesis (H_o): There is no association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Alternative Hypothesis (H_a): There is an association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations). and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Research Question # 2: What is the association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal visits) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Null Hypothesis (H_o): There is no association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of

antenatal visits,) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Alternative Hypothesis (H_a): There is an association between medical risk factors (access to healthcare, distance from hospital/nearest facility, parity, and number of antenatal visits) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Research Question #3: What is the association between Mode of delivery (C-section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Null Hypothesis (H_o): There is no association between mode of delivery (C-section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Alternative Hypothesis (H_a): There is an association between mode of delivery (C-section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Research Question #4: What is the association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Null Hypothesis (H_o): There is no association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Alternative Hypothesis (H_a): There is an association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Threats to External Validity

The external validity of the research refers to the extent to which the findings of the study are generalizable to the larger population (Creswell, 2014; (Frankfort-Nachmias & Leon-Guerrero, 2015). 2015). Threat to external validity occurs when the researcher draws an incorrect inference from the sample data (Creswell, 2009). For my study, the threat to external validity entails the specificity of variables in which the study was conducted using a specific group of individuals in Uganda at a specified period of time and setting, thereby causing the threat that such findings may not be generalizable to other groups at different times and in different places (Cresswell, 2009; (Frankfort-Nachmias & Leon-Guerrero, 2015). To address this threat, I used the entire population of 18,506 in the sample, as this will increase population validity, the power, and statistical significance. This in turn will increase the generalizability to the general population. Also, when drawing conclusions, care was taken to assess which ones may be specific to Uganda and which factors are generalizable.

While it is clear that the 2016 UDHS data set that was used for this study has been validated several times, I expected to encounter a few threats to validity of the study. Some level of content and construct validity threat may exist. Also, there may be a large number of limitations to construct validity, limited number of available variables for analysis in which case some essential variables may be absent, missing data, inherent

bias, errors that were not accounted for in the study (Cresswell, 2009; (Frankfort-Nachmias & Leon-Guerrero, 2015). Also, there could be significant changes to the current status in Uganda because the data were collected in 2016. To minimize these threats, I utilized the SPSS preloaded rules to revalidate the data again.

Internal Validity

The factors that affect or threaten the researcher's ability to draw correct inference from the data about the population represent the internal validity (Creswell, 2014). The employment of a cross-sectional survey design with no experiments will limit threats to internal validity, thereby avoiding some of the threats that may affect the study and because participants are surveyed once. Internal validity threats were reduced by the secondary research and selection bias was eliminated by using the complete UDHS data set for the study. Threats to selection was also limited by the data originators by using a sample design that ensured random selection of participants, which allowed for probability of equal distribution of characteristics across the sample (UBOS-ICF, 2018). This study maintained definitions and measures as standard ones to threat to construct validity that occurred when study definitions and measures of variables were inadequate (Creswell, 2014). Also, threats to statistical conclusions that occurred when inaccurate inferences were drawn from the sample data due to statistical power inadequacy and violation of statistical assumptions, were addressed by a computed statistical power of 0.98 for hierarchical multiple linear regression was attained on a sample size of 18,561 cases after excluding missing variables (Creswell, 2014). I also ensured that the statistical tests met the key theorized assumptions of multiple logistic regressions (Creswell, 2014,

(Frankfort-Nachmias & Leon-Guerrero, 2015). While there is a chance that that all the confounders may not be identified due to the fact that the data is not from primary source, use of statistical methods will control for known confounders (Creswell, 2014).

Ethical Procedures/Considerations

DHS surveys are anonymous surveys that do not allow any potential identification of any household or individual in the data file. These surveys are administered to individuals only after an informed consent is obtained. Authorization to access data set has been obtained from the UBOS and was accessed after Walden IRB approval is obtained. It is maintained that the authorization to download survey data from the DHS program may be used only for the statistical reporting and analysis this registered study (DHS, n.d.). A new registration is required to use the data for another purpose or a new research project. All data set should be treated as confidential. No effort should be made to identify individual respondents interviewed in the survey. I retained the data in a computer hard drive that is protected by a password where it cannot be accessed unauthorized persons. I transferred the data set to a password protected compact disc where it will be archived and destroyed after five years.

To ensure the protection of the rights of the study participants, this proposal was be approved by the Walden IRB before reviewing the data (Creswell, 2014). The integrated disease surveillance and response data are considered a data set of the government and acceptable for use with proper approval. I utilized data collected during the period between June 20 and December 16, 2016 in Uganda on eligible participants ages 15 to 49 that are diagnosed with obstetric fistula. While I utilized the 2016 UDHS

secondary data from the UBOS database, I thoroughly checked each subject's data to ensure that they have been de-identified. This is to ensure that personal data cannot be linked to the specific obstetric fistula case. I strictly followed Ethical standards and IRB guidelines for clearance to use and dissemination of study results (Frankfort-Nachmias & Leon-Guerrero, 2015). Even though, the subject of obstetric fistula is a sensitive one that could have emotional and cultural implications, the study posed none. Also, the study posed neither biological nor physical threats to participants because it is a secondary data. During the data organization, personal demographics were coded and removed from the database before it was available for use. Participants' personal identifiers were removed before data was accessible to prevent harming the respondents in any form (Creswell, 2009).

Summary and Transition

This section provided the research methodology discussing the design, the methodologies, data analysis processes, and ethical consideration of the study. The section has also covered the research design and rational, description of sampling procedure and the procedure applied by the DHS, the source of my secondary data. The sample frame for my study, the study variables, statistical tests, threats to validity, and ethical considerations have been described in this section. The study employed the 2016 DHS secondary data from the UBOS to conduct a quantitative research design study to examine the predictive factors for the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda. The study might be generalizable to Uganda. The next section comprised data collection and results of the analysis of the study. I presented

the results of the statistical analysis in section three. This was followed by a discussion of the results in section four.

Section 3: Presentation of the Results and Findings

The purpose of this quantitative, cross-sectional study was to examine the predictive factors for the likelihood of experiencing obstetric fistula among women 15 to 49 years old living in Uganda using the 2016 UDHS data set on confirmed fistula cases in the country. The IBM SPSS Statistics version 25 software was used to answer the research questions related to demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits), mode of delivery, and location and their association with the developing obstetric fistula among women 15 to 49 in Uganda. :

In this section, I discuss the process of data collection and preparation of the data set obtained from the 2016 UDHS data collected in a cross-sectional survey using a sample that is represented at a national level. I present the results of the secondary data analysis in this section. I also provide the general descriptive statistics that appropriately characterize the samples. I report the statistical analysis findings organized by the research questions and hypotheses testing such as the Chi-square test for association and logistic regression analysis for all four research questions. I then report the results from the statistical analysis in a manner that is consistent with the research questions and hypotheses.

Time Frame for Data Collection and Discrepancies

The 2016 UDHS data were used for this retrospective study. The 2016 UDHS was a cross-sectional survey using a sample that is represented at a national level, undertaken

among women 15 to 49 years old June to December 2016. A two-stage cluster sampling design was applied in this survey. The first stage consisted of 697 EAs, and the second had 10 households in each EA. A computer assisted personal interview with preloaded e-questions was used to collect data. Digital maps provided the boundaries between EAs. Out of the 20,880 households that were selected, 18,506 eligible women were successfully interviewed, indicating a response rate of 97% (UBOs, 2017). The four questionnaires used for the survey were the household questionnaire, the woman's questionnaire, the man's questionnaire, and the biomarker questionnaire (UBOS, 2017). Information for the woman's questionnaire was collected from all eligible women age 15 to 49. For this survey, I used a subset of the entire sample by considering only the information on women in the woman's questionnaire Q 730A to Q 730E. There was no discrepancy between the plan presented in the second section and the actual data collection.

Result

Summary of Descriptive Statistics that Appropriately Characterize the Sample

The key variables used to analyze the predictive factors for developing obstetric fistula among women 15 to 49 years old in Uganda were demographic risk factors including marital status, age at first pregnancy, level of education and income, and religious affiliations. The medical risk factors were access to healthcare, distance from nearest hospital/nearest health facility, parity, and number of antenatal visits (ANC), mode of delivery (C-section), and location of delivery. The descriptive statistics included women 15 to 49 years old who answered *yes* or *no* to the question "experienced fistula." I

selected independent variables with obstetric fistula, with listed variables, using a cross-tabulation. Out of the 18,506 women sampled in the survey, 1.3% experienced fistula, and 98.7% did not experience fistula.

Demographic Risk Factors (Marital Status, Age at First Pregnancy, Level of Education, Income, and Religious Affiliations)

Marital Status. From the 18,506 valid cases, the married women were in the majority at 31.4%. The two groups with the smallest percentage in the analysis were those who were widowed at 2.8% and divorced women at 0.8%.

Age at First Pregnancy. There were 13,745 valid cases for age at first birth (age at first pregnancy). A look at the study population by age distribution at first pregnancy (age at first birth) indicated that the youngest woman was pregnant at 8 years old and the oldest at 44 years. The mean age of women that responded was 18.63 years old, mode was 17 and the median age was 18. A cross-tabulation with experienced fistula indicated that two women age 31 and 37 experienced fistula, which contravened the requirement of at least 10 cases per cell (Laerd Statistics, 2013). Consequently, the categories were combined in 5-year groups in seven categories as follows: <15, 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 44–49. Study participants within the age group 15 to 19 made the majority (8,155 women); however, this age group had the least number of women (21 women) who answered *yes* to experiencing fistula. Participants within the age group 20 to 24 formed the second majority of the study population at 3,782 and fall within the majority of respondents who answered *yes* to experiencing fistula at 57 participants.

Level of Education. From the data analysis, most of this group did not complete their primary school education at 46.2%, with those who had higher education at 7.2% and those who completed their secondary education at 1.4%. Those who had incomplete primary education had the most who answered *yes* to experiencing fistula at 135 women, constituting 1.6% of their group. Cross tabulation with experienced fistula indicated that only 36 participants in the incomplete secondary education group answered *yes*. The third largest group (2,338 women) of the population completed primary education, of which 37 experienced fistula, placing them at the second highest who experienced fistula. Only 29 women from those with no education experienced fistula. Cross tabulation indicated that six women experienced fistula in the gourp of those who completed higher education. Those who completed their secondary education were the least majority (254 women), and only three of them experienced fistula.

Income (Type of Earnings from Respondents' Work). Data analysis indicated that there were 14,429 (78%) valid cases and 4,077 (22%) missing cases. Most of the participants (47.7%) were paid cash only, and 4.4 % (the least majority) were paid in kind only.

Religious Affiliations. Respondents were asked their different denominations including no religion, Anglican, Catholic, Muslim, Seventh Day Adventist, Orthodox, Pentecostal/Born Again/Evangelical, Baha'i, Baptist, Jewish, Presbyterian, Mammon, Hindu, Buddhist, Jehovah's Witness, Salvation Army, Traditional, and Other. Respondents from the Catholic religion were the highest majority (40.8%). The Seventh

Day Adventist was 1.6%, and those who belonged to other religions were .9 %. The Baptist, Orthodox, and no religion were only .1%. The rest were insignificant (.0).

Medical Risk Factors (Access to Healthcare, Distance from Hospital/Nearest Health Facility, Parity, and Number of Antenatal Visits)

Access to Health Care. Access to health care was determined by asking respondents about whether they could get money for treatment. Of the valid cases, 46.9% responded *yes* to having big problem getting money needed for treatment, and 53.1 % responded *not a big problem*.

Distance from Hospital or Nearest Health Care Facility. Distance from hospital or nearest health care facility was determined by asking respondents about whether they had issues with getting help based on distance. Of the valid cases 39.0% responded *big problem*, and 61% responded *not a big problem*.

Parity. Respondents were asked about the number of living children and current pregnancy/other such pregnancies. Missing value was 82.0%, with only 18% responding. Of the valid cases 96.3% of the respondents responded *no*, and 3.7 answered *yes*.

Number of Antenatal Visits. Respondents were asked the number of antenatal visits during pregnancy. There were 8,243 (44.5%) missing cases and 10,263 (55.5%) valid cases. Of the valid cases 1.9% had no ANC visits, whereas 0.4% of the valid cases did not know.

Mode of Delivery

To determine the mode of delivery, respondents were asked whether delivery was by C-section. There were 10,224 (55.2%) valid cases and 8,282 (44.8%) total missing cases. Of the valid cases 93.3% responded no, and 6.7% answered yes.

Location of Delivery

Respondents were asked the place of delivery. Missing system was 44.5% (8243 women), and 55.5% (10,263 women) valid respondents. From the analysis, participants who delivered at the Government Health Center made up the majority at 39.8%, followed by the Government Hospital at 19.9%. The respondent's home was the third highest (18.6%), with the private hospital/clinic trailing behind at 14.4%. Other home was 5.5%, other was 1.6, other private sector, and other public sectors were both at 0.1%.

Geographical Location of Respondent

Geographical location of participants was determined by asking respondents their place of residence. The analysis indicated that majority (14,127; 76.3%) of the respondents lived in the rural areas, and only 4,379 (23.7%) lived in the urban sectors of the country. The sociodemographic characteristics of all the study participants are shown in full in Table 2.

Table 2

Key Sociodemographic Characteristics of Sample

Variable	Frequency	Percentage
Marital Status (Current Marital Status)		
Never in a Union	4,738	25.6
Married	5,813	31.4
Living with Partner	5,566	30.1
Widowed	523	2.8
Divorced	139	.8
No Longer Living Together/Separated	1,727	9.3
Unweighted Total	18,506	100
Age at First Pregnancy (Age at First Birth)		
<15	1,040	5.6
15-19	8,155	44
20-24	3,775	20.4
25-29	668	3.6
30-and above	88	0.5
Total	13,745	74.3
Missing System	4,761	25.7
Unweighted Total	18,506	100
Level of Education (Educational Attainment)		
No Education	2,071	11.2
Incomplete Primary	8,555	46.2
Complete Primary	2,338	12.6
Incomplete Secondary	3,959	21.4
Complete Secondary	254	1.4
Higher Education	1,329	7.2
Unweighted Total	18,506	100
Income (Type of Earnings from Respondent's Work)		
Not Paid	3,250	17.6
Cash Only	6,888	37.2
Cash and In-Kind	3,654	19.7
In-Kind Only	637	3.4
Total	14,429	78.0
Missing System	4,077	22.0
Unweighted Total	18,506	100
Religious Affiliations (New Religion Variable)		
Anglican, Catholic, No Religion	13376	72.3
Muslims and other religions	5130	27.7
Total	18506	100

(table continues)

Variable	Frequency	Percentage
Access to Health Care (Getting Medical Help for Self: Getting Money Needed for Treatment)		
Big Problem	8,683	46.9
Not a Big Problem	9,823	53.1
Unweighted Total	18,506	100
Distance from Nearest Hospital/ Health Facility(Getting Medical Help for Self: Distance to Health Facility)		
Big Problem	7,214	39.0
Not a Big Problem	11,292	61.0
Unweighted Total	18,506	
Parity (Other Such Pregnancies)		
Yes	3,206	17.3
No	122	0.7
Total	3,328	18.0
Missing System	15,178	82.0
Unweighted Total	18,506	100
Number of Antenatal Visits (Number of Antenatal Visits During Pregnancy)		
No ANC Visits	190	1.0
<4 ANC Visits	3,886	21.0
4 ANC Visits	4,084	22.1
>4 ANC Visits	2,059	10.8
Don't Know	44	0.2
Total	10,263	55.5
Missing System	8,243	44.5
Unweighted Total	18,506	100
Mode of Delivery (Delivery by C-section)		
Yes	9,542	51.6
No	682	3.7
Total	10,224	55.2
Missing	39	0.2
System	8,243	44.5
Total	8,282	44.8
Unweighted Total	18,506	100
Location of Delivery (Place of Delivery)		
Respondent's Home	1,911	10.6
Other Home	566	3.1
Government Hospital	2,042	11.0
Government Health Center	4,082	22.1
Private Hospital/Clinic	1,473	8.0
Other	189	01.0
Total	10,263	55.5
Missing System	8,243	44.5
Unweighted Total	18,506	100
Geographical Location of Participants (Type of Place of Residence)		
Urban	4,379	23.7
Rural	14,127	76.3
Unweighted Total	18,506	100

Presence of Obstetric Fistula

The outcome variable in this study was the presence of obstetric fistula. There were 18,506 valid cases. A cross-tabulation of this group showed that 246 (1.3%) respondents experienced fistula, and 18,260 (98.7%) did not. Considering the greater the sample size of the population of more than 11,000 people, the better the power, effect size, and result were provided for the study.

Review of Statistical Assumptions

Chi-Square Test for Association

I conducted a chi-square test for association to answer the research questions. The chi-square test of association determines an association between two nominal variables by comparing the observed frequencies in each cell (Laerd Statistics, 2018). There are four assumptions to consider in order to conduct a chi-square test of association. The first three relate to how the variables are measured, and fourth assumption relates to whether the data fit the model (Laerd Statistics, 2018). These assumptions include the fact that (a) there are two nominal variables; (b) there should be independence of observation—that is, there is no relationship between study groups (Laerd Statistics, 2018); (c) the categories of variables in the study must be mutually exclusive, meaning the null hypothesis that is being tested using this guide cannot be used with all types of sampling; and (d) the data in the cells should have expected counts greater than or equal to five (Laerd Statistics, 2018). Thus, the assumptions of the chi-square test for association were met because the study groups in this study are independent, mutually exclusive, and they are nominal or ordinal categories (Laerd Statistics, 2018).

Logistic Regression Analysis

I used the logistic regression model to determine whether demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits), mode of delivery (C-section), and location of delivery have any predictive influence on the dependent variable (obstetric fistula). I used the model to analyze my four research questions to determine their predictive influence on the outcome variable. Meeting the assumptions of a logistic regression model allowed me to provide information on how accurate my predictions are and determine how well the model fit my data. Additionally, they allowed me to determine the variation in my dependent explained by my independent variables. Finally, the assumptions allowed me to test hypotheses on my regression equation (Laerd Statistics, 2018).

The reliability of the results of a logistic regression are based on whether certain assumptions are not significantly violated (Laerd Statistics, 2018). I tested the following assumptions to address that area. The first four assumptions of a binomial logistic regression relate to the design chosen for the study. These include the fact that the dependent variable is dichotomous or there is one or more independent variables (continuous or nominal), there is independence of observations, the variables are mutually exclusive, and that there is a bare minimum of 50 cases of independent variable (Laerd Statistics, 2018). If these assumptions are not met, then logistic regression is the wrong test (Laerd Statistics, 2018).

Linearity of The Logit. Besides the first four assumptions, another assumption of logistic regression I considered for study is that the independent variables are linearly related to the log odds. This assumption requires that a linear relationship exists between the continuous independent variables and the logit transformation of the dependent variable, obstetric fistula (Laerd Statistics, 2018). If violated, the test underestimates the strength of the relationship and easily rejects the alternative hypothesis because the relationship is insignificant. The results in table 4 indicates that this assumption was not violated since the H-L goodness-of-fit test indicated that data fits perfectly well into the model, X^2= 8.185, df = 8, p = 0.416. The indication of the Nagelkerke R that the model accounts for 17.7% of the variance observed in the outcome further support the fact that the assumption is not violated.

Association Between Study Factors and Obstetric Fistula: Research Question 1

What is the association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations.) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Null Hypothesis (H_o): There is no association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations.) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Alternative Hypothesis (H_a): There is an association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious

affiliations) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda while adjusting for geographical location of participants.

To examine research question #1, and to test my hypothesis 1 whether there is an association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the likelihood of developing obstetric fistula, I conducted a bivariate chi-square test analysis, due to the categorical nature of the dependent and independent variables. Chi-square test is used to examine differences with categorical variables (Laerd Statistics, 2013). I also included the geographical location of participants due to its potential effect on the development of obstetric fistula (Andargie & Debu, 2017).

Statistical significance test was set at alpha < 0.05. The assumptions of cross tabulation and chi-square test were assessed and met. That is, there is an adequate sample size of 40 cases and adequate cell count, a minimum of five cases or counts per cell, no cells in the cross tabulations had an expected count of less than 5 (Laerd Statistics, 2018).

Bivariate Analysis of Demographic Factors (Marital Status, Age at First Pregnancy, Level of Education and Income, and Religious Affiliations)

Marital Status and Obstetric Fistula. To examine the association between marital status and obstetric fistula, I conducted a chi-square test between the two variables.. The result shows statistically significant association between the respondents' marital status and the development of obstetric fistula, X^2 (5) = 43.368, p <0.05. Cramer's V = 0.48. I would suggest that marital status and obstetric fistula are not independent of each other. Therefore, I rejected the null hypothesis that there is no

association between marital status and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda. The strength of the relationship is also provided by the Cramer's Correlation in table 5. Cramer's V correlation of 0.48 shows a strong relationship between marital status and obstetric fistula. The results support the alternative hypothesis that there is an association between the two variables. The analysis indicates that married women were at higher risk of developing obstetric fistula than those that were not. A Cramer's V value of 0 indicates that there is no association. A Cramer's V value of 1 indicates an association (Gertsman, 2015).

Using the sample size n=18,506, I conducted a chi-square test to examine whether the respondents' age at first pregnancy is associated with the likelihood of developing obstetric fistula. The two variables were age at first pregnancy and experienced obstetric fistula. I rejected the null hypothesis that there is no association between demographic factors (age at first pregnancy), and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda. The result indicated a statistically significant association between age at first pregnancy and the likelihood of developing obstetric fistula. Chi-square (X^2) (28) = 43.150, p = 0.034, Cramer's V= 0.056. The Cramer's V correlation indicates a very weak association between the two variables.

Level of Education (Educational Attainment). To determine whether there is an association between respondent's level of education and the likelihood of experiencing obstetric fistula, I conducted a chi-square test between educational attainment and experienced fistula status. The chi-square test result indicates that there is a statistically significant association between level of education and obstetric fistula, X^2 (5) = 18.432,

p=.002, Cramer's V = .032. This indicates that the more educated the women were, the less likely they were to develop obstetric fistula. Therefore, I rejected the null hypothesis that there is no association between respondent's educational level and the likelihood of developing obstetric fistula.

Income and Obstetric Fistula. Using the sample n=18,506, I conducted a chi-square of association to examine an association between respondent's income and the likelihood of developing obstetric fistula. The results show no significant association between respondent's income and the likelihood of developing obstetric fistula, X^2 (3) = 3.875, p = .277, Cramer's V = .016. Cramer's analysis in table 8 (0.016) indicates a very weak association between income and obstetric fistula. The results support that we cannot reject the null hypothesis there is no association between the respondent's income and the likelihood of developing obstetric fistula. Therefore, I failed to reject the null hypothesis there is no association between respondent's income and the likelihood of developing obstetric fistula. However, I will run this variable in the logistic regression model to determine whether it could have a predictive influence of the outcome variable, as this variable is important to my study.

Religious Affiliations (Religion) and Obstetric Fistula. To determine whether there is an association between respondent's religious affiliations and the likelihood of experiencing obstetric fistula, I conducted a chi-square test between religion and experienced fistula status. The chi-square test result indicate that there is no statistically significant association between religious affiliations and obstetric fistula, X^2 (14) = 18.936, p =.167, Cramer's V = .032. Cramer's V correlation of 0.032 shows a weak

relationship between religious affiliations and obstetric fistula. Therefore, I failed to reject the null hypothesis that there is no association between respondent's religious affiliations and the likelihood of developing obstetric fistula.

Association Between Study Factors and Obstetric Fistula: Research Question 2

What is the association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Null Hypothesis (H_o): There is no association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Alternative Hypothesis (H_a): There is an association between medical risk factors (access to healthcare, distance from hospital/nearest health facility , parity, and number of antenatal visits.) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Bivariate Analysis of Medical Risk Factors (Access to Healthcare, Distance from Hospital/Nearest Health Facility, Parity, and Number Of Antenatal Visits) and Obstetric Fistula

Access to Health Care (Getting Medical Help for Self: Getting Money for Treatment) and Obstetric Fistula. To examine the association between respondent's access to health care measured by their answers to the question about Getting Medical

Help for Self: Getting Money Needed for Treatment and the likelihood of developing obstetric fistula, I conducted a chi-square test between the potential risk factor Access to Health Care (Getting Medical Help for self: Getting Money for Treatment) and Obstetric Fistula. I presented a summarized cross-tabulation table for the two variables. The chi-square test result indicates that there is a statistically significant association between access to health care and obstetric fistula, X^2 (1) = 16.494, p=.000, Cramer's V = .030. Cramer's V correlation of 0.30 shows a moderate relationship between access to health care and obstetric fistula. Hence, the results support the alternative hypothesis that there is an association between the two variables. This indicates that respondents that indicated that they had a big problem getting money for medical treatment were more likely to develop fistula than those who indicated they had no problem getting money for medical treatment. Therefore, I rejected the null hypothesis that there is no association between respondent's access to health care and the likelihood of developing obstetric fistula.

Distance from Nearest Hospital/Nearest Health Facility (Getting Medical Help for Self: Distance to Health Facility). To examine the association between distance from nearest hospital/nearest health facility and the development of obstetric fistula, I conducted a chi-square test between the two variables as explained. The result shows statistically significant association between distance from nearest hospital/nearest health facility and the development of obstetric fistula, X^2 (1) = 14.761, p = .000, is <0.05. Cramer's V = 0.28. I would suggest that respondent's distance from the nearest health facility and obstetric fistula are not independent of each other. Also, Cramer's V correlation of 0.28 shows a moderate relationship between distance from nearest

hospital/nearest health facility and obstetric fistula. The results support the alternative hypothesis that there is an association between the two variables. Women who indicated that they had a big problem getting to the nearest hospital or health center were at a higher risk of developing fistula than those that indicated they had no problem. Therefore, I rejected the null hypothesis that there is no association between distance from health facility and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda. The strength of the relationship is also provided by the Cramer's Correlation in table 11 (Cramer's V = 0.028).

Parity and Obstetric Fistula. Using the sample size n=18,506, I conducted a chi-square test examine whether the respondent's parity status is associated with the likelihood of developing obstetric fistula. The two variables were parity and experienced obstetric fistula. I rejected the null hypothesis that there is no association between parity and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda. The result indicates a statistically significant association between parity and the likelihood of developing obstetric fistula. X^2 (1) = 6.240, p = 0.012, Cramer's V= 0.048. This indicates that primiparous women were more at risk of developing fistula than those that had already had previous babies with much more matured and developed pelvis. However, the Cramer's V of 0.048 indicates a weak association between the two variables, indicates that even though relationship is statistically significant, very little variation is explained by the relationship.

Number of Antenatal Visits and Obstetric Fistula. I conducted a chi-square of association to examine an association between number of antenatal visits during

pregnancy and the likelihood of developing obstetric fistula. The results shows no significant association between respondent's number of antenatal visits during pregnancy and the likelihood of developing obstetric fistula, X^2 (16) = 9.456, p = .893, Cramer's V = .030. Therefore, I failed to reject the null hypothesis that there is no association between respondent's antenatal visits during pregnancy and the likelihood of developing obstetric fistula. The Cramer's V of 0.030 indicates a weak association between the two variables, indicating very little variation by this relationship.

For research question 2, I conducted a series of chi-square test for association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal visits) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda, without adjusting for geographical location. All expected cell frequencies were greater than five (Laerd Statistics, 2018). There was a statistically significant association between all the variables (access to health care [p-value = .000], Distance from Hospital/Nearest Health Facility [p-value <0 .001], and Parity [p-value<0.001), except number of antenatal visits (p-value = 0.893). Due to the fact that number of antenatal visits is an important variable for this study I will run it in the logistic regression model to test its predictive ability of obstetric fistula. I did not adjust for geographical location in this analysis.

Association Between Study Factors and Obstetric Fistula: Research Question 3

What is the association between mode of delivery (C-section.) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Null Hypothesis (H_o): There is no association between mode of delivery (C-section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Alternative Hypothesis (H_a): There is no association between mode of delivery (C-section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Bivariate Analysis of Mode of Delivery (C-section) and Obstetric Fistula

I conducted a chi-square test to determine whether mode of delivery (C-section) is associated with the likelihood of developing obstetric fistula. The two variables were delivery by C- section and experienced obstetric fistula. I rejected the null hypothesis that there is no association between mode of delivery and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda. The result indicates that there is a statistically significant association between mode of delivery and the likelihood of developing obstetric fistula. X^2 (1) = 4.083, p = 0.043, Cramer's V= 0.020. This indicates that respondent that did not deliver via C- section were at higher risk of developing fistula than those who delivered by C-section. However, the Cramer's V of 0.020 indicates a weak association between the two variables.

To answer research question 3, I conducted a chi-square test for association to determine an association between Mode of delivery (C- section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda. The analysis indicated a statistically significant association between mode of delivery (C-section), and the likelihood of developing obstetric fistula, $X^2(1) = 4.083$, p = 0.043. The

risk of developing obstetric fistula for respondent that did not deliver via C- section was at higher than those who delivered by C- section. The descriptive analysis supports the result. Significantly less of the respondents with fistula were delivered by C- section (10.6%) than those that were not (89.4%). I did not control for geographical location of participants.

Association Between Study Factors and Obstetric Fistula: Research Question 4

What is the association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Null Hypothesis (H_o): There is no association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants

Alternative Hypothesis (H_a): There is an association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

Bivariate Analysis of Location of Delivery and Obstetric Fistula

To determine whether there is an association between respondent's location of delivery and the likelihood of experiencing obstetric fistula, I conducted a chi-square test between location of delivery and experienced fistula status. The chi-square test result indicates that there is no statistically significant association between the location of delivery and obstetric fistula, X^2 (7) = 7.017, p=.427, Cramer's V = .026. This is supported by the Cramer's V correlation of 0.026 that shows a very weak relationship

between location of delivery (respondent's home, other home, government sector or private sector) and obstetric fistula. The results do not support the alternative hypothesis that there is an association between the two variables. Therefore, I failed to reject the null hypothesis that there is no association between respondent's location of delivery and the likelihood of developing obstetric fistula. However, I will run this variable in the logistic model to further confirm the insignificance of this variable due to its importance in this study.

For research question 4, I conducted a chi-square test for association location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda. There was no statistically significant association between location of delivery and the likelihood of developing obstetric fistula, $X^2(1) = 7.017$, $p = 0.427$. I did not adjust for geographical locations of participants in this analysis.

Marital Status. The details of the demographic risk factors including the P-values were presented in the analysis. Being married was statistically significantly associated with developing obstetric fistula compared to being divorced or widowed. A total of 246 women answered yes to experienced fistula. Obstetric fistula was greater among married women (37.8%) than their divorced counterparts (1.6%), widowed (6.9%), never in a union (10.6%), no longer living together/separated (10.2%), never in a union (10.6%), and living with a partner (32.9%). Married women were at higher risk of getting pregnant at younger age than divorced or widowed women.

Age at First Pregnancy. Compared to the other 5-year age group women ages 20-24 (23%) were more likely to develop obstetric fistula than their counterparts within the age group 30-34 (13%).

Level of Education. Compared to incomplete primary level of education (1.6%), higher level of education (0.5%) was more protective against obstetric fistula. This indicates that the more educated the women were, the less likely they were to develop obstetric fistula.

Income. Participants who earn their income in cash only (1.4%) were more likely to develop obstetric fistula compared to their counterparts that were paid in kind only (1.1%).

Religious Affiliations. Women with obstetric fistula who belonged to the Seventh day Adventist religion (0.8) and those with no religion (0.8) were significantly less likely to develop fistula than those from other religions especially those of the Catholic denomination (42.3%). Out of 292 women from the Seventh day Adventist religion who responded, only 2 responded yes to experienced fistula, and 290 women responded no to experienced fistula. From the Catholic religion, 104 respondents had fistula while 7448 responded no to experienced fistula. Total respondent from this religion were 7552. However, after transforming the religion variables into dummy variables (Dichotomous variables), out of 13376 women from the Anglican, Catholic, and no religion group 174 answered yes to fistula and 13202 answered no. From the 5130 women from the Muslims and other religion group, 72 answered yes, and 5058 said no to fistula.

Access to Healthcare. Respondents that indicated that they had a big problem getting money for medical treatment (59.8%) were more likely to develop fistula than those who indicated they had no problem getting money for medical treatment (40.2%).

Distance from Nearest Clinic/Hospital. Women (those with fistula), who indicated that they had a big problem getting to the nearest hospital or health center had a higher percentage, 50.8% (125 women) of fistula than those that indicated they had no big problem 49.2% (121 women). This supports the notion that timely intervention of obstructed labor could minimize the chances of developing obstetric fistula (Barageine et al., 2014).

Parity. Significantly more respondents with fistula, 57 women (90.5%) responded no to multiple babies or pregnancies than those that responded yes to other such pregnancies,6 women (9.5%).

Number of Antenatal Visits. Those that attended more antenatal visits were less likely to develop fistula than those that had less than those who did no.

Mode of Delivery. Significantly fewer of the respondents with fistula delivered by C- section (10.6%) than those that delivered virginally (89.4%) of the study population (Barageine et al., 2014)

Location of Delivery. More women with obstetric fistula reported that they delivered in Government health centers (36.6%), respondents' home (21.1%) and Government hospitals (19.9%), than private hospitals/clinics.

Inferential Statistical Analysis

Table 3 shows the main predictors of the likelihood of developing obstetric fistula, which were statistically significant with their interactive effect.

Table 3

Results of Chi-Square and Crosstab Analysis

	Experienced Fistula (Yes)	Experienced Fistula (No)	Total	*x2* Value *p*=value	df
Marital Status				43.368[a] .000	5
Never in Union	26 (10.6)	4,712 (25.8)	4,738		
Married	93 (37.8)	5,720 (31.3)	5,813		
Living with partner	81 (32.9)	5,485 (30.0)	5,566		
Widowed	17 (6.9)	506 (2.8)	523		
Divorced	4 (1.6)	135 (0.7)	139		
No longer living together/Separated	25 (10.2)	1,702 (9.3)	1,727		
Age at first pregnancy (Other such pregnancies in 5 year groups)					
15-19	21 (8.5)	4,255 (23.3%)	4,276	44.787 .000	6
20-24	57 (23.2)	3,725 (20.4)	3,782		
25-29	40 (16.3)	2,974 (16.3)	3,014		
30-34	32 (13.0)	2,568 (14.1)	2,600		
35-39	35 (14.2)	1,994 (10.9)	2,029		
40-44	30 (12.5)	1,591 (8.7)	1,621		
45-49	31 (12.6)	1,153 (6.3)	1,184		
Level of Education					
No Education	29 (1.4)	2,042 (98.6)	2,071	18.432 .002	5
Incomplete Primary	135 (1.6)	8,420 (98.4)	8,555		
Complete Primary	37 (1.6)	2,301 (98.4)	2,338		
Incomplete Secondary	36 (0.9)	3,923 (99.1)	3,959		
Complete Secondary	3 (1.2)	251 (98.8)	254		
Higher	6 (0.5)	1,323 (99.5)	1,329		
Income					
Not paid	60 (1.8)	3,190 (98.2)	3,250	3.857 .277	3
Cash Only	96 (1.4)	6,792 (98.6)	6,888		
Cash and in-Kind	54 (1.5)	3,600 (98.5)	3,654		
In-kind only	7 (1.1)	630 (98.9)	637		
Religious Affiliations (New Religion Variable)				0.298[a] 0.585	1
No Religion	174 (0.9)	13202 (71.3)	13376 (72.3)		
Anglican Catholic Muslims and other religions	72 (0.4)	5058 (27.3)	5130 (27.7)		

(table continues)

	Experienced Fistula (Yes)	Experienced Fistula (No)	Total	*x2* Value *p*=value	df
Medical Risk Factors					
Access to Healthcare				16.494 .000	1
Big Problem	147 (59.8)	8.536 (46.7)	8,683		
Not a Big Problem	99 (40.2)	9,724 (53.3)	9,823		
Distance from hospital/nearest health facility				14.671 .000	1
Big Problem	125 (50.8)	7,089 (38.8)	7,214		
Not a Big Problem	121 (49.2)	11171 (61.2)	1,1292		
Parity (Other such Pregnancies)				6.240 .012	1
Yes	6 (9.5)	116 (3.6)	122		
No	57 (90.5)	3,149 (96.4)	3,206		
Number of Antenatal (ANC) Visits				9.456 .893	16
No ANC Visits	5 (3.1)	185 (1.8)	190		
<4 ANC Visits	59 (36.6)	3,827 (37.9)	3,886		
4 ANC Visits	69 (39.1)	4,021 (39.8)	4,084		
>4 ANC Visits	33 (20.4)	2,026 (20.1)	2,059		
Don't Know	1 (0.6)	43 (0.4)	44		
Mode of Delivery					
Delivery by C- section				4.083 .043	1
Yes	17 (10.6)	665 (6.6)	682		
No	143 (89.4)	9,399 (93.4)	9,542		
Location of Delivery				7.017 0.427	7
Respondent's Home	34 (21.1)	1,877 (18.6)	1,911		
Other Home	14 (8.7)	552 (5.5)	566		
Government Hospital	32 (19.9)	2,010 (19.9)	2,042		
Government Health Center	59 (36.6)	4,023 (29.8)	4,082		
Other Public Sector	0 (0.0)	8 (0.1)	8		
Private Hospital/Clinic	22 (13.7)	1,451 (14.4)	1,473		
Other Private Sector	0 (0.0)	15 (0.1)	15		
Other	0 (0.0)	166 (1.6)	166		
Geographical Location				.404 .525	1
Urban	54 (22.0)	4,325 (23.7)	4,379		
Rural	192 (78.0)	1,3935 (76.3)	1,4127		

Multivariate Analysis

I employed the multiple logistic regression analysis using SPSS software version 25 to examine the influence of the independent variables on the dependent variable. The logistic regression model was a good fit for this study because it has the ability to examine the relationship between the variables while adjusting for other variables in the study (Laerd Statistics, 2013). While the income variable and number of antenatal clinic variable were insignificant in the chi-square test of association, I will run these variables in the logistic regression model to determine whether they could have a predictive influence of the outcome variable. Therefore, I used a multiple logistic regression analysis using all the women (N = 18,506) to determine whether there is an association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal visits), mode of delivery, location of delivery, and geographical location.

Multivariate Logistic Regression Model

I performed a multivariate regression model to further ascertain the influence of the predictors on the outcome variable while controlling for the covariates. In this model, I entered all the predictor variables and confounding variables simultaneously into the model. A multiple regression model was therefore performed to investigate the association between demographic factors, (marital status, age at first pregnancy, level of education and income, and religious affiliations), medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal

visits) mode of delivery (C- section), and location of delivery and the likelihood of developing obstetric fistula while adjusting for geographical location of participants.

In Table 4, the main predictor variables of obstetric fistula are displayed, which were statistically significant from the bivariate analysis with their interactive effect. Analysis of the predictor variables together in the model indicated that only two predictor variables (number of antenatal visits and parity) showed a statistically significant association with the dependent variable (Obstetric fistula), while the rest of the predictor variables, demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), medical risk factors (access to healthcare, and distance from hospital/nearest health facility), mode of delivery (C- section), location of delivery, and the confounding variable geographical location were not statistically significant. The result for parity and number of antenatal visits are as follow: Parity, (OR = 3.597, p= 0.046, 95% CI = 1.024, 12.634), number of antenatal visits, (OR = 1.027, p= 0.017, 95% CI = 1.005, 1.050). The odds of demographic factors leading to the development obstetric fistula were significantly lower when adjusting for geographical location. Demographic risk factors; marital status (OR = 0.850, p = 0.361), age at first pregnancy (OR = 1.005, p = 0.933), level of education (OR = 0.781, p = 0.226), income (OR = 0.924, p = 0.374), and religious affiliations (OR = 0.001, p = 0.979). Also, the significance values of the Wald for each of the predictors indicated that access to health care (Wald = 0.309, p = 0.579), distance from nearest hospital/ health facility (Wald = 2.880, p = 0.090), mode of delivery (Wald = 0.408, p = 0.523), location of delivery

(Wald = 1.001, p = 0.317), and geographical location (Wald = 1.330, p = 0.676), did not make any significant contribution to the development of obstetric fistula.

Predictive Ability of the Model

I used the Hosmer and Lemeshow's goodness-of-fit test statistic tests to explain the hypothesis that the observed data are significantly different from the predicted values from the model and the data required is a non-significant value for this test. This analysis indicated that (X^2 (8) = 8.185, p = 0.416) is non-significant (Gertsman, 2015). The Wald criterion pointed to only parity (Wald = 3.987, p = 0.046) and number of antenatal visits (Wald – 5.748, p = 0.017), as predictors that made a significant contribution to prediction. The odds of developing obstetric fistula in a primiparous woman were significantly higher at 3.957 times higher than her multiparous counterparts. The odds of developing obstetric fistula in these women, based on the distance from nearest hospital/health facility, (OR = 0.474, p = 0.090), level of education (OR = 0.781, p = 0.,226), access to health care (OR = 0.784, p = 0.579), marital status (OR = 0.850, p = 0.361), and income (OR = 0.924, p = 0.734) , and location of delivery (OR = 0.975, p = 0.317)were insignificant. According to the significance values of the Wald statistics, for each is that age at first pregnancy (Wald = 0.007, p = 0.933), level of education (Wald = 1.468, p = 0.226), access to healthcare (Wald = 0.309, p = 0.579), distance from hospital/nearest facility (Wald = 2.880, p = .090), mode of delivery (Wald = .408, p = .523), location of delivery (Wald =1.001 , p = .317), and geographical location (Wald = .174, p = .676), did not indicate a significant contribution to the prediction of the development of obstetric fistula.

Table 4

Logistic Regression Model Predicting Obstetric Fistula Based on Variables

Variable	p-value	OR	95% CI Lower	95% CI Upper
Marital Status (Current Marital Status)	0.361	0.850	0.600	1.205
Age at First Pregnancy (Age at First Birth)	0.933	1.005	0.891	1.134
Level of Education (Educational Attainment)	0.226	0.781	0.524	1.165
Income (Type of Earnings from Respondent's Work)	0.734	0.924	0.585	1.459
Religious Affiliations (Religion)	0.979	1.001	0.961	1.041
Access to healthcare (Getting Medical Help for self: Money needed for treatment)	0.579	0.784	0.333	1.849
Distance from hospital/nearest facility (Getting Medical Help for self: (Distance to Health Facility)	.090	.474	.200	1.123
Parity (Other Such Pregnancies)	.046	3.597	1.024	12.634
Number of Antenatal Visits (Number of Antenatal Visits During Pregnancy)	.017	1.027	1.005	1.050
Mode of Delivery (Delivery by C- section)	.523	1.633	.363	7.355
Location of Delivery (Place of Delivery)	.317	.975	.927	1.025
Geographical Location (Type of place of residence)	.676	1.308	.370	4.622
Constant	.249	.101		

Addressing Research Questions and Hypotheses

Two logistic regression models were used to address my research questions. Multivariate logistic regression was conducted to answer the research questions while controlling for confounding variables. I first conducted a univariate logistic analysis involving only one independent variable at a time without controlling for other predictor variables. For this first model, I addressed each research question based on separate logistic analysis results. A multivariate logistic regression analysis was the second model I considered. In this model, I entered all the predictor and confounding variables simultaneously into the model. Therefore, I conducted a multivariate logistic regression analysis to answer the research questions while controlling for the confounding variables.

Research Question 1

I conducted a multiple regression analysis to examine the association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda while adjusting for geographical location of participants. For this first model, addressing each research question was based on separate logistic regression analysis results. I conducted a bivariate logistic regression to examine the predictive relationship between demographic factors and the likelihood of developing obstetric fistula. All the variables were statistically non-significant in this model $\alpha = 0.05$.

While the result from the Chi-square test of association ascertained a significant association between demographic factors and the development of obstetric fistula, the

binary logistic regression performed to examine the association between the dependent variable and the predictor variables failed to indicate significant prediction. The results from Table 5 show that demographic factors together do not significantly predict the odds of developing obstetric fistula among women 15 to 49 years old in Uganda, demographic factors (Marital status, OR = 0.958, 95% Confidence Interval (CI) [1.00-1.02], p= .348, Wald = .602, Age at first pregnancy; OR = 1.02, CI = .984, 1.071, p = 0.229, Wald = 1.444, Level of education; OR = 0.847, CI = .750, .957, p = 0.008, Wald = 7.114, Income; OR = 0.863, CI = .721, 1.033, p = 0.108, Wald = 2.587, Religious Affiliations; OR = 1.008, CI = .998, 1.019, p = 0.112, Wald = 2.533). Level of education is the only variable among the five that indicated significance (p = 0.008). Based on these results, I failed to reject the null hypothesis that there is no significant association between demographic factors and the likelihood of developing obstetric fistula in its totality, and partially reject based on the statistical significance indicated by the level education.

Table 5

Logistic Regression Model Predicting Obstetric Fistula Based on Demographic Factors

Variable	p-value	OR	95% CI Lower	95% CI Upper
Marital Status (Current Marital Status)	.438	.958	.860	1.067
Age at First Pregnancy (Age at First Birth)	.229	1.026	.984	1.071
Level of Education (Educational Attainment)	.008	.847	.750	.957
Income (Type of Earnings from Respondent's Work)	.108	.863	.721	1.033
Religious Affiliations (Religion)	.112	1.008	.998	1.019
Constant	<0.001	0.017		

With the significance level set at $\alpha = 0.05$, all the variables, except education, were statistically non-significant in this model. Given that the results are statistically significant when p less than or equal to α (Gertsman, 2015), using the standard alpha of

0.05, this result would be deemed partially statistically significant, hence, I partially rejected the null hypothesis that there is no association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda. Women's higher level of education was protective of obstetric fistula (p= 0.008). This indicates that the more educated the women were, the less likely they were to develop obstetric fistula. Note: I did not adjust for geographical location of participants in this analysis.

Research Question 2

The Chi-square result indicated a statistically significant association between medical factors (access to healthcare, distance from hospital/nearest facility, parity, and number of antenatal visits) and the likelihood of developing obstetric fistula. Therefore, I performed a multiple regression analysis to further examine the association between medical risk factors (access to healthcare, distance from hospital/nearest facility, parity, and number of antenatal visits) and the likelihood of developing obstetric fistula. The results from Table 6 indicated that the OR were not statistically significant among medical risk factors (Access to health care; [OR= 0.630, p = 0.254], Distance to nearest hospital/health facility [OR = 0.547, p = 0.121], Parity [OR = 2.932, p = 0.083], Number of Antenatal visits [OR = 1.022, p = 0.045]. Number of Antenatal visits is statistically significantly associated with the likelihood of developing obstetric fistula (p = 0.045). Women that attended more antenatal visits were less likely to develop fistula than those that made no visits to the antennal clinics. Based on these results, I partially rejected the

null hypothesis of no association between medical risk factors (access to healthcare, distance from hospital/nearest facility, parity, and number of antenatal visits) and the likelihood of developing obstetric fistula.

Table 6

Logistic Regression Model Predicting Obstetric Fistula Based on Medical Risk Factors

Variables	B	SE	Wald	Df	p-value	OR	95% CI Lower	95% CI Upper
access to healthcare (Getting Medical Help for self: Money needed for treatment)	-0.461	0.404	1.303	1	0.254	0.630	0.286	1.392
Distance from hospital/nearest facility (Getting Medical Help for self: (Distance to Health Facility)	-0.604	0.390	2.399	1	0.121	0.547	0.255	1.174
Parity (Other Such Pregnancies)	1.076	0.621	3.003	1	0.083	2.932	0.869	9.898
Number of Antenatal Visits (Number of Antenatal Visits During Pregnancy)	0.022	0.011	4.024	1	0.045	1.022	1.001	1.045
Constant	-2.731	0.617	19.627	1	<0.001	0.065		

For this analysis, the results are statistically significant when p is less than or equal to α (Gertsman, 2015). The significance level is set at $\alpha = 0.05$., besides number of antenatal visit ($p= 0.045$), all the variables were statistically insignificant in this model. This indicates that respondents that made antenatal visits were less likely to develop obstetric fistula than those that made no antenatal visits. Therefore, using the standard alpha of 0.05, this result would be deemed partially statistically significant, and I partially rejected the null hypothesis that there is no association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal visits,) and the likelihood of developing obstetric fistula among women ages 15

to 49 years old in Uganda. I did not adjust for geographical location of participants in this analysis.

Research Question 3

The results displayed in Table 7 show the multiple logistic regression analysis result performed to examine an association between mode of delivery and the likelihood of developing obstetric fistula among the target population. The result from this analysis indicated that mode of delivery significantly predicts the likelihood of developing obstetric fistula at (OR = 1.689, p = 0.046). Consequently, I rejected the null hypothesis that states there is no association between mode of delivery and the likelihood of developing obstetric fistula and accept the alternative hypothesis that there is an association between mode of delivery and the likelihood of developing obstetric fistula.

Table 7

Logistic Regression Model Predicting Obstetric Fistula Based on Mode of Delivery

Variable	B	SE	Wald	Df	p-value	OR	95% CI Lower	95% CI Upper
Mode of Delivery (Delivery by C-section)	0.519	0.260	3.994	1	0.046	1.689	1.010	2.795
Constant	-4.186	0.084	2467.606	1	<0.001	0.015		

Mode of delivery was identified as a risk factor in this analysis. Women who delivered by C-section were less likely to develop fistula than those that did not. The significance level is set at $\alpha = 0.05$. The results are statistically significant when p is less than or equal to α (Gertsman, 2015). Based on this analysis, mode of delivery is significantly associated with the likelihood of developing obstetric fistula (p = 0.046),

with p-value at = 0.05. This indicates that respondents that delivered by C-section are less likely to develop obstetric fistula than those that did not. Therefore, using the standard alpha of 0.05, this result would be deemed statistically significant, hence I rejected the null hypothesis that there is no association between mode of delivery (C-section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda. I did not adjust for geographical location of participants in this analysis.

Research Question 4

In Table 8, the result shows the multiple logistic regression analysis result performed to examine an association between location of delivery and the likelihood of developing obstetric fistula among the target population. The result from this analysis indicated that location of delivery is significantly associated with the likelihood of developing obstetric fistula at (OR = 0.977, 95% CI [0.957; 0.998], p = 0.031). Therefore, I failed to reject the null hypothesis that states there is no association between location of delivery and the likelihood of developing obstetric fistula and accept the alternative hypothesis that there is an association between location of delivery and the likelihood of developing obstetric fistula.

Table 8

Logistic Regression Model Predicting Obstetric Fistula Based on Location of Delivery

Variable	B	SE	Wald	Df	p-value	OR	95% CI Lower	95% CI Upper
Location of Delivery (Place of Delivery)	-0.023	0.011	4.664	1	0.031	.977	.957	.998
Constant	-3.664	0.226	263.510	1	<0.001	0.026		

The results are statistically significant when p is less than or equal to α (Gertsman, 2015). With the significance level is set at α =0.05, this analysis indicates a statistically significant association between location of delivery (p = 0.031) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda, with p-value at 0.05. Based on this analysis, respondents who delivered their babies in Government health facilities, and those that delivered in their homes were more at risk of developing fistula than those that delivered in private sectors. Therefore, using the standard alpha of 0.05, this result would be deemed statistically significant, and I rejected the null hypothesis that there is no association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda. I did not adjust for geographical location of participants in this analysis.

For this analysis, the results are statistically significant when p less than or equal to α (Gertsman, 2015). Therefore, with the significance level set at α = 0.05, all the variables were statistically insignificant in this model except parity (p = 0.046) and number of antenatal visits (p = 0.017), with α = 0.05. Based on this analysis, a woman with no previous pregnancies is 3.597 times more likely to develop obstetric fistula than those that already had other such pregnancies. Respondents that had no previous pregnancies were at higher risk of developing fistula than their counterparts that had more babies. Similarly, women that attended more antenatal visits were less likely to develop fistula than those that made no visits to the antennal clinics. Therefore, using the standard alpha of 0.05, this result would be deemed partially statistically significant; I

partially rejected the null hypothesis. In this analysis, I adjusted for geographical location.

In order to run the binary logistic regression effectively, I transformed all the variables that were significant in the chi-square test of association into dummy variables (dichotomous variables). Table 10 shows the results of the crude OR and the adjusted OR (AOR) of the predictor variables. I performed binary logistic regression to calculate both the OR and AOR and their respective CIs. First, I calculated the OR and CI comparing the effect of each the predictor variable on the outcome variable. Then, I specifically adjusted for the geographical location of participants in assessing the association between the predictor variables and the likelihood of developing obstetric fistula. I included all seven variables that were significant in the chi-square test of association. I excluded all four variables that were insignificant in the chi-square test.

Table 9

Multiple Regression Analysis Showing Crude and Adjusted Odds Ratios, Confidence Intervals, and P-Values for the Independent Variables

Independent Variable	OR	CI Lower-Upper	p-value	AOR	CI Lower-Upper	p-value
Getting medical help for self: getting money needed for treatment	0.661	0.281-1.552	0.341	0.661	0.282-1.554	0.343
Getting medical help for self: distance to health facility	0.553	0.232-1.225	0.138	0.571	0.246-1.328	0.194
Other such pregnancies	3.455	1.010-11.814	0.048	3.424	1.000-11.716	0.050
Delivery by C-section	1.096	0.252-4.763	0.903	1.142	0.262-4.976	0.859
new current marital status	0.503	0.118-2.142	0.353	0.515	0.121-2.198	0.370
New level of education	1.148	0.393-3.353	0.800	1.177	0.403-3.439	0.766

Multiple Logistic Regression Analysis

The last model was a multivariate logistic regression analysis wherein I entered all predictor and the confounding variable simultaneously. Therefore, I conducted a multiple regression analysis to investigate the association between obstetric fistula and all the predictor variables that were statistically significant in the chi-square test of association, while controlling for the geographical location of participants.

For Research Question 1, the results from the multivariate analysis indicated that there is insufficient evidence to suggest that demographic risk factors (marital status, OR = 0.503, AOR = 0.515, 95% CI [0.121-2.198], p = 0.370 and level of education, OR = 1.148, AOR = 1.177, 95% CI [0.403-3.439]), statistically significantly predict the development of obstetric fistula. Based on these results, I failed to reject the null

hypothesis that there is no significant association between demographic factors and the likelihood of developing obstetric fistula in its totality.

For Research Question 2, the logistic regression analysis results indicated that medical risk factors (Access to healthcare, OR = 0.661, AOR = 0.661, 95% CI [0.282-1.554], p = 0.343; Distance from hospital/nearest facility, OR = 0.553, AOR = 0.571, 95% CI [0.246-1.328], p = 0.194; and parity, OR = 3.455, AOR = 3.424, 95% CI [1.000-11.716], p = 0.050), are not statistically significantly associated with the development of obstetric fistula, except parity. Therefore, using the standard alpha of 0.05, this result would be deemed partially statistically significant. Based on these results, I partially rejected the null hypothesis of no association between medical risk factors (access to healthcare, distance from hospital/nearest facility, and parity) and the likelihood of developing obstetric fistula.

For Research Question 3, the result from this analysis indicated that mode of delivery does not significantly predict the likelihood of developing obstetric fistula at (OR = 1.096, AOR = 1.142, 95% CI [0.262-4.976], p = 0.859). Consequently, I failed to reject the null hypothesis that states there is no association between mode of delivery and the likelihood of developing obstetric fistula. Women who deliver via C-section were 1.4 times more likely to develop obstetric fistula than those did not have C-section.

Summary

The purpose of the study was to examine the predictive factors for the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. The study was based on four research

questions with corresponding eight hypotheses. I examined those four research questions and hypotheses. I used the SPSS version 25, and statistical tests of the hypotheses included the Chi-square test of association, logistic regression, CI, and OR for the logistic regression.

For research question 1, I conducted a series of chi-square test for association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda without adjusting for geographical location of participants. All expected cell frequencies were greater than five (Laerd Statistics, 2018). There was a statistically significant association between marital status (p-value = .000). Married women were at higher risk of getting pregnant at a younger age than divorced or widowed women. Age at first pregnancy was significant (p-value = 0.034). Based on this analysis, compared to their counterparts, the younger respondents were at higher risks of developing obstetric fistula. The level of education variable (p-value = 0.002), was significant, indicating that the more educated the women were, the less likely they were to develop obstetric fistula. There was no statistically significant association between income (p-value = 0.227), and religious affiliations (p-value = 0.167), and the likelihood of developing obstetric fistula. However, despite the fact that the income variable and that of religious affiliations were insignificant based on the chi-square test of association, I ran these variable in the logistic regression model to determine whether they could have a predictive influence of the outcome variable. Both variables were insignificant in the logistic regression model.

To test whether the independent variables significantly predict the development of obstetric fistula, I performed multivariate analysis, which included a multiple logistic regression analysis of the five predictor variables performed with a p-value < 0.05. Based on the results, I failed to reject the first null hypothesis that there is no association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda while adjusting for geographical location of participants.

For Research Question # 2, that asked whether there is an association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal visits) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants, I partially rejected the null hypothesis that there is no association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal visits,) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. As indicated in table 21, parity (p = 0.046) was found to be statistically significantly associated with the likelihood of developing obstetric fistula while adjusting for geographical location of participants. Based on this analysis, primiparous women were at higher risk of developing fistula than those that previously had babies.

The alternative hypothesis that there is an association between medical risk factors (access to healthcare, distance from hospital/nearest facility, parity, and number of antenatal visits) and the likelihood of developing obstetric fistula was found to be incorrect.

The analysis indicate that there was a significant association noted between parity ($p = 0.046$) and the development of obstetric fistula. The positive value of 1.280 indicates an increase in the likelihood of association with the dependent variable (obstetric fistula). In this analysis, the association of parity with obstetric fistula is high, and there is a positive relationship between the two. The odds of developing obstetric fistula are 3.424 times higher in women with no previous pregnancies/babies. The less/no previous babies/pregnancies a woman has, the higher the risk of developing obstetric fistula, and those that have more pregnancies/babies are less likely to develop obstetric fistula.

This calls for the attention of policy makers and health care providers to put measures in place for more obstetric clinics to identify such cases at the early stages of pregnancy, to prevent the risk of obstetric fistula due to pregnancy and delivery (Andargie & Debu, 2018). Also, in addition to other intervention programs, maternal health care providers and other public health practitioners should focus their attention on issues that may lead to complicated labor such as parity.

For the third Research Question, that asked whether there is an association between Mode of delivery (C-section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants, I failed to reject the null hypothesis that states there is no

association between mode of delivery (C-section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants (OR = 1.096, AOR = 1.142, 95% CI [0.262-4.976], p = 0.859). The alternative hypothesis was found to be incorrect. There is no statistically significant association between mode of delivery and the likelihood of developing obstetric fistula, while adjusting for geographical location

For research question 4, that asked whether an association exists between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants, I failed to reject the null hypothesis that states there is no association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants (p = 0.317). The alternative hypothesis was found to be incorrect. There is no statistically significant association between the two, while adjusting for geographical location.

In section 4, I discussed the interpretation of the research finding from the analysis and limitations of the study. I also discussed the social change implications of the study and recommendations for further studies.

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

The purpose of this retrospective, cross-sectional, quantitative study was to examine factors predicting the development of obstetric fistula among women 15 to 49 years old in Uganda. This design used secondary data from the 2016 UDHS data set provided by the UBOS to examine the relationship between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal visits), mode of delivery (C-section), and location of delivery and the outcome variable obstetric fistula in the study population. I included the geographical location of participants as a covariate, as each factor has been independently shown to play a role in the likelihood of developing obstetric fistula in women ages 15 to 49. Using SPSS version 25, I conducted descriptive statistics, univariate, bivariate, and multivariate analysis of the secondary data set.

This capstone was designed to fill a gap in research by examining these relationships. In the first part of this section I included a concise summary of my findings. Then I include an in-depth interpretation of the findings and answers to research questions and hypotheses. This is followed by the limitations of the study, recommendations from the study, and implications for professional practice and positive social change. I end the section with the conclusion of the study.

Summary of Key Findings

A total of 18,506 women 15 to 49 years old were included in the study after review and verification of the data set. The result indicated that among the 18,506

women, 1.3 % (246) of the study participants experienced fistula. Most of the study population 98.7 % (18,260) of the respondents did not experience fistula.

Descriptive statistics for each variable, bivariate analysis, and multiple regression analysis focused on the outcome variable (obstetric fistula) helped confirm or reject the hypotheses. There was no association observed with all the demographic variables (marital status, OR = 0.503, AOR = 0.515, 95% CI [0.121-2.198], p = 0.370; and level of education, OR = 1.148, AOR = 1.177, 95% CI [0.403-3.439]). Based on this analysis, I failed to reject the null hypothesis that there is no association between demographic factors and the likelihood of developing obstetric fistula among women ages 15 to 49 in Uganda while adjusting for geographical location of participants. There was also no association between medical risk factors of (access to health care [OR = 0.661, AOR = 0.661, 95% CI [0.282-1.554], $p = 0.343$] and distance to the nearest hospital/clinic [OR = 0.553, AOR = 0.571, 95% CI [0.246-1.328], $p = 0.194$]), though parity (OR = 3.455, AOR = 3.424, 95% CI [1.000-11.716], $p = 0.050$) was found to predict obstetric fistula. Further, the odds of developing obstetric fistula were 3.455 times higher in women with more babies. Based on this analysis, I partially rejected the null hypothesis that there is no association between medical risk factors and the likelihood of developing obstetric fistula among women ages 15 to 49 in Uganda while adjusting for geographical location of participants. Finally, no association was observed between location of delivery ($p = 0.317$) or geographical location ($p = 0.676$) and the likelihood of developing obstetric fistula. Thus, I failed to reject either of the last two null hypotheses.

Interpretation of Findings

The aim of this study was to investigate whether there is an association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits), mode of delivery (C-section), and location of delivery and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda. The results showed that there is no association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), mode of delivery (C-section), and location of delivery and the likelihood of developing obstetric fistula among women between 15 to 49 years old in Uganda while adjusting for geographical location of participants. The results also showed no association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal visits) and the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda except for parity. Based on the result, I partially rejected this hypothesis as, parity ($p = 0.050$, OR = 3.455, AOR = 3.424, 95% CI [1.000-11.716]) indicated statistical significance.

Interpretation of Findings in Relation to Literature Review

Research Question 1

For this research question, I tested the association between demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the likelihood of developing obstetric fistula among women between 15

to 49 years old in Uganda while adjusting for geographical location of participants? I hypothesized that the demographic variables were not associated with the development of obstetric fistula.

Marital Status. Though the Chi-square test indicated a statistically significant association between marital status and the development of obstetric fistula ($p = .000$), the OR from the logistic regression analysis showed no association between marital status and the development of obstetric ($p = 0.438$). Therefore, there is no relationship between marital status and the likelihood of developing obstetric fistula.

These results differ from findings of previous researchers. For instance, Barageine et al. (2014) indicated a significant association between being single and developing obstetric fistula compared to being married in a study in west Uganda. In a qualitative study using 20 women who had previously had repair of obstetric fistula in Malawi, Drew et al. (2016) found 80% of the study population to be married prior to the development of the fistula. Similarly, in a literature review on causes and consequences of obstetric fistula in Ethiopia, Tollosa and Kibret (2013) revealed a statistically significant association between marital status and experience of obstetric fistula ($p < 0.001$). Divorced women and those separated from their spouses were affected most by obstetric fistula at 6.5%. In another study, Lufumpa et al. (2016) found that cultural practices around marriage played a key role in the perpetuation of obstetric fistulas sub-Saharan Africa such as parents giving daughters in marriage in exchange for a bride price and using marriage to ensure financial security for their daughters. Further, the culture and religious beliefs in some parts of the Ugandan community on marital status include

disapproving of divorce. The percentage of the study population that was divorced was the lowest at 139 women (0.8%), while married women were at 5,813 (31.4%), and 5,566 (30.1%) were those living with partners (Barageine et al., 2014).

The differences in the outcome of the current study and previous research could be due to the sample size. For example, Drew et al. (2016) studied a sample of 20 Malawian women who had previously undergone fistula repair surgery. Barageine et al. (2014) used 140 cases and 280 controls. However, my study used a large sample size of 18,506 women using the 2016 UDHS data set.

Age at First Pregnancy. The Chi-square test indicated a statistically significant association between age at first pregnancy and the likelihood of developing obstetric fistula ($p = 0.034$). Given this result, I conducted a binary logistic regression to further determine the influence of age at first pregnancy on the likelihood of developing obstetric fistula. The result of the logistic analysis indicated that there is no association between age at first pregnancy and the likelihood of developing obstetric fistula after adjusting for geographical location ($p = 0.933$).

These findings are in contrast with the findings of researchers whose studies have indicated a relationship between age at first pregnancy and obstetric fistula. For example, Andargie and Debu (2017) examined the determinant factors associated with obstetric fistula in Ethiopia and found that age at first birth had negative significant association with the incidence of obstetric fistula using a logistic model ($p < 0.001$). It was also indicated that women who had their first birth between the ages of 15 and 19 were 51.9% less likely to develop obstetric fistula than their counterparts whose first birth occurred at

an age of < 15 years. The likelihood further decreased in women whose first birth fell within the age range of 25 years and above at 86% less likely to experience fistula. Typically in Uganda most of the women are married by age 18, even in cases where the stipulation of country laws should be above the age of 18 (Barageine et al., 2014). This early marriage leads to early pregnancy, which in turn leads to obstetric fistula due to immature pelvis to accommodate the baby. However, I found no association between age at first pregnancy and obstetric fistula in my study. This could be attributed partially to the difference in sample size and the fact that the prevalence of obstetric fistula in Ethiopia from the sampled data was 18.8%, as opposed to the prevalence the 2016 UDHS that indicated that 2% of Ugandan women aged 15-49 had experienced obstetric fistula (Kakembo et al., 2020).

Level of Education. The Chi-square test indicated that there is a statistically significant association ($p = 0.002$) between level of education and the likelihood of developing obstetric fistula. The logistic regression analysis showed that the likelihood of an educated woman to develop obstetric fistula is not statistically significant while adjusting for geographical location, ($p = 0.226$). Though the Chi-square test confirmed that level of education influences the development of obstetric fistula, the result from the logistic regression model indicated that there was no statistically significant association between level of education and the likelihood of developing obstetric fistula. Therefore, I failed to reject the null hypothesis that there is no association between level of education and the likelihood of developing obstetric fistula.

These findings are in contrast with the findings of other researchers. Andargie and Debu (2017) indicated an association between educational status and the incidence of obstetric fistula. They showed that women with primary, secondary, and higher education were less likely to develop the condition than those with no education in Ethiopia using data source from the Ethiopian DHS conducted in 2005 (Andargie & Debu, 2017). Andargie and Debu found an 89.3% less likelihood for a woman with primary education (OR = 0.107; 95% CI: 0.068-0.17) and 80% less likelihood for women with secondary and higher education (OR= 0.200; 95% 0.123-0.324) to develop obstetric fistula than those with no education. Basheer and Pumpaibool (2014) also revealed a relationship between level of education and the occurrence of vesico vaginal fistula ($p < 0.001$).

The study by Andargie and Debu (2017) was a retrospective study in which only 3,178 women were considered out of the 14,070 women who underwent a face-to-face interview on their background characteristics. The sample size was relatively small (n = 3,178) and must be interpreted with caution. On the other hand, the findings of my study regarding educational level and the likelihood of developing obstetric fistula is based on a much larger sample using a more recent study (2016 UDHS). The study by Andargie and Debu utilized the 2005 Ethiopian DHS data set, and 11 years is a significant amount of time where several educational programs and strategies may have been in place to create awareness in a way that level of education was no longer a significant predictor of obstetric fistula.

Income. The result did not indicate a statistically significant association between income and the likelihood of developing obstetric fistula X^2 (3) = 3.875, Likelihood Ratio

= 3.770, p = 0.277, Cramer's V = 0.016). The Cramer's analysis indicated a very weak association between income and the likelihood of developing obstetric fistula. Therefore, I failed to reject the null hypothesis that there is no association between income and the likelihood of developing obstetric fistula.

These findings contradict findings from other researchers from the literature review (Adefris et al., 2017; Keya et al., 2018; Lufumpa et al., 2018; WHO, 2019). Lufumpa et al. (2018) found that the characteristics of areas where fistulas are most prevalent have low levels of education and financial instability. Keya et al. (2018) also found that most women who had lived with obstetric fistula were homemakers, some with small family business or farms in both Nigeria and Uganda. Similarly, in a study to examine reasons for delay in decision making and reaching health facility among patients with obstetric fistula and organ prolapse in Gondar University hospital, Northwest Ethiopia, Adefris et al. (2017) found lack of economic empowerment among most women in rural Ethiopia as the most frequently mentioned reason for delay in seeking treatment. WHO (2019) supported these findings by asserting that women who are disproportionately affected by obstetric fistula are the poorest women in the community, whose voices are hardly heard by the people that matter. Gebresilase (2014) also stipulated that income earning respondents had less chances of developing obstetric fistula than their counterparts who were housewives or peasant farmers. In other words, the development of obstetric fistula has been associated with income.

Though the study indicated no association between income and obstetric fistula, the disparity in the findings could be attributed partially to variety of factors such as

differences in design, sample size, study setting, and methodology. Additionally, UNFPA has made it possible for thousands of women and girls to receive reintegration services such as skills training and small grants to start business with support from organizations like Maternal and Newborn Health Thematic Fund (UNFPA, 2020).

Religious Affiliation. The result indicated that there no statistically significant association between religious affiliations and the likelihood of developing obstetric fistula X^2 (14) = 18.936, Likelihood Ratio = 15.024, p = 0.167, Cramer's V = 0.032). The Cramer's analysis showed a very weak association between religious affiliations and the likelihood of developing obstetric fistula. Therefore, I failed to reject the null hypothesis that there is no association between religious affiliations and the likelihood of developing obstetric fistula.

This study's findings are inconsistent with my findings in the literature review. Researchers have linked the religious denomination of a women and the likelihood of developing obstetric fistula (Drew et al., 2016). In a study conducted to better understand the long-term quality of life and outcomes among women who have had fistula repair at the Fistula Care Center in Lilongwe, Malawi, Drew et al. (2016) found that women from less prominent denominations (e.g., Protestantism, Catholicism) were affected more than those from the two prominent religious affiliations (Christianity and Islam). Religious leaders from the prominent religious denominations can be influential in health education intervention programs, which may have led to those from less prominent denominations being more affected. Mubukayi et al. (2016) also conducted research in the Democratic Republic of Congo and reported that majority of the participants who had no fistula were

more likely to be those with the same religious affiliation as their spouses. They also concluded that prominent religious denomination leaders are among influential people in health education intervention programs, which positively affect change by simply spreading the "word" to their respective congregations. Given the universal religious commitment and engagement in some African population, without the involvement of influential people like religious leaders, there are potentially missed opportunities for these leaders to raise awareness about fistula and even provide support for women who are already living with obstetric fistula in the community (Watt et al., 2014).

The disparity in the findings could stem from the difference in sample size. The sample size used in the study conducted by Drew et al. (2016) was much smaller (20 Malawian women) than the 18,506 respondents of the 2016 UDHS data set that was utilized in this study. Another possibility is that I tested 16 separate categories of religious affiliation, and even with a large sample size there were no associations determined.

Research Question 2

What is the association between medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity and number of antenatal visits) and the likelihood of developing obstetric fistula among women ages 15 to 49 in Uganda while adjusting for geographical location of participants?

Access to Healthcare. The Chi-square test for association indicated that there is a statistically significant association ($p < 0.001$) between access to healthcare and the likelihood of developing obstetric fistula. The result of logistic regression analysis

showed that there is no statistically significant association between access to healthcare and the development of obstetric fistula while adjusting for geographical location, (OR = 0.784, 95% [0.333, 1.849], p = 0.979, and the Wald = 0.309). Based on these findings, I failed to reject null hypothesis that there is no statistically significant association between access to healthcare and the development of obstetric fistula while adjusting for geographical location.

These findings are in contrast with findings from the literature review. Keya, Sripad, Nwala, & Warren (2018) found a link between access to health care and the likelihood of developing obstetric fistula. These researchers conducted a qualitative approach in Ebony in Nigeria, Hoima and Masaka in Uganda between June and December 2015, and discovered that women who suffer from multiple cost barriers often are less likely to access health care, and often seek emergency obstetric care too late. What all these studies have in common are inability to access quality health care due to distance and lack of money or source of income. While there is no guarantee that a pregnant woman will receive effective interventions in maternal health, the likelihood of receiving effective maternal health interventions during those visits increases for pregnant women that comply with this recommendation by the WHO (UNICEF, 2018). Harrison et al. (2015) found poor access to quality health care to be among to root causes of the development of obstetric fistula.

In every society including Uganda, living indicators of maternal health care are the presence of obstetric fistula patients (Swain, Parida, Jena, Das, & Das, 2020). The provision of accessible essential obstetric care services is among the ultimate solutions to

this issue (Swain et al., 2020). However, the decision to use these services even if they exist is affected many factors. For instance, typically, in a village setting in sub-Saharan Africa, the decision on where to go to deliver a baby is not made by the pregnant mother but by other influential people like the husband, or if the woman is not married then the decision-making process falls on elders and parents (Mselle & Kohi, 2015). The difference in the above findings could be attributed to sampling methods and size.

Distance from Hospital/Nearest Health Facility. I tested to determine whether is an association between distance from nearest hospital/the nearest health facility and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. My hypothesis was there is no association between distance from nearest hospital/the nearest health facility and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. The Chi-square test for association indicated that there is a statistically significant association (p-value < 0.001), between distance from hospital/the nearest health facility and the likelihood of developing obstetric fistula. The result of logistic regression analysis showed that there is no statistically significant association between distance from hospital/the nearest health facility and the development of obstetric fistula while adjusting for geographical location (p-value = 0.090). Therefore, I failed to reject null hypothesis that there is no statistically significant association between distance from hospital/the nearest health facility and the development of obstetric fistula while adjusting for geographical location.

The finding of this research differs from my findings from the literature review. Lyimo & Mosha (2019); Barageine et al. (2014); (Changole et al. (2018) discovered an association between obstetric fistula and distance from hospital or emergency comprehensive obstetric care. Lyimo & Mosha (2019) concluded that inaccessibility or unaffordability of public transportation to access a health care facility is among the causes of delay in seeking treatment among women with fistula. Many women reached treatment centers using motorcycles or walked long distances, and some even used other means of transportation. However, a woman who is already in labor that may have already been prolonged may not have a chance if an emergency obstetric care center is distance away. In a case study conducted in Western Uganda to compare background factors of women with obstetric fistula (cases) and those without (controls), Barageine et al. (2014) found that significantly more of the obstetric fistula patients in their study were living far from the nearest comprehensive Emergency Obstetric Care facilities in relation to the controls. The median distance between the patients and the controls was 17.5 km and 5 km respectively. The difference in these findings could stem from the design and sample size. My study design was a cross-sectional quantitative approach, while the study by Barageine et al. (2014) was a case control study using 420 respondents (140 cases and 280 controls) altogether. In their study in the region of Central Malawi to explore labor and childbirth experiences of women with obstetric fistula with their focus on accessibility of care in that region, Changole et al. (2018) found inaccessible health facilities as one of the risk factors for fistula formation. The study indicated that 15 out the 25 participants lived far from the nearest health facility, with most living 10 to 30 km

away, and found it impossible to arrive in time, especially when labor is in progress. However, even though, these researchers have come up with these risk factors, more work is still needed to identify such predictive factors among women aged 15-49 years in Uganda and come up with recommendations for health policy decision making bodies and other responsible parties (Barageine et al., 2014). While my study did not find an association between access to health care and the development of obstetric fistula, other studies have highlighted some significant factors that provided treatment pathways for fistula patients living in Uganda, suggesting vital targets for improvement (Nalubwama et al., 2020)**.** Easy access to health care is no exception.

Additionally, while there is a disparity between findings of the above studies and mine, the result of my study is not surprising. Other studies in Uganda did not find delay to seek obstetric care as an associated risk of obstetric fistula. This could be attributed to changes by the Ministry of Health in Uganda to increase facility-based births, particularly given the nation's emphasis on prevention of the transmission of HIV from pregnant mothers to their unborn children (Nalubwama et al., 2020).

Parity. I tested to determine whether there is an association between parity and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants? My hypothesis was there is no association between parity and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. The Chi-square test for association indicated that there is a

statistically significant association (p-value = 0.012), between parity and the likelihood of developing obstetric fistula.

Both the Chi-square test for association (p-value = 0.012) and the logistic regression model (p-value = 0.046) confirmed that parity has an influence on the development of obstetric fistula while adjusting for geographical location. As a result, I reject the null hypothesis that there is no association between parity and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

These findings suggest that the odds of a developing obstetric fistula based on the parity of the woman are 3.597 higher than the other predictors. The positive value of 1.280 indicates an increase in the likelihood of association with the dependent variable (obstetric fistula. In this case, the association of parity with obstetric fistula is high, and there is a positive relationship between the two. The more babies a woman has (multiparity), the higher the risk of developing obstetric fistula. On the other hand, their counterparts with less pregnancies/babies are less likely to develop obstetric fistula.

Sih et al. conducted a study using a multivariate analysis to examine the association between parity and fistula location in women with obstetric fistula in Malawi. While the findings of this study is based on multiparity, the study by Sih et 2016 indicated that altogether, 196 (43.4%) of the 452 respondents were primiparous at the time the fistula developed, and 256 (56.6) were multiparous at the time they developed fistula. Consequently, in addition to other intervention programs, maternal health care providers and other public health practitioners should focus their attention on issues that

may lead to complicated labor such as parity. These findings are consistent with findings from previous research. Researchers have identified a relationship between primiparous status and obstetric fistula (Jokhio et al., 2014). In a study in rural Pakistan using a population-based sample to estimate prevalence of obstetric fistula researchers reported a higher proportion of the sample population with obstetric fistula being primiparous (Jokhio et al., 2014). This finding is consistent with the retrospective study of Lilungulu, Gumodoka, Nassoro, Soka, and Stephen (2018) using hospital records of obstetric fistula women that had their repair during the 2013 and 2014 period to examine predictors of obstetric fistula and factors that contribute to the development of this condition as well as birth outcomes of women undergoing repair at Dodoma Regional Referral Hospital in Tanzania. In this study, 47 (90.2%) out of the 52 women in the study were primiparous while only 5(9.6) were multiparous (Lilungulu et al., 2018). A study by Ouedraogo et al. (2017) to investigate a 6-month follow-up of 384 patients from the Danja Fistula Center indicated that the average parity of women at the time of the occurrence of fistula was 4, with a median parity of 3, and a range of parity from 1 to 14.

Even though, the study by Ouedraogo et al. (2017) was a retrospective, observational, cohort study that utilized the case records of 384 patients from the Danja Fistula Center and assesses associated-factors, over an 18 month period, (January, 2013 to July, 2014), both findings indicated an association with the development of obstetric fistula. Therefore, the current findings suggest the need for interventions that are directed towards family planning programs towards individuals and communities in Uganda.

Number of Antenatal Visits. I tested to determine whether is an association between number of antenatal visits and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants? I hypothesized that there is no association between number of antenatal visits and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. The Chi-square test for association showed that there is no statistically significant association (p-value = 0.893), between number of antenatal visits and the likelihood of developing obstetric fistula. The difference in the results could be attributed to the fact that I did not adjust for geographical location with the chi-square test but adjusted for geographical location with the multiple logistic regression analysis. Consequently I failed rejected the null hypothesis that there is no association between number of antenatal visits and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants.

These findings are in contrast with findings from previous research from the literature review. Yismaw, Alemu, Addis, & Alene (2019) and Andargie & Debu (2017) agreed that there is an association between antenatal visits and obstetric fistula. Andargie & Debu (2017) found follow up of ANC during pregnancy among the significant determinant factors of obstetric fistula in Ethiopia. The frequency of ANC visits was shown to have a statistically significant association with the incidence of fistula ($p<0.001$) in their analysis. In fact, they discovered that the odds of women experiencing the condition among those who had ANC for 7 days and or more during their pregnancy

was 87.1% less likely to occur compared to those who had no ANC visit (OR=0.129; CI:0.053-0.310).

In the study conducted by Andargie & Debu (2017), it was clear that the odds of women experiencing obstetric fistula among those who visited the antenatal clinic for 7 days and above during pregnancy was 87.1% less likely to occur compared to their counterparts who had no ANC visits. However, Andargie & Debu (2017) used a sample size of 3,178 women who responded about their experience on obstetric fistula. My study used the entire sample of 18, 506 women.

Similarly, in a study conducted to estimate the average recovery time of obstetric fistula and to identify its determinants, in Gondar University teaching hospital in Northwest Ethiopia, Yismaw et al., (2019) found that having history of ANC was one of the significant determinate variables which shorten the recovery time of obstetric fistula. The recovery rate for those who had ANC follow-up was higher than their fellow patients that had none by 95% (AHR =1.95, 95% CI = 1.39-2.73). From this analysis, they concluded that patients who had ANC visits experienced shorter recovery time than their counterparts that had no antenatal visits. While these two studies have different objectives, and the participants were at different stages of the condition, they both pointed to ANC to be helpful in both preventing the condition and shortening the recovery time from fistula repair surgery, even after occurrence of obstetric fistula (Andargie & Debu, 2017;Yismaw et al., 2019).

Additionally, Yismaw et al. (2019) conducted an institutional based retrospective follow-up study to estimate recovery time from obstetric fistula and its determinant

factors within a seven-year period, using data extracted for hospital registry of patient chart on obstetric fistula in Gondar University teaching and referral hospital in northwest Ethiopia. They used a sample size of 612 fistula patients. Irrespective of sample size, design, and setting, my study could add to the existing body of evidence of the burden of obstetric fistula in the low-resource nations and draw attention of policy makers and health administrators to the problem. Also, the findings of my study could shed light on the importance of improving quality of information regarding childbirth during pregnancy, during antenatal visits. This finding is clinically relevant and calls for improvement of quality of information during ANC (Barageine et al., 2014).

Research Question 3

What is the association between Mode of delivery (C- section) and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Mode of Delivery (C-Section). For research question 3, I tested to determine whether there is an association between mode of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants? I hypothesize that there is no association between mode of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. The Chi-square test for association indicated that there is a statistically significant association (p-value = 0.043), between mode of delivery and the likelihood of developing obstetric fistula. The result of logistic regression analysis

showed that there is no statistically significant association between mode of delivery and the development of obstetric fistula while adjusting for geographical location (p-value = 0.523). Therefore, I failed to reject the null hypothesis that there is no statistically significant association between mode of delivery and the development of obstetric fistula while adjusting for geographical location.

This study is in line with findings of other researchers. Delamou et al. (2016) conducted a scoping review studies reporting on pregnancy and childbirth in women who underwent fistula repair in sub-Saharan Africa. This was in an effort to synthesize the pregnancy and childbirth after the repair and to identify knowledge gap. Among the vital findings of their study was the fact that many sub-Saharan African women still have the desire to become pregnant after the repair of their obstetric fistula. They conducted and searched relevant articles published between January, 1970 and March, 31, 2016; and found that 208 out of 459 women delivered by elective C- section, (45.3%), 176 women by emergency C- section (38.4%), and 75 women delivered by virginal delivery (16.3%). These are women who had their fistula repaired prior to the pregnancy. The findings of their study indicated that C- section was associated with recurrence of obstetric fistula and even maternal death. Also, while the evidence from the study by Delamou et al. does not offer precise estimates of the incidence of pregnancy and outcomes of pregnancy after fistula repairs, fistula recurrence was found to be a common maternal complication in included studies (Delamou et al., 2016).

The study by Delamou et al. focused on women who had their fistula repaired in sub-Saharan Africa. My study used the 2016 UDHS data set using the sample size of

18,506 women ages 15 to 49. While no statistically significant association was found between mode of delivery and obstetric fistula, the findings from my study could build on prevention programs that are already in place. This would call for Policy makers to consider a scheme to fund readily available transportation to transport women in labor to skilled obstetric centers for skilled intervention, as this would prevent women from developing obstetric fistula (Barageine et al., 2014).

Research Question 4

What is the association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants?

Location of Delivery. For research question 4, I tested to determine whether there is a relationship between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants? I hypothesized that there is no association between location of delivery and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. The Chi-square test for association indicated that there is no statistically significant association between location of delivery and the likelihood of developing obstetric fistula (p-value = 0.427). Like the Chi-square test for association, the result of the logistic regression analysis did not show a statistically significant association between location of delivery and the development of obstetric fistula while adjusting for geographical location (p-value = 0.317). Therefore, I failed to reject the null hypothesis that there is no statistically

significant association between location of delivery and the development of obstetric fistula while adjusting for geographical location.

These findings are not consistent with those of other researchers in the literature review findings. Andargie & Debu (2017); Khisa, Omoni, Spitzer, & Nyamongo (2017); Ouedraogo, Payne, Nardos, Adelman, & Wall (2017) each found that place of delivery has a significant link with the incidence of obstetric fistula. In their study to examine the determinant factors associated with the prevalence of obstetric fistula in Ethiopia, Andargie & Debu (2017) found that women who delivered their babies in health centers were 80.3% less likely to experience obstetric fistula compared to their counterparts who delivered their babies from home, adjusting for other variables in the model. Also, in a study aimed at documenting the experiences of women who suffer from fistula in Kenya, Khisa et al. (2017) identified place of delivery as one of the six emergent themes predicting occurrences of obstetric fistula.

Moreover, in their quest to report a 6-month postoperative follow-up of patients from Danja Fistula Center in Niger, and assess factors associated with successes or failures with such operations, Ouedraogo et al. (2017) discovered that only 64 (18%) of the 384 patients in the study delivered at home. However, even though the rest of the participants (300, 82%) delivered at a health center, they arrived there too late.

The location of delivery is one of the key items of the checklist of the pregnant woman is determining where to give birth to the baby (Mselle & Kohi, 2015). While this requires advanced planning by the pregnant woman and spouse, this is not the case in African communities. The decision on where to go only comes up when the woman is in

labor and it has been made clear that she cannot be delivered by an untrained attendant. More importantly, the pregnant woman is not among the key players in making this decision-making process. Instead, husbands and mother-in-law play the key role in the process.

The disparity in the findings could be attributed to variety of factors, study design, sample size, setting, time period, and so on. Ouedraogo et al. (2017) conducted their study using medical records on 6-month postoperative follow-up of 384 patients from a single health center: Danja Fistula Center. My study considered a sample of 18,506 from the 2016 UDHS data set. Khisa et al. (2017) conducted their study by recruiting participants from fistula repair centers in Kenya in 2013, including Kenyatta National Hospital, Kisii Level 5 Hospital and Gynocare Fistula Centre. My study includes 18,506 participants from the 2016 UDHS data set. Despite these discrepancies, the common theme that women with fistula share are poverty, illiteracy, living in rural areas, early marriage, and receiving inadequate obstetric care during pregnancy (Ouedraogo et al. 2017). Alternative explanations could be attributed to the fact that other studies were descriptive, therefore, did not control for confounding and interaction, which was done in my study.

Covariate: Geographical Location of Participants. I tested the covariate to determine whether there is an association between the two, geographical location of participants and the dependent variable, likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants? I hypothesize that there is no association between geographical location of

participants and the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. Both the Chi-square test for association (p-value = 0.525), and the logistic regression analysis (p-value = 0.676), indicated that there is no statistically significant association between geographical location of participants and the likelihood of developing obstetric fistula. Therefore, null hypothesis that there is no statistically significant association between geographical location of participants and the development of obstetric fistula while adjusting for geographical location will be rejected in favor of the alternative hypothesis that there is an association between geographical location of participants and the likelihood of developing obstetric fistula.

On the contrary, previous researchers found an association between geographical location and obstetric fistula in their studies. Andargie & Debu (2017); Kumar et al. (2018); Mselle & Kohi (2016), found a link between geographical location of participants and the development of obstetric fistula. In a study to examine the determinant factors associated with the prevalence of obstetric fistula in Ethiopia, Andargie & Debu (2017) found that women who reside in the rural areas of Ethiopia had the higher prevalence of obstetric fistula compared to women who lived in urban area (21.2%). The disparity in the findings could be attributed in part to multiple factors including methodology, and sample size. I used 18, 506 women in my study while Andargie & Debu (2017) used a sample of 3,178 women in their study. In a study that used 16 Tanzanian women's stories to illustrate the challenges that cause them failure to access adequate obstetric care in a timely manner, Mselle & Kohi (2016) stated that most of the participants with obstetric

fistula (82%) lived in rural areas prior to developing obstetric fistula. Furthermore, Kumar et al. (2018) conducted a retrospective study to analyze 311 patients with genitourinary fistulas after obstetric surgeries between January 2005, and January 2018. They discovered that majority (90.4%) of the fistula patients were from the rural areas (Kumar et al., 2018). While these researchers did a great job in adequately documenting this vital link, not much has been said about this association in Uganda. The differences in outcome between my study and those of other researchers could be partially attributed to sample size. For instance, the sample size used in the study by Andargie & Debu (2017) was 3,178. I considered the entire sample of 18, 506 women.

Interpretation of Findings in the Context of the Theoretical Framework

The Andersen's Behavioral Model of healthcare utilization was the main theoretical framework that I utilized for this study. The Andersen's model proposes that access to and use of health services by an individual is considered to be a function of three characteristics including predisposing factors, enabling factors, and need factors (Azfredrick, 2016). The main predisposing factors in the model were age at first pregnancy, marital status, parity and religious affiliations. Besides, parity, all the predisposing factors considered for this study indicated no statistically significant association with the outcome variable, the likelihood of developing obstetric fistula. Parity indicated a statistically significant association with the likelihood of developing obstetric fistula while adjusting for geographical location (p-value = 0.046). Level of education and income (wealth indicators) were the enabling factors in the study. Both variables indicated no statistically significant association with the outcome variable, the

likelihood of developing obstetric fistula. This is in direct contrast with the predictions of Andersen's Model that posits that education is perceived to have a direct link with health utilization. In this study, the need factors represent medical risk factors such as access to health care, number of antenatal visits, location of delivery, and the mode of delivery. Number of antenatal visits was statistically insignificantly associated with the likelihood of developing obstetric fistula. This finding is inconsistent with what was found by researchers that support routine screening as a predictor of positive health outcome (Tolera, Gebre-Egziabher, & Kloos, 2020).

When I applied Andersen's behavioral model of health service use to the predictor variables in this study, findings are consistent with those of previous researchers were observed. There is evidence within literature that sheds light on the use of resources as a positive impact upon quality of life and substantially affects the overall population health (Healthy People 2020, 2014). Andersen's behavioral model of health services was utilized as a guide to identify the study variable, designing research questions and hypotheses data analysis, and interpretation of findings. My study investigated the risk factors that predict the likelihood of developing obstetric fistula among women 15 to 49 years old in Uganda while adjusting for their geographical locations. The findings of the study that parity is statistically significantly associated with obstetric fistula are in line with Andersen's behavioral model of health service utilization. According to these findings, number of antenatal visits has no influence on the development obstetric fistula. Also, while parity played a significant role in the development of obstetric fistula, demographic factors (marital status, age at first pregnancy, level of education and

income, and religious affiliations) did not show any significance. Additionally, surprisingly, access to health care and nearest hospital/clinic was not statistically significant.

Limitations of the Study

The data set used for this study was collected during the time period of June 20 and December 16, 2016, therefore, will be more than two years prior to the study. Changes may have happened since that time including reality on the ground in Uganda. The study was based on data that were collected in 2016 in a previous UDHS that was generally representative (the national level, the residential level [rural-urban], and the regional level [departments, states] household surveys, containing a wide range of indicators about health, nutrition, and population. While generalizability was not an issue, UDHS was affecting generalizability to some extent, because DHS samples were not large enough to provide estimates for small regions. Otherwise, findings and conclusions were generalizable.

Some of the limitations in the sampling process were not documented limitations by the 2016 UDHS, as no consideration was given to populations like the refugee population. Unfortunately, there was high influx of refugees into the country at that time. However, generalization of estimates to Uganda resolved this limitation because it took care of any special populations like the refugees who fall in that category (UBOS-ICF, 2018).

Additionally, due to the fact that data set was a 2016 UDHS data, the findings of the study may have those limitations that are peculiar to secondary data usage. These may

include inadequate or incomplete information that may have not been of value to the study and may produce inconsistencies when data is being entered (Creswell, 2009).

Due to use of a secondary data collected by the UDHS during the time period of June 20 and December 16, the chance to define variables was limited, thereby limiting the strength of data analysis. This limitation was resolved by recoding the data. The varying levels of recall capacities of the respondents (who have different levels of education) may have negative impacts on the study findings. However, the UBOS ensured that enumerators understood the concepts and questionnaire administration and interpretation by ensuring adequate training. The limitation of that was the various manipulation of the data set over the years may affect the data set in a way that they may be hard to code; was mitigated by running the data into the SPSS version 25.

Recommendations

The lack of significant association between the demographic variables (marital status, age at first pregnancy, level of education and income, and religious affiliations) and the outcome variable (Obstetric fistula), was a key finding of this study. However, while majority of the medical risk factors indicated no statistical significance, parity and number of antenatal visits were statistically significantly associated with the likelihood of developing obstetric fistula.

This study also indicated that the mode of delivery is not a significant predictor of the likelihood of developing obstetric fistula. Incorporating core indicators that relate to obstetric fistula in the national health management system, if not already done, is a promising development. Also, policymakers, politicians, and health administrators in this

nation must make obstetric fistula a higher priority. There must be collaboration among government at all levels in the country to provide easy access to specialized obstetric centers to women for the medical care they disparately need. I recommend further research on the impact of other likely existing factors on the likelihood of developing obstetric fistula, not addressed in the current study.

Implications for Professional Practice and Social Change

This quantitative cross-sectional study aimed at examining the factors predicting the development of obstetric fistula among women 15 to 49 years old in Uganda. I used Andersen's behavioral model of health service utilization as framework for the study.

Professional Practice

The findings of this study have highlighted the main predictors of obstetric fistula. Therefore, it may serve as a guide for health care administrators in designing interventions to improve obstetric care delivery system in the country. My study highlights some of the issues that the government should focus on to improve maternal health and reduce maternal mortality rates. It is important to understand the front row drivers of maternal mortality and morbidity, and one of the tools that can be used as a method of interaction is antenatal services where early signs of potential difficult labor can be detected. The findings pointed to number of antenatal visits as an important predictor of the likelihood of developing obstetric fistula. It can, therefore, inform increased knowledge and awareness among the high-risk population on steps they can take to prevent this condition. Improvement programs should be established by the Ministry of Health to ensure access to quality antenatal services.

One of the outcomes of this study is that its findings help to shed light on maternal health issues that the government should focus on to improve the health of the women of Uganda. The fifth of the Eight Millennium Development Goals is to improve maternal health (WHO, 2020). The 2016 UDHS indicated that 2% of Ugandan women aged 15-49 had experienced obstetric fistula (Kakembo et al., 2020). Given that it is critical to understand the drivers of maternal mortality in the nation, and the use of antenatal services as a vehicle to reach the target population as well as training women on the warning signs of complicated labor, in addition to other intervention programs, maternal health care providers and other public health practitioners should focus their attention on issues that may lead to complicated labor such as parity.

There are several clinical and practical positive implications that the findings of my study bring to the table that help in designing and implementing maternal mortality/morbidity prevention programs as well as public health educational campaigns in Uganda.

Positive Social Change

A positive social change is that my study adds to the existing knowledge on the risk factors for the likelihood of developing obstetric fistula and generating knowledge on predictors of the condition among Ugandan women. It will help policy makers, health managers, and service providers to understand these risk factors and be instrumental in the prevention intervention programs. Using the findings of this study, more knowledge of the main predictors of obstetric fistula could facilitate engagement in preventive

maternal health services at individual level, which could in turn have direct positive impact on the health of their families.

At community level, the findings of my study could shed light on targeted awareness programs such as outreach programs that promotes antenatal visits during pregnancy. Also, health care administrators and policy makers could create interventions that specifically target older women in the community, and opinion and religious leaders in the community that may increase awareness among the target population. The findings of this study can facilitate a decision-making process that is evidence-based. This is important because in African settings, women tend to rely on the advice and recommendations from elders and leaders of the community. For instance, when it comes to childbearing issues, younger women of child-bearing age rely on their mothers, mothers-in-law, or even experienced midwives/traditional birth attendants to advice on obstetric needs such as attending antenatal clinics. The result of this research provides insightful information on the extent of the problem of obstetric fistula in Uganda. The fact that parity is statistically significantly associated with the likelihood of developing obstetric fistula among the target population is now established and documented. Therefore, policy makers and health administrators can use this information to inform the development of health promotion interventions to reduce maternal morbidity and mortality in Uganda. Also, measures should be in place to strengthen family planning to prevent the risk of obstetric fistula due to pregnancy and delivery (Andargie & Debu, 2018).

Conclusion

The aim of my study was to investigate how demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), medical risk factors (access to healthcare, distance from hospital/nearest health facility, parity, and number of antenatal visits), mode of delivery (C- section), location of delivery impact the likelihood of developing obstetric fistula among women ages 15 to 49 years old in Uganda while adjusting for geographical location of participants. A cross-sectional design was utilized using a 2016 UDHS secondary data set.

My study found that the factors of number of antenatal visits and parity were found to be significant predictors of the likelihood of developing obstetric fistula. There was no significant association demonstrated for the demographic factors (marital status, age at first pregnancy, level of education and income, and religious affiliations), access to healthcare, and distance from the nearest hospital/health facility, mode of delivery (C-section), and location of delivery. These findings were supported by chi-square test of association and logistic regression analysis, with all covariates for each hypothesis entered into the model.

Findings from this study added new knowledge to the body of evidence that could be used as a guide for both local health administrators and reputable international organizations to design maternal health promotion intervention programs for the improvement and enhancement of access to quality obstetric services. Also, the results from this research exert meaningful impact on public health practice in that area, improve

access to quality maternal health care, and could be a springboard for future research on obstetric fistula among this population.

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Appendix: Sample Questionnaires from the UDHS Data Set (2016)

INTRODUCTION AND CONSENT

SECTION 1

RESPONDENT'S BACKGROUND QUESTIONS AND FILTERS CODING CATEGORIES

Hello. My name is _____. I am working with Uganda Bureau of Statistics. We are conducting a survey about health and other topics all over Uganda. The information we collect will help the government to plan health services. Your household was selected for the survey. The questions usually take about 30 to 60 minutes. All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time. In case you need more information about the survey, you may contact the person listed on the card that has already been given to your household. Do you have any questions? May I begin the interview now?

RECORD THE TIME.

SIGNATURE OF INTERVIEWER

DEMOGRAPHIC RISK FACTORS

Marital Status

Are you currently married or living together with a man as if married?

Response: YES, CURRENTLY MARRIED 1

YES, LIVING WITH A MAN 2

NO, NOT IN UNION 3

What is your marital status now: are you widowed, divorced, or separated?

WIDOWED 1

DIVORCED 2

SEPARATED 3

AGE AT FIRST PREGNANCY

In what month and year were you born?

MONTH . . . . . .

DON'T KNOW MONTH 98

YEAR . . . . . .

DON'T KNOW YEAR

How old were you at your last birthday?

AGE IN COMPLETED YEARS

Level of Education

Have you ever attended school?

YES 1

NO 2

What is the highest level of school you attended: primary, "O" level, "A" level, tertiary or university?
PRIMARY 1
"O" LEVEL 2
"A" LEVEL 3
TERTIARY 4
UNIVERSITY 5

INCOME

As you know, some women take up jobs for which they are paid in cash or kind. Others sell things, have a small business or work on the family farm or in the family business. In the last seven days, have you done any of these things or any other work?
YES 1
NO 2
Are you paid in cash or kind for this work or are you not paid at all?
CASH ONLY 1
CASH AND KIND 2
IN -KIND ONLY 3
NOT PAID 4

Religious Affiliations

What is your religion?
NO RELIGION . . . ……..10
ANGLICAN . . . . . .……11
CATHOLIC . . . . . .…….. 12
MUSLIM . . . . . .……13
SEVENTH DAY ADVENTIST 14
ORTHODOX . . . . . .…….. 15
PENTECOSTAL/BORN AGAIN/EVANGELICAL 16
BAHA'I . . . . . .…….. 17
BAPTIST 18
JEWISH 19
PRESBYTERIAN. 20
MAMMON 21
HINDU 22
BUDDHIST 23
JEHOVAH'S WITNESS 24
SALVATION ARMY 25
TRADITIONAL 26
OTHER 96

MEDICAL RISK FACTORS

Access to health Care (Getting Money for Treatment/ Distance to Health Facility)

Many different factors can prevent women from getting medical advice or treatment for themselves. When you are sick and want to get medical advice or treatment, is each of the following a big problem or not a big problem:
Getting money needed for advice or treatment?

BIG NOT A BIG PROBLEM ……..1
BIG PROBLEM……2
The distance to the health facility?
BIG NOT A BIG PROBLEM ……..1
BIG PROBLEM……2

Parity
Now I would like to ask about all the births you have had during your life.
Have you ever given birth?
YES 1
NO 2
Antenatal Clinics
When (NAME)'s mother was pregnant with (NAME), did she have any antenatal check-ups?
YES 1
NO 2
DON'T KNOW 8
Did you see anyone for antenatal care for this pregnancy?
YES 1
NO 2
MODE OF DELIVERY
Was (NAME) delivered by caesarean, that is, did they cut your belly open to take the baby out?
YES 1
NO 2
LOCATION OF DELIVERY
Where did you give birth to (NAME)?
HOME
HER HOME … 11
OTHER HOME 12
PUBLIC SECTOR PUBLIC SECTOR
GOVERNMENT HOSPITAL 21
GOVERNMENT HEALTH
CENTER 22
OTHER PUBLIC SECTOR 26
PRIVATE MEDICAL SECTOR
PRIVATE HOSPITAL/CLINIC 31
OTHER PRIVATE MEDICAL SECTOR MEDICAL SECTOR 36
OTHER 96
Geographical Location:
Do you live in a city, town, or rural area?
CITY 1
TOWN 2
RURAL 3

PRESENCE OF OBSTETRIC FISTULA (DEPENDENT VARIABLE)

Sometimes a woman can have a problem of constant leakage of urine or stool from her vagina during the day and night. This problem usually occurs after a difficult childbirth, but may also occur after a sexual assault or after pelvic surgery.

Have you ever experienced a constant leakage of urine or stool from your vagina during the day and night?

YES 1
NO 2

Have you ever heard of this problem?

YES 1
NO 2