2022

Risk Factors Associated with Access to Intermittent Preventive Treatment for Malaria Among Pregnant Women in Uganda

MAYANJA Simon Peter
Walden University

Walden University

College of Health Professions

This is to certify that the doctoral dissertation by

Mayanja Simon Peter

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Richard Jimenez, Committee Chairperson, Public Health Faculty
Dr. Heidi Sato, Committee Member, Public Health Faculty
Dr. Scott McDoniel, University Reviewer, Public Health Faculty

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

Walden University
2022

Abstract

Risk Factors Associated with Access to Intermittent Preventive Treatment for Malaria Among Pregnant Women in Uganda

by

Mayanja Simon Peter

MA Demography, Makerere University, 2001

MPH, Uganda Christian University, 2009

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

February 2022

Abstract

Intermittent preventive treatment of malaria in pregnancy (IPTp) is an intervention consisting of the full course of therapeutic antimalarial medicine administered to pregnant women during routine antenatal visits regardless of whether the woman is infected with malaria. The use of intermittent preventive treatment of malaria in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP) has been reportedly low in most of the malaria endemic areas, including Uganda. The coverage of IPTp in Uganda has been estimated to be as low as 17%. An in-depth secondary data analysis using the 2016 Uganda Department of Health Services survey was conducted to understand the causal relationships between predictor variables of interest and the outcome variable – uptake of the recommended three doses of IPTp among pregnant women. Using a logistic regression model, the underlying association between maternal education, age of the mother, knowledge about malaria, frequency of antenatal care visits, socioeconomic status including household wealth status and number of cowives was measured against the outcome variable. Key independent variables including maternal education, knowledge about malaria, age of the mother and frequency of antenatal care visits were all significantly associated ($p<0.05$) with taking the recommended dosage of IPTp-SP during pregnancy. The number of cowives in a relationship showed no significant association ($p>0.05$) with taking the recommended doses of IPTp-SP during pregnancy. The study findings contribute towards positive social change for improved access to malaria prevention services and specifically IPTp-SP among pregnant women.

Risk Factors Associated with Access to Intermittent Preventive Treatment for Malaria Among Pregnant Women in Uganda

by

Mayanja Simon Peter

MA Demography [MUK] 2001, MPH [UCU] 2009

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

February 2022

Dedication

I would like to dedicate this piece of work to my late Dad, Mr. Edmund Kisubika Musoke. You greatly inspired me into the glorious fundamental values of life, including the value of education and the resolve to excel, no matter what. You will always be an integral part of our accomplishments and successes. For this I greatly honour you, Papa, and humbly dedicate this dissertation to you. Fare Thee Well!!.

Acknowledgments

Indeed, it's been a very long journey! I'm greatly humbled by the generous support and encouragement that I have received from a wide spectrum of individuals. First of all, this work would not have been successful without the continuous mentorship, support and guidance from my supervisors – the dissertation committee. I'm highly indebted to the chair of my dissertation committee, Dr. Brinkley L. Garland, the Committee Member Dr. Heidi D. Sato, and the URR Delegate Dr. Scott McDoniel for their tireless efforts and invaluable guidance to make sure that I remain on course and complete this work. I would also like to extend my appreciations to colleagues and associates specifically from the Evaluation Society of Uganda for their professional space that gave me the opportunity to read widely periodic articles on the subject matter.

To my colleagues in the struggle, with whom we always endured long hours sometimes in the night discussing after work, analyzing literature, reflecting on models that guide public health practice, I can't thank you enough. I would also like to express my sincere thanks to the Uganda Bureau of Statistics for granting me wide access to their publications and resources to enhance my research work particularly in the field of malaria among pregnant women.

Finally, to my loving family, my old mother Gladys, my dear wife Rebecca and our beautiful children, Belinda, Bernice and Belisha. Thank you so much for being very supportive throughout this entire process. I will forever be grateful.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Malaria continues to ravage mass populations in sub-Saharan Africa, with children and pregnant women being more vulnerable. The disease happens to be one of the greatest threats to global public health in Africa. Malaria infection claims lives of more than 435,000 people every year (World Health Organization [WHO], 2018a). Global estimates indicate that almost half of the world's population could be at the risk of malaria infection (WHO, 2018b), with children and pregnant women being the worst hit. In this regard, malaria has been ranked the third most common cause of death among women aged 15-49 years in Africa (Roll Back Malaria Partnership, 2014). Most of these cases are from Africa, south of the Sahara. In most cases some population groups are disproportionately more affected than others, making malaria a public health emergency in endemic countries. Pregnant women are more susceptible to malaria because their immunity is usually diminished due to pregnancy particularly during the first and second pregnancies (Center for Disease Control and Prevention [CDC], 2019). According to global estimates, close to 20 million pregnant women globally could be potentially at the risk of getting the infection (WHO, 2018a). There are serious consequences if the infection is not prevented or well managed. Malaria among pregnant women significantly increases the risk of premature births, maternal anaemia, still births, miscarriages, intrauterine demise, and babies with low birth weight (President's Malaria Initiative [PMI], 2019); this partly clarifies the role of malaria to higher maternal and neonatal mortality rates especially in Africa.

It has been estimated that malaria infection is globally responsible for over 10,000 maternal and 200,000 neo-natal deaths per year (Roll Back Malaria Partnership, 2014; WHO, 2019). If only countries could achieve an 80% coverage of MIP interventions most of these deaths could be averted. The processes and mechanisms through which pregnant women become more prone to malaria infection have been extensively explained. However, malaria is highly preventable, if only countries could strengthen access to and use of the "recommended anti-malarial interventions" (WHO, 2018b). These may include proven interventions such as the consistent use of insecticide treated mosquito nets (ITN), indoor residual spraying of the vector (IRS), intermittent presumptive treatment of malaria in pregnancy (IPTp), early diagnosis, and prompt management of malaria cases and for pregnant women before during and after delivery (Uganda Ministry of Health, 2017). In this study, I sought to estimate the proportion of and determine factors associated with uptake of IPTp specifically using *sulfadoxine pyrimethamine* (SP) among pregnant women in Uganda. The study was premised on the growing body of evidence that indicates that despite concerted efforts to make antimalarial therapies for prevention during pregnancy available, fewer Ugandan mothers have the required access to IPTp-SP (Uganda Demographic and Health Survey [UDHS], 2016).

Malaria in Uganda

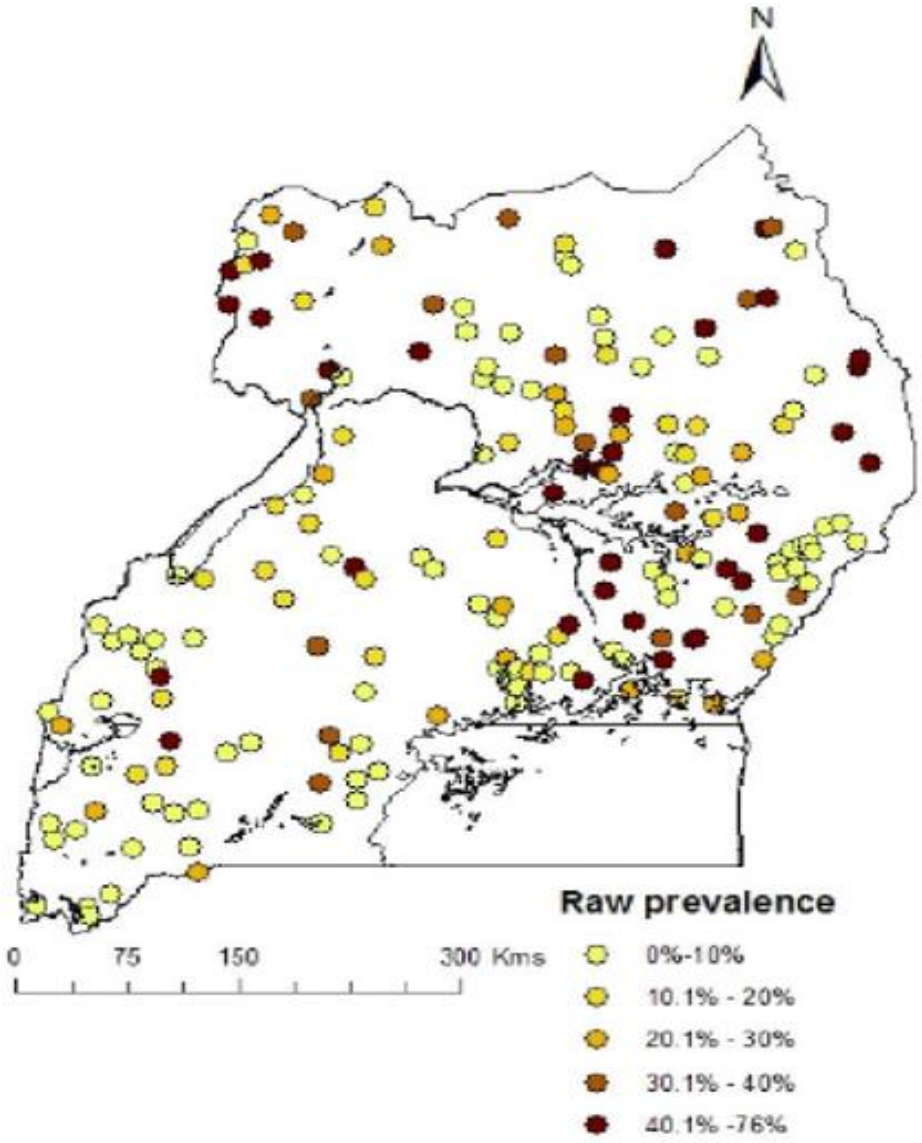
Uganda is a land-locked country located along the equator in the eastern part of Africa; with an estimated population of about 40 million people (Uganda Bureau of Statistics, 2019). Malaria is endemic in Uganda with up to 35 million people at risk of

malaria infection throughout the year. The burden of malaria disease as it relates to morbidity and mortality is quite widespread in Uganda. The country is reported to have had some of the highest recorded malaria cases and transmission rates in the world (PMI, 2019). Uganda has been ranked eighth in terms of the magnitude of malaria infections in sub-Saharan Africa (PMI, 2019).

Whilst an estimated 219 million malaria cases were reported globally in 2017, Uganda was categorized among the ten high burden countries in the African region (WHO, 2018b). According to the Malaria Consortium (2018), Uganda has some of the highest recorded malaria transmission rates in Africa. It is estimated that an average Ugandan living within the central lake region receives over 1,500 mosquito bites annually. The country is ranked third in terms of the highest malaria-related deaths on the continent (Abeku et al., 2015; Malaria Consortium, 2018). The Ugandan Ministry of Health (2017) has reported that as high as 80% of pregnant women are vulnerable and being targeted for malaria preventive programs. However, access and use remain suboptimal. Increased access to and use of malaria prevention therapies such as IPTp is critically needed to help reduce the burden of malaria in Uganda. Figure 1 below shows the observed malaria cases various sites during the Malaria indicator survey of 2014.

Figure 1

Map of Uganda Showing Observed Malaria Prevalence at Survey Locations- MIS 2014-2015



Note: Ssempiira, et al., 2017

Uganda is largely endemic, with few spotted areas of low transmission but quite prone to epidemics (Uganda Ministry of Health, 2017). The prevalence of malaria infection in Uganda, the incidence of disease, and the mortality due to severe malaria all have remained quite high (Malaria Indicator Survey, 2014) in this third word developing

country. According to the most recent entomological surveillance reports, *Plasmodium Falciparum* is the most common vector responsible for most malaria cases in Uganda (Malaria Indicator Survey, 2014; UDHS, 2016; Uganda Ministry of Health, 2017) but this phenomenon may vary from country to country.

The disease is known to have considerable risks to pregnant woman, the fetus, and to the neonates. Evidence shows that children under 5 years and pregnant women are particularly more vulnerable to malaria infection (Muhumuza et al., 2016; Taremwa et al., 2016; WHO, 2018). In Uganda, malaria accounts for up to 34% of all the out-patient clinic visits and between 19 – 30% of all in-patient admissions (PMI, 2019). This implies that if malaria is not managed well, the infection may result into severe illness leading to the otherwise preventable death of the mother, the unborn child or both.

Malaria in Pregnancy

Pregnancy is known to be a time condition characterized by immunologic tolerance as a result of the growing fetus in woman's uterus (Kourtis et al., 2014). Pregnant women who have very low levels of previously acquired immunity are particularly at high risk of the most severe complications of malaria during the gestation period (Ameh et al., 2016). The fatal and devastating effects of malaria during pregnancy are well-known. They include conditions such as abortion, severe anaemia, intrauterine foetal deaths, still births, premature delivery, as well as the potential death of the mother, baby, or both (Ameh et al., 2016; Muhumuza et al., 2016; Taremwa et al., 2016).

These consequences are highly preventable and can be reduced using recommended public health interventions including treatment using highly effective

Artemisinin-based Combination Therapies (ACT) upon early detection of the infection. During pregnancy, malaria infection is usually asymptomatic (Ameh et al., 2016); and as such one of the most applied control measures is the use of IPTp. This therapy helps to treat malaria infection currently present at the time of the treatment (Odongo et al, 2016) but also has potential to provide protection in terms of posttreatment prophylaxis for malaria prevention.

A recent study conducted in Nigeria involving 330 pregnant women as participants found out that placenta malaria was strongly associated with low birth weight (*OR* 1.01, 95% CI [1.001 – 1.020] *p*=0.004) and fetal anaemia (*OR* 1.02, 95% CI [1.01 – 1.03] *p*=0.001; Use of IPTp-SP was associated to the increase in knowledge about the use of insecticide treated nets (Ameh et al, 2016).

Effects of Malaria

Apart from the well-known health related impacts of malaria, the disease has been shown to cause far reaching consequences beyond the infected individual to the household, community, and the healthcare system. The human, social, and economic burden of malaria has been widely investigated. The cost of the disease to the individual and society has been found to be quite enormous. At household level, financial resources spent on malaria prevention and treatment services, time spent on caring for the sick members of the family, the amount of wages lost due to nonproduction and reduced earning capacity of the household are some of the socioeconomic implications of malaria at household level (Tabbabi, 2018).

National governments have also not been spared, given the increased national budget expenditure on malaria and the diminished production capacity due to sick members of the workforce (Nonvignon, 2016). An increasing body of evidence indicates that malaria exerts a huge burden on the economy of most developing countries, particularly in sub-Saharan Africa. The gross domestic product (GDP) of many third world developing countries could reduce by 5 – 6% as a result of malaria (Nonvignon, 2016). Malaria and poverty have a lot in common. The most highly burdened malarious countries of the world have been known to be the most impoverished communities globally. Poverty can result into a heavier burden for malaria and yet on another hand malaria can also escalate poverty.

Intermittent Preventive Treatment (IPTp)

IPTp is one of the highly recommended antimalarial therapies for endemic countries (PMI, 2019). IPTp is a full course of therapeutic antimalarial drugs administered to a pregnant woman during scheduled antenatal care visits to prevent malaria. The WHO (2017) specifically recommends the use of IPTp along with an antimalarial drug *Sulfadoxine Pyrimethamine* (SP) as a highly effective measure for preventing the adverse effects of malaria among pregnant women. The effectiveness of IPTp-SP in preventing adverse pregnancy outcomes related to malaria has been well established. The IPTp intervention has been shown to reduce the risk of several malaria related effects such as low birth weight, maternal anemia, as well as perinatal mortality (WHO, 2018a). As a viable therapy in preventing MIP, it has been recommended that all pregnant women especially in malaria endemic countries should receive three or more

doses of IPTp-SP during each pregnancy (WHO, 2018a). IPTp primarily prevents episodes of maternal malaria during pregnancy as well as maternal and fetal anemia, low birth weight, placental parasitemia, and neonatal mortality (UDHS, 2016). The guidelines require that the pregnant woman receives the initial dose of IPTp-SP as early as possible, preferably during the second trimester of the pregnancy. Thereafter subsequent doses of IPTp-SP should be given within a 1-month interval, with the last dose being administered until the time of delivery with no safety concerns (WHO, 2018a).

Evidence has shown that IPT therapy with SP is more than just an antimalarial treatment; the drug has been linked with significant reduction in risks associated with malaria in pregnancy (MIP) such as low birth weight, anemia, miscarriages, maternal and neonatal mortality (Gutman & Slutsker, 2017). The benefits and protective efficacy of IPTp-SP have been estimated at around 26% based on survey analysis from 32 countries (Gonzalez et al., 2014; Gutman & Slutsker, 2017), and hence, WHO has recommended IPT-SP for all moderate-to-high malaria stable transmission areas in Africa.

The WHO (2014) recommended a highly controlled administration of IPTp-SP among pregnant women for optimum results with the understanding that the service providers at the facility will be able to monitor appropriate and scheduled intake. However, numerous logistical constraints as well as long travel distances seem to have favored the unsupervised intake of IPTp-SP raising serious doubts to whether the guidelines requiring more frequent intake will be appropriately implemented given the country context (Odong et al., 2014).

While most of the countries on the African continent implement MIP programs, at least 39 countries had adopted this IPTp policy in 2018, though coverages differed from one country to another (WHO, 2018). Wide uptake variations still occur among diverse educational and wealth groups adjusted for the appropriate sociodemographic features (Yaya et al., 2018). A recent analysis of Malaria Indicator Surveys conducted from eight African countries observed that prevalence of IPTp has largely remained very low compared to the underlying need for IPTp. Uptake of IPTp in the studied countries (including Uganda) was significantly associated with household income status as well as individual education level among other determinants (Yaya et al., 2018). In Uganda, the IPTp policy has been adopted and implemented during the past decade with the recent revision in 2014 to take into consideration the revised WHO guidelines on IPTp. However, the proportion of pregnant women who received two or more doses of IPTp remained at 45% (Malaria Indicator Survey, 2014; UDHS, 2016); while only 17% of the women reported taking the recommended three doses or more of IPTp-SP to prevent malaria during pregnancy (UDHS, 2016). In this regard, Uganda in terms of IPTp-SP uptake falls below the average for 33 WHO selected African Countries (22%).

The interplay between specific predictor variables and the uptake of IPTp-SP has not been clearly understood, despite IPTp coverage remaining low in malaria endemic regions of sub-Saharan Africa – including Uganda. I designed my study to generate useful information with which countries, and specifically Uganda, can use to design strategies for scaling up coverage of IPTp-SP uptake among pregnant women. Evidence has shown that the uptake of the three recommended doses of IPTp-SP is likely to offer

continued benefits in preventing malaria related adverse pregnancy outcomes in endemic settings (Odong et al., 2016). I identified specific factors that are associated with the low uptake of this highly effective malaria preventive intervention among one of the most susceptible population subgroups (pregnant women). It should be noted that the study findings and key recommendations are meant to contribute towards shaping policy action with relevant community health education programs to subgroups of women as a way of increasing adherence to the optimum usage of IPTp-SP for the prevention of malaria among pregnant women in Uganda.

Mortality due to Malaria

Globally, the WHO (2017) has estimated as high as 435,000 malaria deaths annually, largely occurring in sub-Saharan Africa. Among pregnant women and children under 5 years of age whose immunity has been compromised, malaria infection is likely to become severe and life-threatening and thus may result into deaths. As high as 10,000 maternal deaths are estimated to occur annually as a result malaria-related anemia (WHO, 2016). In this regard, malaria can have far devastating consequences to the health of the mother, newborn, infant, and the growing child.

Economic Burden of Malaria

The economic implications of treating moderate, severe, and complicated malaria cases among pregnant women is usually very high particularly as it relates to low-resource settings. In addition, when maternal deaths occur because of malaria, an even higher economic burden in terms of indirect costs is placed on the bereaved families and households (Nonvignon et al. 2016)). At macrolevel, malaria has been found to wield a

huge burden on the economy of most developing countries, particularly in sub-Saharan Africa (Alonso et al. 2019) .

Problem Statement

Uganda is one of the world's malaria endemic countries with high morbidity and mortality across all geographical regions. Overall, incidence of malaria infection remains quite high with an estimated average monthly incidence of approximately 473 cases per 10,000 population (Muwanika et al., 2017). There seems to be wide variations in terms of malaria incidence with the risk being higher during June-July period and the use of malaria prevention interventions in pregnant women remaining quite low (Muhumuza et al., 2016). It is however quite difficult to accurately ascertain whether the incidence of malaria in Uganda is increasing or decreasing given the inconsistencies in available statistics (Muwanika et al., 2017). The national malaria control program, among other things, aims to ensure that by 2020 malaria morbidity should be reduced to 30 cases per 1,000 population (Ministry of Health – National Malaria Reduction Strategic Plan 2014-2020). This translates to a reduction of 80% from 150 confirmed malaria cases per 1,000 population in 2013 (Government of Uganda MoH, 2014).

The WHO (2016) recommended that pregnant women particularly from sub-Saharan Africa should take at least three doses of IPTp-SP during pregnancy to prevent malaria. Available data from five sub-Saharan countries (Kenya, Namibia, Rwanda, Tanzania, and Uganda) revealed that despite the observed high ANC attendance rates in sub-Saharan Africa, there is still low IPTp coverage (Maheu-giroux & Castro, 2014). In addition, a recent cross-sectional study examined prevalence of uptake of IPTp in

selected malaria endemic countries (including Uganda) using MIS data (see Ssempiira et al, 2017). While the data sources differ between the MIS and UDHS, more in-depth studies are highly recommended to understand country-specific barriers to, and preferences of, using IPTp-SP among women from different socioeconomic backgrounds (Yaya et al., 2018). I undertook an in-depth analysis specifically focusing on the Ugandan population to determine underlying causes for the observed low IPTp coverage among pregnant women. In a closely related study, Musoke et al., (2018) observed that uptake of IPT interventions among Ugandan mothers is particularly lower in rural areas where the quality of public health services and the health-seeking behavior of the residents is inadequate. This calls for more inquiry into the phenomenon to clearly understand causal determinants and the differentials between and among population groups. The WHO revised and updated the IPTp policy in 2014. Since then, there has been few studies that sought to estimate the extent to which mothers take IPTp and the underlying factors associated with this intervention among pregnant women. A critical investigation is therefore necessary to determine underlying risk factors associated with access to malaria prevention and control services in general and IPTp services. The findings from such studies are meant to inform public health policy of appropriate strategies for improving access to and uptake of malaria services in Uganda.

Purpose of the Study

The primary purpose of my study was to examine the key determinants at personal and household level for improved access to IPTp-SP for malaria prevention among pregnant women in Uganda. Although the use of antimalarial prevention

medicines such as IPTp-SP has been proven to be effective in managing malaria in pregnancy, limited access and low levels of use remain a big challenge in Uganda (MOH, 2014), Most of the studies on malaria prevention in Uganda have focused on effectiveness of the interventions and largely on the use of ITN (Musoke et al., 2018, Taremwa et al., 2017). There is need therefore to clearly articulate important drivers to the low uptake of specific interventions such as IPTp-SP. To understand this phenomenon, I undertook an in-depth analysis of data collected through the Uganda Demographic and Health Survey of 2016 and conducted multivariate logistic regression analysis to measure predictors of IPT-SP use among pregnant women in Uganda. For this study, I considered access to preventive antimalaria drugs and specifically IPTp-SP or Fansidar to be determined by the proportion of pregnant women who received the recommended two or more doses during the prenatal period.

Research Questions

The primary research question for the study largely focused on measuring the extent to which selected determinants (maternal age, perceived risk, level of education, knowledge of signs and symptoms of malaria, and socioeconomic status) are responsible for limited access to IPTp-SP to prevent malaria among Ugandan pregnant women. I sought to measure the extent to which access to IPTp-SP can be explained by selected variables of interest.

RQ1: Is there an association between maternal education level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda.

$H_0$1: There is no association between maternal education level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda.

$H_1$1: There is an association between maternal educational level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda.

RQ2: Is there a relationship between socio-economic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether the mother is employed?

$H_0$2: There is no association between socioeconomic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether the mother is employed.

$H_1$2: There is an association between socioeconomic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether the mother is employed.

RQ3: Is there any association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda?

$H_0$3: There is no association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda.

$H_1$3: There is an association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda.

RQ4: Is there any association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether the mother is employed?

$H_0$4: There is no association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether the mother is employed.

$H_1$4: There is an association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether the mother is employed.

RQ5: Is self-risk perception associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether the mother is employed?

$H_0$5: There is no association between self-risk perception and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether the mother is employed.

$H_1$5: There is an association between self-risk perception and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether the mother is employed.

RQ6: Is the presence of co-wives in a relationship associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity?

$H_0$6: There is no association between the presence of co-wives in a relationship and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity.

$H_1$6: There is an association between presence of co-wives in a relationship and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity.

Theoretical Framework

The study design was premised within the confines of the health belief model (HBM) which seeks to predict individual health related behaviors based on underlying individual expectations. The model expresses itself on preventive health behaviors particularly at population level, and it has been widely used in studies that seek to explain or predict health related behaviors (Jones et al, 2015). I sought to understand underlying determinants for IPTp-SP treatment-seeking behavior for malaria prevention among pregnant women in Uganda. The HBM is premised on six major constructs (Montanaro & Bryan, 2014). These include (a) perceived benefit of taking the desired health action,

(b) perceived susceptibility to a particular disease, (c) perceived seriousness of the disease, (d) perceived barrier to taking the desired health action, (e) readiness to take the desired action, and (f) self-efficacy. The theory was the most suited for the study as it presupposes that individuals will undertake a given health related action or service if they feel that the action will help to avoid a negative health condition. I made an assumption that pregnant women may decide to take IPTp-SP if they expect a positive outcome (such as normal delivery and a healthy baby) or if they believe that they can successfully and comfortably take the drug without any side-effects, which is quite consistent with the confines of the HBM. The model has been applied widely in similar contexts, such as the study to predict H1N1 vaccine uptake among young people in a college population (Nan & Kim, 2014).

Nature of the Study

In this study, I performed an in-depth secondary data analysis of the UDHS of 2016, specifically to investigate key determinants associated with limited access to malaria prevention and control services among pregnant women in Uganda. These determinants were factors such as maternal age, socioeconomic status, and knowledge about malaria infection. With the application of a two-stage stratified sampling methodology, the UDHS 2016 sampled a total of 18,506 women from 697 Enumeration Areas (EAs). It was a large-scale cross-sectional population survey with EAs randomly selected using probability proportional to size technique (Uganda Bureau of Statistics, 2016). Malaria related data was collected from all women aged 15-49 and this formed the basis of the study. Of particular interest, UDHS 2016 findings revealed low levels of

uptake of antimalarial therapies. Specifically, for IPTp-SP, only 17% of the eligible pregnant women had received the WHO recommended dosage for IPTp-SP for malaria prevention (at least three doses of SP during pregnancy being administered at least 1 month apart). Logistic regression analysis was performed to examine the underlying association between IPTp-SP preventive treatment-seeking behavior against other variables of interest (predictors). The primary focus of this study was on personal sociodemographic and behavioral characteristics of mothers, and events pertaining to any live birth during the 2 years that preceded the survey. This was meant to better understand factors associated with this low uptake of malaria prevention services among pregnant women. I also measured the level of knowledge that a woman had about signs of severe malaria and how this affects IPTp-SP uptake in the surveyed population. The results were analyzed against IPTp-SP uptake to measure underlying associations. The study design has been used in similar contexts specifically in managing population-based outcome evaluations especially those that relate to social sciences - to measure behaviors, attitudes, knowledge, and practices (Nega et al., 2015). The study is justified, grounded in recent research literature, it is original, and therefore relevant for scientific inquiry.

For the study design, I applied quantitative methodologies, particularly logistic regression analysis, to examine IPTp-SP treatment seeking behaviors among Ugandan pregnant women and determine underlying factors of interest that are associated with positive health seeking behaviors. The age of the mother (maternal age) was one of the factors that were investigated to determine whether it affects access and use of IPTp-SP during pregnancy. The relationship between maternal age and health seeking behaviors

has been widely investigated. Shahabuddin et al. (2017) indicated that treatment seeking behaviors among adolescent girls and young women are largely shaped and affected by very little decision-making autonomy as well as interpersonal and family level factors. The resultant effect has been an elevated risk of adverse maternal effects and outcomes associated with younger mothers such as miscarriages, eclampsia, low birth weight, preterm births, neonatal deaths as well as maternal deaths (Shahabuddin et al, 2017).

In addition, adolescent girls and younger women in Uganda are less likely to have adequate knowledge on critical aspects of maternal health such as infection prevention, care, and treatment than their older women counterparts (UDHS, 2016). Some of them especially in rural areas may not even consider routine ANC check-ups to be necessary unless if they experience pregnancy related complications. Anecdotal evidence shows that in some instances, family members and particularly husbands and mothers-in-law are most likely to be the ultimate decision makers in terms of younger mothers seeking for skilled maternal health services like IPTp-SP. All these factors are likely to shape the health-seeking behaviors of young mothers and will therefore be investigated.

The 2016 UDHS indicated that less than 20% of pregnant women in Uganda reported use of the recommended doses of IPTp-SP during their last pregnancy (UDHS, 2016). The low uptake of IPTp is associated with poor maternal health outcomes. Potential barriers to IPTp-SP uptake may include reported drug stock outs in health facilities, community beliefs, and misconceptions that IPTp-SP could be harmful to the fetus (Ameh et al, 2016), as well as limited knowledge about IPTp-SP as prophylaxis for malaria prevention among pregnant women. In addition, advanced maternal age, lower

gestation age at registration of ANC, higher education, use of ITNs and a higher parity have all been documented to be associated with uptake of IPTp-SP in several countries (Ameh et al, 2016).

Definition of Terms

I applied the following terminologies as defined and extracted from the 2016 World Health Organization Malaria Terminology Guide. In some instances, minor adjustments have been made as appropriate to align with other study-related resources.

Household: The term household relates to directly a house – any structure other than a tent or mobile shelter where human beings sleep. In this regard, household refers to any ecosystem including people and animals occupying the same house and the accompanying vectors (WHO, 2016).

Intermittent Preventive Treatment of Malaria in Pregnancy (IPTp): The World Health Organization defines IPTp as the full course of therapeutic anti-malarial medicine administered to pregnant women during routine antenatal visits regardless of whether the woman is infected or not infected with malaria.

Malaria Case: Refers to any person diagnosed to have malaria infection, determined by diagnostic testing (either laboratory examination or parasitological testing using RDTs) and has been confirmed to have malaria parasites in the blood, with or without symptoms.

Malaria Elimination: The World Health Organization defines malaria elimination as the interruption of local malaria transmission resulting in zero incidence of indigenous cases for a specified malaria parasite within a clearly defined geographical area resulting

from deliberate interventions (WHO, 2016). During malaria elimination phase, WHO recommends that intervention measures should be continued in order to prevent the recurrence of transmission reestablishment.

Malaria Infection: This refers to the presence of plasmodium parasites in the blood or tissues, confirmed by diagnostic testing either by RDTs, microscopy or nucleic acid-based amplification (such as polymerase chain reaction assays to detect DNA or RNA of the parasite).

Plasmodium: According to WHO (2016), plasmodium refers to a genus of protozoan blood parasites of vertebrates that includes the causal agents of malaria. There are several species of plasmodium, but the most common one is *Plasmodium Falciparum,* well-known to cause malaria in humans.

Study Assumptions

This study has been premised on several underlying assumptions. These assumptions are classified under various categories including philosophical and phenomenological while others are simply ideological, programmatic, sociological, while others are research-related assumptions. The study was based on secondary data collected through the 2016 UDHS. I assumed that relevant questions were asked to the right respondents and that the data responded appropriately to all underlying objectives of the study. Since the UDHS questionnaires relied heavily on self-reported data, I assumed that the respondents accurately and honestly shared correct information that relate to their past pregnancy experience. It has also been assumed that the women that were interviewed during the study were randomly selected and that they represented the true characteristics

of the study population in Uganda for purposes of inference and generalization. In selecting the underlying variables of interest for the study, it was assumed that accurate and valid data was collected to appropriately enhance the determination of cause and effect.

Delimitations

The study design was primarily based on a cross-sectional quantitative research methodology focusing specifically targeting women respondents aged 15 – 49 years that had delivered a baby in 24 months preceding the survey. In terms of delimitations, the study may have left out some very important variables in the analysis since they were not collected in the UDHS survey and therefore did not appear in the dataset. Such variables may include risk perception and knowledge about malaria transmission. The study could have been affected by recall bias since women respondents were supposed to recall their IPTp experience during their last pregnancy – which could have been a long time. The design could have been constrained due to cost and time limitations. Otherwise, considerations should have been made to extend it to include an in-depth qualitative analysis that would help to understand deeper perceptions on uptake of IPTp-SP. The design considered a wide range of factors to be associated with IPTp-SP uptake but not all of them were in the dataset. The data that was used in the study was primarily cross-sectional and therefore could not be relied on fully to ascertain causality.

Limitations of the Study

The current study was designed primarily to determine risk factors associated with access to malaria preventive services and specifically IPTp-SP among pregnant

women in Uganda. The study may have some limitations that are characteristic of similar studies that rely on secondary data analysis by design. Data collected through the UDHS of 2016 was used as a primary source for the study and may have generated the following limitations. There could have been a possibility of a mismatch between variable and constructs of the UDHS and those of the current study. In this regard, a particular variable of interest might have been missing from the secondary data. As in the case of most secondary data analyses, there could be no control over the process of data collection that was used in the demographic and health survey (Emebet, 2017). The secondary data could have had some inherent irregularities such as sampling errors and low response rates. This could negatively affect the validity and accuracy of the measurements for the current study. In addition, the data used in the study was primarily cross-sectional and therefore the underlying associations could not guarantee directionality nor causality. The study by design and the nature of the sample could not allow to have any form of control over the selection of variables and their corresponding measurements. This could have been a potential source of selection bias. The behaviors and self-reported practices of the women respondents could have been affected by the principle of temporality, thus affecting validity and generalizability of the findings. In addition, the UDHS survey data could have been subjected to potential confounders that could have affected the measurement of the associations. For instance, some variables could have had the potential to influence others (e.g., maternal education and socioeconomic status). The effect of confounding could have enhanced multi-collinearity and the potential for inverse associations.

Implications for Social Change

Social change can happen anytime anywhere. It involves adopting a population-based approach in prevention of diseases and promoting good health. The study has provided useful findings that should be used to promote increased positive social change particularly by informing the process of designing and implementing relevant policies and programs to improve uptake of IPTp-SP among pregnant women. It should be noted that positive social change in the context of public health involves the use of evidence-based research findings that transcends to address the social determinants of health (WHO, 2016).

The study findings are considered to provide a deeper understanding of structural gaps in the provision and uptake of IPTp among pregnant women in Uganda. This calls for a re-awakening at all levels of society including individual communities for positive social change to address the identified gaps. According to WHO (2018b), a network of social determinants for health influences multi-sectoral actions through relevant policies such as economic policies, social, political, development agendas and social norms. Using the findings from the study, positive social change is embedded within integrated social and medical actions that are likely to be more effective than waiting for mothers and families to visit health facilities (WHO, 2016). Community driven approaches could be prescribed based on the study findings to constitute positive health-seeking behaviors, motivating individuals to modify their perceptions towards healthful living, encouraging mothers to prioritize antimalarial therapies for the well-being of Ugandan households. In addition, the study findings could be shared with decision makers including local leaders,

public health managers and health care workers, to enhance their knowledge about IPTp-SP as an effective malaria preventive intervention and this knowledge would cascade to the local population.

Significance of the Study

Use of highly effective anti-malarial drugs such as IPTp-SP by pregnant women in Uganda remains low (UDHS, 2016), despite government efforts to avail them. Available literature indicates that despite increasingly high ANC attendance rates in sub-Saharan Africa and specifically Uganda, there is still low IPTp coverage (Maheu-Giroux & Castro, 2014). There are a wide range of factors that limit women in Uganda to have adequate access to IPTp-SP (Ahumuza et al. 2014). These barriers may include variables such as: maternal age, level of education, perceived risk, knowledge of signs and symptoms of malaria, as well as their socioeconomic status being measured specifically by the wealth quintile. These are the specific variables that the study used to measure their relationship with access to IPTp-SP for malaria prevention during pregnancy. The study generated useful information for improving the malaria treatment seeking behavior of pregnant women in Uganda. As a result, the uptake of IPTp-SP and other preventive strategies for malaria in pregnancy is likely to improve. To avert the risk of malaria infections, positive social and behavior change is required at population level, as well as policy reforms at macro level. The study has therefore contributed towards addressing the identified gaps in IPTp service delivery, including the need for an in-depth country specific analysis of barriers to, and preferences of, using IPTp-SP among women from different socioeconomic backgrounds. Study findings are critical in terms of designing

relevant policies and programs to strengthen maternal and child health systems in general and particularly preventing malaria infections among pregnant women.

Specific recommendations have been made to promote increased positive social change. The results are therefore critical to inform the process of designing and implementing relevant policies and tailor-made programs for increased use of IPTp-SP among pregnant women. Such policies are meant to increase awareness and promote advocacy of the benefits related to IPTp-SP in preventing malaria among Ugandan pregnant women. As a result, the study was designed to support ongoing efforts towards the reduction of malaria related morbidity and mortality among mothers and their babies. In this regard, the well-being of Ugandan households and the community is likely to improve if mothers are protected from malaria infection. The results are specifically meant to target decision makers including local leaders, public health managers and health care workers, to enhance their knowledge about IPTp-SP as an effective malaria preventive intervention.

Summary of the Chapter and Transition:

In Chapter1 of this study document, I have presented an introduction of the study that focuses risk factors associated with access to malaria prevention services for pregnant women in Uganda. In the introduction, several components have been presented including malaria in pregnancy, a situation analysis of malaria in the Ugandan context, the effects of malaria, IPTp. In addition, the purpose of the study has been discussed alongside the theoretical framework upon which the study is premised. The study limitations, assumptions, delimitations, and mitigation processes have been presented.

Chapter 2 of this study largely focuses on the review of relevant literature associated with the study. The narrative is based on determinants of and underlying variables that are linked with the uptake of anti-malaria therapies in general and IPTp in particular. The chapter primarily presents a comprehensive review of relevant literature on MIP, and the critical determinants of uptake of available prevention interventions. Specifically, the review focuses on recent publications on intermittent preventive treatment of malaria using IPTp-SP, with attention to determinants, levels and trends in uptake. The chapter also highlights the different pathways through which the theoretical framework is premised, and how the study fills in the knowledge gaps that exist in the available body of knowledge – the evidence.

Chapter 2: Literature Review

The risk factors associated with malaria among pregnant women have been well documented (WHO, 2018). Malaria heavily contributes to the burden of disease as well as maternal mortality in sub-Saharan Africa. Over 90% of the global malaria deaths occurred in the African region (CDC, 2019), with pregnant women and young children being most vulnerable. Among pregnant women, the impact of malaria has been responsible for elevating the risk of premature babies as well as still births (PMI, 2019); In addition, malaria increases the risk of low-birth-weight babies, maternal anaemia, as well as interuterine demise among others (PMI 2019).

In this chapter, I have presented specific themes that have been strategically reviewed and presented. These include areas such as: the burden and epidemiology of malaria, global and national malaria responses, populations at risk of malaria infection, malaria in pregnancy, IPTp-SP, and factors associated with access to IPTp. The primary focus of this chapter is to present relevant studies that have been done on the subject matter and specifically highlighting areas that are responsible for the low uptake of IPTp-SP in sub-Saharan Africa and Uganda in particular. The chapter also presents a detailed highlight of the search strategy as well as possible ways through which the identified gaps are to be addressed in the study protocol. In addition, there are detailed discussions on the theoretical approaches and how this has been conceptualized in the study design. The chapter concludes by presenting the theoretical model upon which the study is premised.

Literature Search Strategy

The literature search strategy in this chapter comprises of a wide range of resources and databases to be reviewed for relevant information. The strategy is meant to enhance the appreciation of research work already done on the subject matter. The resources that were searched include the Walden University Library, the google scholar search engines, online databases such as ProQuest Dissertations, POPLINE, MEDLINE, CINAHL as well as the Allied Health source. The search for relevant literature also involved the World Health Organization library, the CDC Library, and the global USAID health related malaria projects website. I also searched relevant malaria publications from the Ugandan Ministry of Health, the National Malaria Control Program (NMCP) and the Elimination Strategy to update the study. Recent scientific publications done on malaria in the Ugandan context were reviewed and included in the study protocol. The search terms that were used in the literature search will include: *Malaria in Pregnancy, Intermittent Preventive Treatment in pregnancy (IPTp), uptake of IPTp, Malaria in Uganda, Epidemiology of Malaria, determinants of malaria, malaria control and elimination, intermittent preventive sulfadoxine-pyrimethamine (IPTp-SP) factors, socio-economic status,* and *malaria.* The literature search was limited to the most recent publications between the period 2014 and 2019.

Reflections on the Problem Statement

Uganda is one of the global malaria endemic countries with high burden of disease across all geographical regions. Malaria incidence remains quite high with wide seasonal variations. The use of IPTp using SP during routine ANC visits can greatly

reduce the burden of malaria in pregnancy. However, there is still low IPTp coverage in most of the Sub-Sahara African countries including Uganda (Maheu-Giroux & Castro, 2014). I aimed to examine key factors associated with uptake of IPTp-SP for malaria prevention among pregnant women in Uganda. In particular, I analyzed the characteristics of women who did not take the recommended doses of IPTp-SP during pregnancy. The purpose is to clearly understand the important drivers that explain the low uptake of IPTp-SP among Ugandan pregnant women.

Malaria Burden and Epidemiology

Globally, scholars have been concerned about the burden of malaria and particularly understanding risk factors within different country contexts (Eshetu et al., 2015; Mbonye et al., 2016.) In the southern part of Ethiopia, about 18% plasmodium infections were confirmed using blood smear microscopy and a rapid diagnostic test (Nega et al., 2015). The researchers applied a community based cross-sectional study of pregnant women to analyze sociodemographic data alongside blood sample results. It is possible that such a high burden of malaria could affect the maternal health situation of that country. As a response, most countries like Ghana have embraced highly effective strategies such as the use of IPTp and timely case management as a measure to address the high malaria burden (Doku et al., 2016).

Many of the Ugandan pregnant women have found themselves being susceptible to malaria (Uganda Ministry of Health, 2015), resulting into potential risks to the mother, the unborn child and the family at large. This trend, if not intercepted, may result into

increased miscarriages, low birth weight, premature delivery congenital infections and perinatal mortality (Rogerson, 2017).

Estimation of malaria prevalence varies depending on platform and methodology used. While malaria presents with several symptoms placental malaria may manifest in pregnancy without peripheral symptoms (Odongo et al., 2015). In a recent review, prevalence estimates of placental malaria among pregnant women was reported ranging from 9.5-37% using placental blood smears, 41-43% using rapid antigen tests, 51-59% using PCR, and the 55-75% placental histology (Odongo, et al., 2015). It is evident that there are wide differences in the estimation of malaria burden which may be partly attributed to levels of sensitivity that vary across different tools used (Odongo et al., 2015). This may therefore suggest that probably the true burden of malaria in pregnancy and specifically placental malaria across regions in sub-Saharan Africa has been underestimated (Odongo et al., 2015).

Malaria in Pregnancy

Malaria in pregnancy is a serious public health issue putting the lives of women and newborns at risk. Women who are exposed to plasmodium infection are likely to develop antibodies which in turn renders them semiimmune (Ameh et al., 2016). However, the acquired immunity is usually inhibited during pregnancy which makes both the pregnant woman and their unborn foetus susceptible to the adverse effects of Plasmodium falciparum (Stephens et al., 2017). The effect of IPTp on levels of plasmodium falciparum antibodies in pregnant women and their babies has been widely investigated. Using IPT-SP tablets for MIP is one of the WHO recommended

interventions to prevent the debilitating effects of malaria on both the pregnant woman and her unborn baby (WHO, 2018b).

Researchers from Nigeria investigated the prevalence and risk factors associated with malaria in pregnant women in a semiurban community in north-western Nigeria. The results confirmed that malaria is still a big threat to public health with considerable risks to the mother, unborn and the new-born (Fana et al., 2015). Women who had adequate knowledge about malaria transmission were more likely to seek for malaria prevention and control programs (Fana et al., 2015). Based on a sample of 255 pregnant women, Fana et al. (2015) established that malaria prevalence and parasite density remains high primarily because of illiteracy levels and inadequate use of ITNs, suggesting that increased community awareness for malaria preventive measures such as IPT-SP and early attendance of ANC should be prioritized as a strategy for malaria reduction. The findings from Nigeria also indicated that while malaria prevalence remained high, but it decreased with age (Fana et al., 2015).

In India, scholars investigated the occurrence of malaria infection and risk factors associated with anaemia in pregnant women in semiurban community. Using a cross-sectional survey to collect and analyse sociodemographic, clinical, and obstetrical data, the magnitude of malaria in pregnancy was estimated at 5.4% overall, around 4.3% at ANC and 13.2% at Delivery Units (Sohail et al., 2015). It was noted that most cases were reportedly asymptomatically infected with P. vivax at ANC and delivery units. Multivariate analysis showed that peripheral parasitaemia was expressively related with fever, rural origin of subjects, and parity. The study thus concluded that effective

management of malaria in pregnancy requires early diagnosis regardless of symptoms (Sohail et al., 2015) and comprehensive drug regime should be given to pregnant women particularly in malaria endemic countries following stipulated national guidelines.

Malaria Prevention Strategies

According to WHO (2016), malaria endemic countries should have a standard package of effective case management interventions that are combined with supply of ITNs and IPT-SP in pregnancy through routine ANC programs. The efficiency and coverage of IPT using SP to prevent malaria in pregnancy has been a major subject in scientific research in many sub-Saharan countries. In Ivory Coast, scholars collected data on neonate birth weights, obstetrical data of mothers, IPT-SP coverage, and socioeconomic status of a sample of 1,317 postpartum women from selected clinics. While the majority (90%) had made more than 2 ANC visits, roughly 43% received at least two doses of IPT-SP during their current pregnancy (Toure et al., 2016), rural-urban variations notwithstanding. The study findings seem to suggest that high ANC attendance does not necessarily translate into high IPT coverage (Toure et al, 2016).

One of the key global malaria initiatives has been the PMI which was launched in 2005, primarily to decrease malaria-related mortality by 50% across the 15 high-burden countries in sub-Saharan Africa (PMI, 2019). The strategy was premised on a quick scale-up plan of four proven and efficient malaria prevention and treatment interventions (a) use of ITNs, (b) indoor residual spraying (IRS), (c) accurate diagnosis and early treatment with artemisinin-based combination therapies (ACTs) and (d) IPT of pregnant women (Department of State, 2018). In Uganda, PMI and other partners supported

Ministry of Health to roll out the Uganda Malaria Reduction Strategic Plan 2014 – 2020 that seeks to improve and expand malaria-related services including IPTp among other interventions (Uganda Ministry of Health, 2018). The strategy is implemented through prompt case management, social and behavior change communication strategies, health system strengthening and capacity building, surveillance, monitoring, and evaluation, and operational research (Uganda Ministry of Health, 2018).

The Ugandan Ministry of Health, along with several other partners in malaria prevention and control programs, have strengthened efforts to improve access to and use of efficient, highly efficacious, and cost-effective interventions including IPTp-SP among pregnant women (Uganda Bureau of Statistics, 2015). The interventions primarily focus on vector control, chemoprophylaxis and effective case management among pregnant women. IPTp-SP is also emphasized as on of the main focus of the national malaria control programmes in Uganda.

Intermittent Preventive Treatment

There are three approaches that are recommended by WHO for the control of malaria in pregnancy. These highly effective approaches include (a) the use of SP for IPTp-SP, (b) the use of ITNs; and (c) effective case management of malarial illness (WHO, 2016). WHO recommends highly effective preventive interventions for malaria in pregnancy including the use IPTp-SP or fansidar. IPTp-SP is the provision of SP treatment doses to asymptomatic pregnant women that reside in malaria endemic regions, regardless of their malaria parastaemia status (Mpongoro et al., 2014). IPTp is premised on the assumption that every pregnant woman residing in highly endemic transmission

areas has malaria parasites in his blood or placenta regardless of whether there are malaria symptoms or not. For effective results, the WHO (2016) recommends three or more doses of IPT with SP to prevent malaria during pregnancy. It has been observed that IPTp remains as one of the highly cost-effective and life-saving health intervention for the prevention of adverse effects of malaria among most pregnant women in low developing countries (Ibrahim et al., 2017). Fernandes et al., (2015) studied several hypothetical cohorts of 1000 pregnant women receiving either three or more doses of IPT-SP against those that were receiving two doses of IPT-SP. The researchers found out that administering IPTp-SP3+ to a cohort of 1,000 pregnant women averted 113.4 disability-adjusted life-years (DALYs) at an incremental cost of $825·67 (Fernandes et al., 2015), producing an incremental cost effectiveness ratio (ICER) of $7·28 per DALY averted. The results fully support the WHO guidelines that recommend at least three doses of IPT-SP administered on a monthly basis from the second trimester throughout pregnancy (Fernandes et al., 2015).

IPTPp-SP is commonly used across countries to reduce the incidence of negative adverse pregnancy outcomes due to malaria. Data from MIS indicated that the utilization of IPT among pregnant women in sub-Saharan Africa is still very low with well-known regional and socioeconomic differences (Yaya et al., 2018). The importance of IPT among pregnant women particularly in sub-Saharan Africa, and the probable risks should women go without any anti-malaria intervention has been extensively studied. There could be adverse risks of pregnancy loss, severe anemia, maternal death, intrauterine growth restriction, or preterm delivery causing low birth weight (Choi et al., 2017; Huynh

et al., 2015). Nonetheless, most of these debilitating effects could be avoidable since malaria is highly preventable and generally treatable.

Scholars in Benin conducted a hospital based cross sectional study to determine adherence to IPT-SP and the associated factors of MIP. The findings revealed that not only did MIP present a high risk of mortality and morbidity to both mother and the unborn but also IPT-SP was one of the proven interventions approved by the WHO as preventive control strategy for malaria among pregnant women (Badirou et al., 2018). The study identified several important determinants to adherence to the recommended minimum of two doses of IPTp-SP. These include participation in campaign sessions on IPTp-SP (*OR*=4.61, CI=95% [2.32 – 9.17], $p<0.0001$); knowledge about the number of doses of IPTp-SP to take during pregnancy (OR=4.70, CI=95% [2.12 – 10.39], $p<0.0001$); as well as comprehensive knowledge about malaria control measures (*OR*=2.56, CI=95% [1.17 – 5.60], $p=0.200$) compared to those without adequate knowledge (Badirou et al., 2018).

In most of the third world countries, the delivery of IPT to pregnant women has been largely confined to scheduled ANC visits (Ameh et al, 2016). Women also get the opportunity to receive other essential anti-malarial commodities such as ITN and printed health messages. In this regard, the Dellicour study observed that system effectiveness for the uptake of IPTp was 62% among hospitals compared to 72% in lower-level health units (Dellicour et al., 2016). Therefore, the delivery system of SP for IPTp, especially at facility level, should be highly efficient to avoid any situation where women go without the drugs.

General healthcare system challenges such as user fees, inadequate stock, and healthcare provider performance came out prominently during a meta-analysis of determinants of IPT and ITN using random effects models in selected countries (Ameh et al., 2016; Choi et al., 2017; Huynh et al., 2015) as these affected the uptake of IPT. In addition, IPT service delivery has been affected by facility-based barriers such as long waiting time, provider knowledge and attitude, as well as long distances to health facilities (Ameh et al, 2016; Kateera et al, 2015; Malaria Consortium, 2018; Onyeneho et al, 2015). Many countries in sub-Saharan Africa have had low levels of IPTp coverage considering the recommended minimum of three doses; such barriers should therefore be prioritized. In Uganda, the public sector works hand in hand with private health facilities through a functional private-public-partnership to administer IPT among pregnant women during ANC visits (Government of Uganda MoH, 2014). In a study to examine prevention and treatment practices for malaria in a rural population, Mbonye et al (2016) observed that most of the facilities visited did not have malaria treatment guidelines as required by the national malaria control program. This implies that the quality of malaria services including the administration of IPT is likely to be compromised. It is not therefore surprising that many providers at the private facilities prescribed artemisinin-based combination therapy for prevention of malaria in pregnancy instead of SP (Mbonye et al., 2016). Pregnant women gave various reasons for not taking the recommended doses of SP, including not feeling sick and not being aware of the benefits of SP (Mbonye et al., 2016). Such barriers should be addressed for increased use of IPTp.

Literature on Key Study Variables

The study aims at identifying factors or determinants for uptake of IPTp-SP among pregnant women attending ANC clinics in Uganda. Barriers and factors associated with IPTp usage in developing countries and the related policies have been investigated. A systematic review of the most recently available literature has been performed to provide an update on issues of access, coverage, acceptability and determinants of IPTp use particularly in Sub-Sahara Africa. It is widely known that IPTp-SP use in pregnancy is clinically effective. However, there are several concerns including attitudes, behaviors and practices of health care workers and pregnant women, being shaped by socio-economic and cultural dimensions, which in turn determine how, where and when pregnant women seek for malaria prevention and treatment therapies (Boateng et al, 2018).

According to the literature review there are several important factors that influence the uptake of IPTp-SP in Sub-Sahara Africa including Uganda. These factors have been documented and they some of them include variables such as: Socio-economic status, Knowledge about malaria, Maternal age, Self-risk perception, level of education and area of residence – whether rural or urban.

IPTp and Socio-Economic Status

Malaria prevention is subject to socio-economic influences that interact with a wide range of behavioral and geographic factors to shape utilization levels. In line with this notion, scholars have sited a predominant sociological theory which holds that resources like knowledge, power, prestige, money or beneficial social connections are

important when diseases are liable to effective prevention (Clouston Yukich & Anglewicz, 2015).

The uptake of IPTp has been associated with socio-economic characteristics such as level of education and socio-economic status (Agarwal et al., 2015; Mwandama et al., 2015). In Malawi, women with higher education (completed secondary school and above) were more likely to have received IPT during pregnancy as compared to women with no education (Adjusted OR 4.10, 95% CI [1.90 – 8.70] p=0.001). In addition, women of the lowest socioeconomic status quintile (poorest) were less likely to get IPT than those of higher socioeconomic status quintile (Adjusted OR 0.68, 95% CI [0.48 – 0.97] p=0.001) based on results (Mwandama et al., 2015). This factor is grounded within the broader socio-economic determinants of health.

A similar study in Nigeria sought to determine underlying barriers and factors associated with the use of IPTp-SP for the prevention of malaria among pregnant women. The design considered socio-economic status (SES) as one of the key variables of interest. SES was constructed from a total of 22 variables on household possession and housing characteristics. The total SES scores were computed for each of the study participant and thereafter categorized into quintiles (LOW, MIDDLE and HIGH). The results indicate that high social economic status among pregnant women was associated with uptake of the recommended doses of IPTp-SP (OR=1.78, 95% CI [1.42 – 2.24] p=0.001) against those in the lowest quintile (Ameh, Owoaje et al, 2016).

IPTp and Knowledge Levels

Uptake of IPTp-SP during pregnancy has been associated with knowledge about malaria related symptoms, as well as providers' knowledge on IPTp administration. Studies have clearly demonstrated underlying associations between having good knowledge and understanding of malaria in pregnancy and the use of IPTp-SP (Darteh & Akuamoah-Boateng et al, 2019). On the other hand, limited knowledge about malaria and health in general during pregnancy has been a limiting factor to the uptake of IPTp-SP among pregnant women in Sub-Saharan Africa including Uganda. Knowledge about malaria transmission as well as the use of malaria preventive interventions are some of the common social economic inequalities that influence uptake of IPTp-SP at individual level. Women who had adequate knowledge about malaria and knew the benefits of IPTp-SP, when and how to take SP were more likely to use the treatment (Adjusted OR= 2.2, 95% CI [1.03 – 4.62) than their uninformed counterparts (Ibrahim et al., 2017). In fact, malaria could be subject to socio-economic influences arising from a wide range of behavioral and geographical determinants (Clouston et al., 2015). In Madagascar, which is one of the high malaria endemic countries, scholars found out that household wealth and maternal education highly influenced the knowledge about, efforts to prevent and treat malaria. In addition, malaria prevalence among children was linked to household wealth (OR=0.25, 95% CI [0.10-0.64] p=0.004) in terms of richest versus the poorest (Clouston et al., 2015).

Researchers in Ghana also examined factors influencing uptake of IPT using sulfadoxine pyrimethamine among pregnant women. The country had been implementing

the IPT-SP policy for MIP but still coverage remained significantly low (Ibrahim et al., 2017). Using a randomised sample of 400 pregnant women attending pre-selected antenatal clinics and focus discussion groups, findings revealed that over 95% of the study participants had received at least one dose of IPT-SP during their current pregnancy while 71% received at least three doses of SP at the time of study (Ibrahim et al., 2017). Women who had adequate knowledge about Malaria in Pregnancy were more likely to be associated with uptake of optimal doses of IPTp-SP (Adjusted OR 2.2, 95% CI [1.03 – 4.62] p=0.001) than those with less knowledge. Similarly, women with adequate knowledge about IPTp for preventing malaria in pregnancy were more likely to take the recommended doses (Adjusted OR 1.8, 95% CI [1.45-2.96] p=0.001) than those without (Ibrahim et al., 2017). It was therefore concluded that having adequate knowledge about MIP and IPTp significantly influenced the uptake of the recommended three SP doses among pregnant women (Ibrahim et al., 2017). This calls for concerted efforts for the increase in knowledge about malaria and IPTp, but also to encourage pregnant women to attend ANC regularly in order to improve the optimal uptake of SP.

Scholars in Nigeria were interested in identifying specific barriers to and the underlying determinants of the use of IPTp-SP among pregnant women attending ANC in PHC facilities in Nigeria. Using binary logistic regression with data collected from 400 pregnant women – ANC attendees aged 15-49 years, the researchers found out that the uptake of IPTp-SP was generally low and associated with knowledge of use of SP (OR=22.13, 95% CI [8.10 – 43.20] p = 0.001) for the prevention of malaria in pregnancy (Ameh, Owoaje et al, 2016). Similarly, the use of IPTp-SP was strongly associated with

knowledge of the use of ITNs (OR=2.13, 95% CI [1.70 – 3.73] p = 0.001. It was also found out that, the use of ITNs increased the likelihood of using IPTp-SP (OR=2.38, 95% CI [1.24-12.31] p = 0.001) among several other factors (Ameh, Owoaje et al, 2016).

In the East African region, Tanzania is one of the malaria endemic countries. It has been estimated that up to 93% of the population in Tanzania is at the risk of malaria infection (Mpongoro et al., 2014). After implementing the IPT policy for more than ten years, Tanzanian scholars sought to assess levels of compliance and acceptability of IPT using SP. Using two cross-sectional studies covering four districts, the study revealed that as high as 63% of women were found not to be keen on taking IPT-SP during pregnancy (Ayubu & Kidima, 2017). Study findings revealed that 54% of pregnant women of 30-40 weeks gestation period had only taken one single dose of SP, 34% had taken two doses while 16% of the women had not taken SP at the time of the interview (Ayubu & Kidima, 2017). It was also noted that IPTp-SP was not being administered under direct observed therapy (DOT) in the majority of cases (86% of the women), thus making it difficult to correlate between the number of SP doses and the ANC start date (Ayubu & Kidima, 2017).

Limited knowledge and awareness about IPT as a preventive intervention for malaria in pregnancy has been linked to poor coverages. In a study to monitor compliance and acceptability of IPTp using SP, Tanzanian scholars found out that, even after ten years of implementing IPT-SP policy guidelines, 63% of the women were not so motivated in taking SP during pregnancy (Ayubu & Kidima, 2017). A bigger proportion (91%) only considered taking SP after testing positive for malaria during the ANC visits

(Ayubu & Kidima, 2017). Overall, the majority (82%) were knowledgeable about the adverse effects of malaria in pregnancy, however less than 65% of those interviewed had no knowledge of the recommended IPTp-SP dosage required during pregnancy (Ayubu & Kidima, 2017). On further analysis, the researchers found a positive association between IPTp-SP uptake and the availability of drugs at the facility during ANC visits ($p=0.0001$). However, there was no significant relationship between IPTp doses received by pregnant women and the timing of ANC ($r^2 = 0.0033$, 95% CI [-0.016 – 0.034]) (Ayubu & Kidima, 2017). In addition, Ayub & Kidima (2017), observed that IPTp-SP uptake was significantly associated with knowledge about the adverse effects of placental malaria among pregnant women (OR 11.81, 95% CI [5.76 – 24.23] $p = 0.0001$), thus concluding that the availability of drugs is a major factor influencing the uptake and implementation of IPTp-SP (Ayubu & Kidima, 2017).

Furthermore, the uptake and adherence to IPT by pregnant women has been investigated but with varying predictors across countries. While adherence to IPT remained low in a Benin study, the researchers pointed out some four important factors that were linked to adherence to IPTp-SP (Badirou et al., 2018). These include: i) Satisfactory knowledge of the SP dosage number to be taken during the pregnancy, ii) Involvement in community communication for social and behavioral change on IPT-SP, iii) Satisfactory knowledge on the SP tablets per dosage, and iv) Adequate knowledge on malaria prevention methods during pregnancy. In this regard, the study suggests that educating and improving women's awareness on malaria is a critical step towards achieving ITP-SP adherence with particular emphasis on communication for social and

behavioral change for pregnant women, community leaders, heads of families and healthcare workers (Badirou et al., 2018).

IPTp and ANC Coverage

Evidence has shown that regular ANC visits and early uptake of the first dose of IPT-SP by pregnant women to prevent malaria are closely linked (Boateng & Anto, 2017). The uptake of IPT-SP for malaria prevention among pregnant continues to generate a lot of interest among scholars. In West Africa, for instance, scholars sought to examine the 'New' SP 5-dose policy and specifically the uptake of IPT-SP to prevent Malaria in Pregnancy. Using a hospital based cross-sectional study design, nursing mothers were targeted, specifically those who had delivered within 12 weeks preceding the study and were seeking postnatal care. Data was collected on the number of visits and dosage of IPT-SP received, as well as background characteristics and obstetric history of the study participant. The frequency and timing of ANC visits was positively associated with the uptake of the recommended doses of IPTp-SP (Adjusted OR = 4.57, 95% CI [1.15 – 18.16] $p < 0.05$) among study participants (Boateng & Anto, 2017). In addition, women who received their first dose of IPTp-SP in the third trimester were more likely to receive the recommended three or more doses of IPTp-SP (Adjusted OR = 0.04, 95% CI [0.01 – 0.16] $p = <0.05$) than their counterparts who received IPTp-SP in the second semester (Boateng & Anto, 2017). Based on the findings, it becomes evident that regular ANC visits and early uptake of the first dose of SP or Fansidar by pregnant women is absolutely essential to achieve the intended IPTp-SP targets (Boateng & Anto, 2017). Early and prompt ANC visits are usually linked to higher chances of optimal IPT-SP

uptake (RRR=2.05, 95% CI [1.18 – 3.57] p<0.05) with the recommended three or more doses (Exavery et al, 2014).

A similar study in Benin sought to investigate factors associated with poor coverage of IPT among pregnant women of Pobè-Adja-Ouèrè-Kétou health zone. After several years of implementing the national IPT strategy, still IPT coverage (two or more doses) was found to be low at 49% against an anticipated target of 80% (Tiendréogo et al., 2015). The study identified two critical factors associated with low IPT coverage. These include: i) low antenatal care coverage and ii) prenatal consultations in private facilities (Tiendréogo et al., 2015). In this regard, appropriate actions should be taken to encourage women to complete the recommended four ANC visits during pregnancy towards improving the uptake of IPT across countries.

A team of scholars sought to investigate underlying factors associated with the uptake of intermittent preventive treatment of malaria in pregnancy in the West African country of Ghana. Using a cross-sectional study design on ANC attendees, the findings revealed that women who attended recommended minimum of 4 ANC visits were found to be positively associated with the uptake of optimal doses of IPTp-SP (OR=4.7, 95% CI [1.31 – 17.2] p=0.001) than their counterparts with less ANC visits (Ibrahim et al., 2017).

IPTp and Socio-Demographic Characteristics

Scholars have sought to understand the characteristics of women who take IPT using SP during pregnancy. In Nigeria, a research team applied a cross-sectional design to evaluate an 18-month MIP prevention program in 6 local government areas where data from a comparative intervention–control study had been compared with a parallel-group

design. This was an exploratory qualitative study that targeted women who had given birth within a six-months period. Compliance to IPT-SP uptake was significantly linked with several demographic factors such as; education level, older age bracket, previously married, living with a partner, and household wealth (Onyeneho, Idemili-Aronu, Igwe & Iremeka, 2015; Onyeneho, Orji, Okeibunor & Brieger, 2015).

A similar study in Tanzania, where malaria accounts for at least a fifth of all maternal deaths, found out that the major factor influencing optimal or partial IPT-SP uptake is counselling on the risks associated with MIP (RRR=6.47, 95% CI [4.66 – 8.97] $p<0.05$) for optimal doses; and (RRR = 4.24, 95% CI [3.00 – 6.00] $p<0.05$) for partial dosage (Exavery et al., 2014).

There are other factors that contribute to uptake of IPTp-SP, including maternal education. Women with secondary or higher education level were almost twice as likely to receive optimal SP doses during pregnancy compared to those who had inadequate or no education (Ayubu & Kidima, 2017; Exavery et al., 2014). In terms of marital status married women reportedly showed a 60% decline in the IPT-SP partial uptake though the inter-district differences in the uptake of both optimal and partial IPT-SP doses still existed (Exavery et al., 2014). Countries should therefore target efforts towards counselling of pregnant women about the risks of MIP, support formal education beyond primary school as these significantly enhance the uptake of optimal doses of SP.

Scholars in Uganda have examined trimester specific pharmacokinetics of SP and other links to variability of its use to prevent malaria among pregnant women. While IPT-SP is widely used its pharmacokinetic interactions in pregnancy often presents variable

and contrary results (Odongo et al., 2015). Using a randomized clinical trial between pregnant and non-pregnant women who received doses of SP during the second and third trimester, it was observed that that SP if well administered offers substantial benefit for prevention of malaria in pregnancy (Odongo, et al., 2015). The findings underpin clinical relevance of SP between pregnant and non-pregnant women and thus provides support to the WHO guidelines that recommend for more regular dosage of IPT-SP (Odongo, et al., 2015).

The effect of IPTp on plasmodium antibodies has been explored. Scholars in Ghana randomly recruited 320 pregnant women at the ANC in selected facilities to determine the outcome of IPT on levels of plasmodium falciparum antibodies in pregnant women and their babies. The design involved collecting venous blood samples at the 1st ANC registration with 4-week intervals of post-IPT administration. The placental blood alongside the cord blood samples obtained at delivery with the infants were followed up monthly for 6 months after birth (Stephens et al., 2017). Overall, there was a general decline in the trend of mean concentrations of all the antibodies from enrolment to delivery (Stephens et al., 2017), the levels of antibodies within the cord blood and placenta were well interrelated (Stephens et al., 2017), and the children did not illustrate any clinical signs of malaria at 6 months after delivery (Stephens et al., 2017). The findings seem to suggest that that IPT-SP could have been responsible for the decrease in malaria exposure. The study also noted that the levels of maternal and cord blood antibodies at delivery disclosed no adverse repercussions on malaria among the children at 6 months, however, “the quantum and quality of the antibody transferred still required

further investigations" to ensure that the infants were protected from severe malaria episodes (Stephens et al., 2017).

IPTp and Urban-rural Variations

In most of the Sub-Saharan Countries, access to essential health services is more predominant in urban locations. In contrast, rural areas are primarily characterized by various socio-cultural and socio-economic barriers that influence the pattern of health-seeking behaviors rendering uptake of effective malaria control services compromised. Geographical factors including area of residence for the pregnant woman and her family have been documented as important drivers but also barriers to the distribution, access, and uptake of malaria prevention and treatment services. Specifically, urban residence has been linked with uptake of IPTp-SP (Exavery et al., 2014).

Among women in their reproductive age group (15-49 years) who participated in the study those whose area of residence was in an urban setting were more likely to be associated with uptake of optimal doses of IPTp-SP (OR=8.20, 95% CI [1.90 – 34.48] p=0.005) than their rural counterparts (Mpongoro et al., 2014). Thus, the study recommended increased efforts to roll out malaria related services to reach out to the remote populations of Tanzania.

In Malawi, a recent study investigated the uptake of IPT for malaria in pregnancy using SP among postpartum women. Using a cross-sectional design on a randomized pre-selected sample of 463 postpartum women, scholars noted that IPT uptake still remains far below the expected national average in Malawi (Azizi et al., 2018); with approximately 27% receiving the recommended ≥ 3 doses of SP, and the majority (65%)

of the women receiving ≤ 2 doses. Overall, low IPT uptake was observed: i) among women who received IPT-SP from rural Health Facilities, ii) those who had three or fewer ANC visits versus four or more visits and iii) those who didn't take SP under the direct observation therapy (Azizi et al., 2018). These categories were less likely to receive the recommended three or more doses of IPT-SP as compared to their counterparts. Findings revealed that as low as 127 (27%) of the women respondents received ≥ 3 doses of SP, while 299 (65%) received ≤ 2 doses. The researchers analysed the data using a combination of bivariate and multiple logistic regression. Rural-urban differences were observed suggesting the dire need for further research to understand underlying barriers and the enablers of the IPTp-SP uptake in each country context. In this regard, increased uptake of TPT-SP requires strategies that promote the number of ANC visits, use of DOTs and sustained health awareness programs. These could be used to shape country-led interventions meant for improving the uptake of IPT taking into considerations of the urban-rural variations.

The effect of residence as a factor in influencing uptake of IPTp-SP has been observed to mostly enhance partial uptake of doses of SP. The likelihood of uptake of partial doses of IPTp-SP was significantly higher in rural districts (RRR = 3.26, 95% CI [1.91 – 5.55] $p>0.05$) compared to urban districts (Exavery et al., 2014). In fact, urban residence was the only individual factor associated with uptake of a full recommended dose of IPTp-SP.

Similarly, in Tanzania, a recent study observed that women who took three or more doses of IPT-SP at two selected facilities Geita hospital and Katoro health centre

was about 9.06% and 1.2%, respectively (Mpogoro et al., 2014). The distribution revealed that uptake of IPTp-SP remained alarmingly low – with less than 10% overall. On bivariate analysis, Mpogoro et al. (2014) found out that uptake of the recommended IPTp-SP 3 doses (or more) was significantly associated with four or more ANC visits (Adjusted OR = 4.41, 95% CI [1.79 – 11.11] p=0.001), higher level of education (Adjusted OR = 4.22, 95% CI [1.85 – 9.62] p=0.001) against those with no education (Mpogoro et al., 2014). In addition, IPTp use was associated with area of residence in urban setting (Adjusted OR = 8.2, 95% CI [1.90 – 34.48], p=0.005) compared to rural residents, as well as being employed or doing business (Adjusted OR = 4.35, 95% CI [1.85 – 10.10] p=0.001). Conversely, there was no significant association between uptake of IPTp-SP and maternal age, marital status and gravidity (Mpogoro et al., 2014). The study recommended that there is need to improve efforts among sub-Saharan countries towards the scale-up and continuous evaluation of IPT-SP efficiency.

IPTp and Self-Risk Perception

Individual risk-perception refers to an individual person's beliefs about the likelihood of experiencing negative or harmful consequences of malaria (Asingiziwe et al, 2019). These beliefs have been considered to have an influence in determining the use and uptake of malaria preventive interventions including IPT-SP among pregnant women. Self-risk perception is an important phenomenon in determining uptake and consistent use of highly effective malaria prevention measures. It should be noted that the intentions to use or not to use a certain malaria prevention intervention (LLIN, IRS, IPTp) is consistently driven by perceived severity, perceived self-efficacy and perceived

response efficacy among other factors (Asingizwe, Poortvliet, Koenraadt et al, 2019). Similarly, uptake of anti-malarial measures such as IPT-SP could be hindered by perceived barriers. In a recent qualitative study in Rwanda, study participants believed that uptake of interventions is directly linked to a belief that malaria risk was high and among those who perceived a high mosquito density (Asingizwe, Poortvliet, Koenraadt et al, 2019). In this regard, malaria prevention interventions such as IPT-SP should focus and address individual perceptions to enhance increased uptake and consistent use of these anti-malaria measures.

Perceived risk in terms of malaria prevention can be examined and interpreted in line with a person's behavior and future intentions. Furthermore, it should be noted that risk perceptions are shaped by subjective norms that are positively related to behavioral intentions and practices. In situations where the majority of people in the community accept and apply malaria preventive interventions (LLINs, IRS, IPTp-SP, ACTs) then it is more likely that these same people will intend to consistently use these interventions (Asingiziwe et al, 2019).

The intention to use IPTp for the prevention of malaria among pregnant women is largely influenced by the way community members perceive the risk of malaria. In this regard, the extent to which individual risk perceptions influence intentions to use malaria prevention interventions should be further understood from specific country contexts. Ameh, Owoaje et al. (2016), observed that in some cases pregnant women could not understand why, when or even the implications of and what it means that they should take IPTp-SP. In this regard, pregnant women should be supported to perceive the risk of

not taking IPTp-SP promptly and to ensure that these women and their partners understand and appreciate the importance of taking the drug, and starting early in pregnancy (Ameh, Owoaje et al., 2016; Roman et al., 2019). In areas where resources are constrained, pregnant women should be made aware of the need to demand for the IPTp service during routine ANC visits, as this will ensure that optimal coverage is achieved.

Malaria risk perceptions have been reported as an important factor in determining and predicting consistent use of anti-malarial interventions such as IRS, LLINs, ACTs and IPTp (Asingiziwe et al, 2019). As a result, the perceived susceptibility of the individual is positively associated with behavioral intentions to use or not to use the recommended malarial prevention measures.

In addition, several studies have observed that self-risk perception is to some extent associated with self-efficacy – the inherent belief in one's ability to use or not to use malaria preventive interventions (Mitiku & Assefa, 2017; Asingiziwe et al, 2019), and that both concepts influence the consistent use of these contemporary anti-malarial interventions.

Addressing perceived self-risk and the importance of consistent utilization of the recommended anti-malarial measures was also reported in Ethiopia – in terms of influencing treatment-seeking behaviors. Study participants who had low self-risk perception about susceptibility to malaria infection and those who had low perception to severity of the malaria disease were all more likely to seek for and utilize anti-malaria interventions (Mitiku & Assefa, 2017). The study sought to identify key determinants of treatment-seeking behaviors and practices among a rural population in West Ethiopia.

Perceived susceptibility to malaria and perceived barrier to seek treatment were important factors that influence the intention to seek for health care (Mitiku & Assefa, 2017).

Uptake of anti-malarial interventions is closely associated with a number of risk related parameters such as perceived risk from malaria, perceived consequences of malaria, as well as perceived self-confidence in undertaking a specific malaria related behavior (RBM Partnership to End Malaria, 2017). All these parameters when combined will determine inherent fears and the lack of confidence at population level to utilize malaria interventions. Individual risk assessment therefore involves identifying fears that people have in terms of susceptibility and severity of malaria (Mitiku & Assefa, 2017; RBM Partnership to End Malaria, 2017). It should be noted that susceptibility involves the belief that people possess indicating that the disease condition or threat of it can actually happen to them. On the other hand, severity is defined as the extent to which people believe the malaria threat to be (RBM Partnership to End Malaria, 2017). The two indices (susceptibility and severity) are measured by a combination of several parameters which are finally aggregated to compute the mean score which denotes the perceived risk and perceived consequences.

The intentions to use malaria preventive interventions have been shown to consistently be driven by perceived severity, perceived barriers, perceived response efficacy, perceived self-efficacy and subjective norms that seem to hinder uptake (RBM Partnership to End Malaria, 2017).

IPTp and on-going Malaria research activities

The availability of different local researchers who are malaria-focused is very important in establishing local solutions to the malaria problem in general, and effective prevention intervention among pregnant women in particular. In some country contexts, researchers do lack appropriate platforms for public engagement, and dialogue with political leaders (Mwendera et al., 2016); and yet in others the WHO policy position remains unknown, with some countries not having the required malaria research repository (Mwendera et al., 2016). Evidence from Malawi shows that all these factors often come into play and should be well-coordinated if countries are to address the barriers and possibly improve malaria research utilization in policy development (Mwendera et al., 2016). This will result into progressive trends towards the adaptation of evidence-based interventions to reduce the malaria burden and enhancing malaria elimination agenda.

The World Health Organization has recommended IPT-SP for MIP at each scheduled ANC visit to curb the adverse effects associated with MIP in sub-Saharan Africa (WHO, 2016; WHO, 2018). Countries in Africa have continued to implement the IPTp policy since 2014, with varying levels of performance given country specific challenges (WHO, 2018). The uptake of IPT-SP for MIP as well as the pregnancy related outcomes has been investigated. Scholars in Tanzania examined IPT-SP uptake and its relation to the pregnancy outcomes among single pregnant women who delivered in the two pre-selected health facilities (Mpogoro et al., 2014). Data on self-reported SP uptake was confirmed using the ANC card and records. Out of a total sample of 431 participants,

167, 134, 104, and 26 reportedly took none, one, two, and ≥ three doses of SP in pregnancy, respectively (Mpogoro et al., 2014). It was evident that less than 10% of the study participants received that recommended three or more doses of IPT-SP during pregnancy. Low uptake could be attributed to the associated adverse birth outcomes, further suggesting that if pregnant women received the recommended three or more doses of IPT-SP, this could significantly reduce the odds of MIP.

Utilization of IPTp using SP has been central to discussions around maternal and child health with special attention to provider and user acceptability. The process generally involves intermittent screening, treatment and the control of MIP due to the known adverse maternal and foetal effects (Almond et al., 2016). In this regard, provider and user acceptability becomes essential for the success of the IPTp program. In Malawi, qualitative techniques involving semi-structured interviews of ten health workers and five focus group discussions of 38 women were conducted to investigate this phenomenon. Among health workers, the study revealed that there were conflicting opinions on the preferred blood sampling techniques, the influence of technique on reliability of diagnosis and the perceived greater efficiency of DP as compared to SP (Almond et al., 2016). However, concerns were raised regarding user compliance with the full DP dose in non-trial settings and despite the distress of repeated finger pricks, pregnant women mostly accepted the IST to check for infections and the supposed efficiency with fewer side effects of DP as compared to SP (Almond et al., 2016). This particular trial setting revealed that pregnant women preferred IST-DP over the IPT-SP and health workers also supported the use of IST-DP as a substitute to IPT-SP in light of the growing resistance to

SP (Almond et al., 2016). Other supporting factors to be considered were consistency of stock, observance of malaria test results and user observance of the full DP course (Almond et al., 2016). The study also recommended efficient communication amongst health workers, pregnant women and their communities a critical ingredient for the acceptability of focused ANC.

As countries continue to expand the coverage of IPTp services in Africa, there has been a growing concern of increasing resistance of plasmodium falciparum parasites to SP especially in Sub-Saharan Africa (Braun, Rempis, Schnack et al., 2015; Mwendera et al., 2016). The increased resistance has potential to threaten the antimalarial effectiveness of IPTp particularly in East and Central Africa. Scholars have sought to compare the efficacy of IPT-SP against intermittent screening and treatment (IST) with dihydroartemisinin–piperaquine (DP). A randomized clinical trial on Malawian pregnant women sought to compare the impact of IST-DP against IPT-SP on the development of malaria antibody immunity. While there were no remarkable differences between the two arms (IPT-SP and IST-DP), the results showed fewer low birth weight babies delivered on the IPT-SP arm (10.7%) compared to the IST-DP group (15.7%) respectively (Teo, Randall, Madanitsa, et al, 2019).

The Uganda National Malaria Control Programme (UNMCP) supports the use of IPT using SP to prevent malaria during pregnancy (Uganda Ministry of Health, 2017). Nonetheless, low IPT-SP uptake exists (Wanzira, Katamba, Okullo & Rubahika, 2016). Scholars sought to evaluate the factors associated with uptake of IPT-SP therapy among 1,820 women who had recently had live births using data from the 2014 Malaria

Indicator Survey dataset. It was striking to note that uptake of IPT-SP during pregnancy was strongly associated with knowledge of the use SP for malaria prevention and being seen by a skilled health worker. The results showed that IPTp-SP uptake was strongly associated with knowledge of the use of SP for malaria prevention (Adjusted OR 10.72, 95% CI [7.62-15.08] p=0.001) and mothers being attended to by a skilled health worker (Adjusted OR 3.19, 95% CI [1.26-8.07] p=0.015) compared to their counterparts who neither had knowledge nor attended to by skilled health workers (Wanzira, Katamba, Okullo & Rubahika, 2016).This particular finding underscores the importance of behavior change communication focused on IPT uptake which could further be strengthened by having skilled health workers attending to the pregnant women during ANC visits (Wanzira et al, 2016).

In addition, Ugandan researchers recently made some strategic observations towards improving IPTp-SP intake and adherence under limited supervision (Odong et al., 2014). Through an exploratory study that examined up to 700 women using exit interviews in an urban clinic, Odong et al., (2014) observed that the correct knowledge on IPT-SP use during pregnancy significantly predicted compliance with IPT-SP intake instructions. By contrast, there was no significant association between factors such as maternal education level, number of ANC visits, maternal age, and parity, and adherence with IPTp-SP intake instructions (Odong et al., 2014). This could probably be explained by the fact that the study by design was conducted from an urban setting with homogeneous characteristics among study participants other than levels of knowledge on IPTp-SP.

In line with the WHO guidelines, IPTp-SP is usually administered during scheduled prenatal visits, as one of three recommended malaria prevention and control programs (WHO, 2016). Across countries in Africa, the uptake of IPTp-SP for malaria in pregnancy has been affected by several barriers including demand side as well as supply side barriers (Rassi et al., 2016). Researchers in Uganda observed that despite the reported high ANC attendance (over 90%) and increased strategies to address the known obstacles, IPTp-SP uptake still remains low (Rassi et al., 2016). This could probably be due to supply side factors such as stock outs, lack of training and supervision opportunities for health workers and inadequate knowledge about IPT guidelines (Mubyazi & Bloch, 2014; Rassi et al., 2016). In some cases, women are reportedly denied services due to high rates of stock-outs of IPTp-SP particularly in the private sector. In this regard it is highly recommended that systems be strengthened for regular facilitation of ANC, availability of clear guidelines, routine supply of commodities particularly to the private sector, and implementation of the up-to-date WHO IPT policy guidelines (Rassi et al., 2016). In addition, health workers should be properly trained and supervised to facilitate IPTp-SP administration and improve facility and district-level recording and reporting as these are critical for increased uptake of IPTp-SP (Rassi et al., 2016). It is possible that the supply side barriers for IPTp in Uganda could possibly account for all the missed opportunities for the distribution and provision of IPT despite the high ANC attendance rates (Rassi et al., 2016).

Factors associated with utilization of anti-malaria services among pregnant women in Uganda have been investigated. Using in-depth structured interviews on 400

pregnant women attending 16 prenatal clinics, Bbosa & Ehlers (2017) observed that pregnant women with level of education beyond primary level were more likely to take IPT drugs and use ITN's to prevent malaria than their uneducated counterparts (Bbosa & Ehlers, 2017). In addition, women were more likely to implement malaria preventive actions if they were contented with the available health services and lived within five-kilometre radius from the clinics and were knowledgeable about the malaria preventive measures (Bbosa & Ehlers, 2017). In this regard, the study recommended that all the pregnant women in Uganda should attend ANC at least four times during each pregnancy; they should receive adequate health education and prenatal services that involves the recommended IPT doses; and that they should use ITNs consistently throughout their pregnancy (Bbosa & Ehlers, 2017).

Widespread resistance to Sulfadoxine-Pyrimethamine commonly known as fansidar has also been extensively explored. Using a double-blind randomized control trial on dihydroartemisinin–piperaquine as a new intervention for malaria prevention during pregnancy, the researchers found out that actually malaria burden among pregnant women was significantly lower for the dihydroartemisinin–piperaquine group than among those who received SP (Kakuru et al., 2016). The findings give hope for alternative medication to prevent malaria in pregnancy not only in Uganda but also in many other endemic countries particularly in Sub-Saharan Africa.

With regard to uptake of IPTp-SP among pregnant women, scholars have examined knowledge levels and compliance with national policies that guide malaria management during pregnancy, from a providers' perspective. The incorrect

administration of antimalarial drugs and specifically IPT-SP, as well as sub-optimal treatment is likely to result in harmful effects that may affect the mother and unborn child or both (Riley et a/., 2016). Prescriptions with the right drug and the correct dosage for mothers attending urban clinics in Kenya accounted for 62% for Health Facilities and 42% among Drug Outlets (Riley et al., 2016). In fact, correct IPTp prescriptions were more likely to be observed within the second or third trimester and less during the first trimester. In some cases, clinicians prescribe contraindicated antimalaria dugs; suggesting inadequate knowledge levels and improper clinical practices for treatment of malaria in pregnancy (Riley et al., 2016).

A systematic meta-analysis of 58 household survey datasets from Demographic Health Surveys and Malaria Indicator Surveys (MIS) from 31 countries in the sub-Saharan Africa, revealed the IPT coverage is insufficiently low despite the fact many countries have long since adopted the IPT policy (Andrews et al., 2015). This could probably suggest that countries are not doing enough in terms of addressing "missed opportunities" for IPTp coverage (Agarwal et al., 2015; WHO, 2016). It has been recommended that countries should focus on the most effective strategies including increased community awareness of IPT, strengthening ANC service delivery, training of both the pregnant women and providers so as to increase the use and coverage of IPTp to prevent malaria during pregnancy (Agarwal et al., 2015).

IPT-SP was introduced by WHO as a strategy for prevention of malaria among pregnant women in endemic countries. Initially, the intervention was as a regional policy by the WHO African Regional Office for roll out in countries of sub-Sahara Africa. Most

countries with on-going malaria transmission have adopted the IPTp policy, as well as national guidelines and training materials for delivering ITPp in antenatal care settings. However, countries are still facing various obstacles that hinder women to have optimal access to and uptake of IPT with SP during pregnancy (Roll Back Malaria Partnership, 2014; Agarwal et al., 2015; Rupérez, González, & Mombo-ngoma, 2016; Muhumuza, Namuhani, Balugaba, Namata & Kiracho, 2016). These include obstacles such as lack of adequate knowledge by pregnant women, low awareness of the benefits IPTp, value of SP and number of doses required as well as timing of the doses (Roll Back Malaria Partnership, 2014). In addition, there are misunderstandings at community level over what constitutes safe drugs that can be taken during pregnancy, fear of perceived side effects, and "low social position" among women leading to delayed attendance of antenatal care visits (Roll Back Malaria Partnership, 2014). There are also widespread economic barriers in which case underlying costs related to accessing IPTp such as transport costs, the need to buy water, and user fees often hinder women of low economic capacity to access IPTp. In some instances, the health care providers were reportedly having insufficient knowledge and perceptions regarding IPTp, for instance the strategy, misunderstanding over the timing and dosage in relation to the gestation period (Roll Back Malaria Partnership, 2014). Health care providers in some cases are too busy to prescribe SP, and they keep on blaming pregnant women for the poor uptake of IPT-SP (Roll Back Malaria Partnership, 2014).

Similar research work from Mali and Kenya indicates that IPTp distributed directly during the scheduled ANC visits has remained low and ineffective and even

though there are different contexts across countries (Agarwal et al., 2015). There are wide variations in terms of application of the IPT policy, dosage as well as coverage. Limited reach and inconsistencies do exist, particularly at health facility level in the same district (Agarwal et al., 2015). Strategic interventions should therefore be designed and implemented to address provider-specific barriers to IPT service delivery in endemic countries. Effective scaling up of IPTp coverage in Africa would require special attention and focus on strengthening of health systems, increased knowledge on IPTp and anti-malarial drug, education level and training of both the pregnant women and providers, as well as prioritizing ANC visits (Agarwal et al., 2015).

The use of IPTp for malaria prevention during pregnancy and other highly efficacious interventions like ITNs and IRS have been key components of national strategic plans for control and prevention of malaria in Africa. As such, there has been a steady decline in morbidity and mortality related to MIP (Mwandama et al., 2015; WHO, 2018). Whereas the coverage for both ITN use and IPT have been investigated, there is still scanty information on root factors related to IPTp delivery and ITN use in Africa. A recent cross-sectional study in Malawi applied a two-stage cluster-sample design to estimate coverage and factors associated with IPT and ITN targeting over 3,200 women of child-bearing age (WOCBA). Among these, 96% had made at least one ANC visit, 91 % reportedly got at least one dose of IPTp, and 72 % reportedly got ≥ 2 doses of IPT (Mwandama et al., 2015). Regional differences were particularly observed, while the educated women were more likely to have receive IPTp as compared to women with no education, and the women of low socioeconomic status were less probable to get IPTp

than those of higher socioeconomic (Mwandama et al., 2015). There is need for widespread demand creation activities for anti-malaria interventions such as IPTp and ITNs. Increased health promotion activities should specifically help to boost early ANC attendance, ITN usage and increased IPTp uptake not only in Malawi but also in other similar country contexts.

IPTp is not a stand-alone intervention. It is part of a global strategy to eradicate malaria from endemic countries (WHO, 2016). The Global Technical Strategy (GTS) was launched by the WHO as to support global efforts towards the elimination of malaria from targeted countries. As a result, a conceptual framework for vector control for malaria elimination was developed covering 9-countries: Bhutan, Cape Verde, Malaysia, Mauritius, Namibia, Philippines, Sri Lanka, Turkey, and Turkmenistan (WHO, 2014). The framework was reviewed, formatted and data was made available for use. Gueye et al. (2016) has observed that countries continue to employ a wide range of vector control interventions, vector management but the effects of these measures are not well expressed. In addition, national programs have been conducting entomological reconnaissance, but the response remains largely limited and undescribed (Gueye et al., 2016).

Summary Reflections

This chapter 2 has clearly presented the literature review section as a synthesis of relevant information related to the malaria disease in terms of morbidity, mortality and coverage of interventions to prevent malaria in pregnancy. The epidemiology of the disease globally and in Uganda has been comprehensively discussed. The impact of the

disease at macro and household level has also been explored. IPTp-SP as a highly effective anti-malarial intervention has also been searched from relevant literature. The chapter has also done a thorough review of the underlying factors for the uptake of IPTp-SP with reference to relevant data from various country contexts. It should be noted that the current literature is by no means conclusive and exhaustive on the subject matter.

In the current study analysis, the predictor variables for IPT-SP uptake, as identified in the existing literature, have been re-examined to identify the key drivers to utilization of the drug among pregnant women in Uganda. A glaring gap exists in terms of the unclear interaction between the various predictors to establish the contribution of each in explaining the continued low uptake of IPT-SP among pregnant Ugandan women. The study is a re-examination of factors that are responsible for uptake of IPT-SP among pregnant women. There exists some understanding around the relationship between background characteristics and uptake of IPT-SP, however, the significance of each of these factors is not clearly understood. The study therefore aims to re-assess uptake of IPT-SP using the 2016 UDHS data to establish the contribution of each predictor in explaining uptake of IPT-SP (fansidar) to prevent malaria among pregnant women.

Overall, there has been an attempt through various studies to document important factors that are associated with low or partial uptake of IPTp-SP (1-2 doses) as well as those that influence optimal use (3+ doses of IPTp-SP). Some of the observed factors from literature include frequency and timing of antenatal care visits (Ameh, Owoaje et al, 2016; Toure et al, 2016; Ibrahim et al., 2017; Ayubu & Kidima, 2017; Badirou et al., 2018), area of residence whether rural or urban (Mpogoro et al., 2014), inadequate

knowledge about the number of doses of SP to be taken during pregnancy, inadequate knowledge about the number of tablets per dose of SP to be taken, and limited knowledge of available malaria control measures during pregnancy (Badirou et al., 2018; Ameh et al, 2016; Fana, Danladi, Bunza, Anka & Imam, 2015; Onyeneho et al, 2015; Kateera et al, 2015; Malaria Consortium, 2018; Darteh & Akuamoah-Boateng et al, 2019; Ibrahim et al., 2017; Clouston et al., 2015).

Similarly, structural factors have also been explored including limited and erratic drug supply (Darteh & Akuamoah-Boateng et al, 2019), inadequate knowledge, attitudes and skills of healthcare workers including unfavourable provider-patient interactions (Darteh & Akuamoah-Boateng et al, 2019), as well as long distances from health facilities (Kateera et al, 2015). In addition, non-adherence to treatment guidelines and IPTp-SP protocols among health care workers has been linked to low levels of IPTp-SP. Most of these studies, particularly those conducted in the East African region (including Uganda) have been using sub-national data, and very few have applied large-scale data sets representing the entire country. In this regard, there is need to have more in-depth studies and analysis to have a clearer understanding of the dynamics that have resulted in the low uptake of IPTp-SP across countries in Sub-Saharan Africa. The current study therefore attempts to fill this gap by using large-scale population-based data to explore factors associated with uptake of IPTp-SP in a Ugandan context. The study determines the relationship between predictor variables and the outcome using the HBM model on the 2016 UDHS dataset. Chapter 3 presents an analysis of the study rationale and the proposed methodological approaches.

Chapter 3: Research Method

The primary purpose of my study was to identify potential factors that are responsible for the uptake of IPTp-SP among pregnant women in Uganda. I estimated the proportion of pregnant women who took the recommended doses IPTp-SP using secondary data analysis of the 2016 UDHS. From the outset, I recognized that efforts have been made to understand stand this phenomena; however, specific contextual information is limited and the magnitude of malaria in pregnancy remains high (see Muhumuza et al., 2016; Roll Back Malaria Partnership, 2014; WHO, 2018b). The study design involved statistical data analysis to establish factors associated with uptake of IPTp-SP among pregnant women in a Ugandan population. On the other hand, I also sought to understand the coverage and adherence to the IPTp intervention given its importance in addressing MIP. The results from the study have been strategically presented to provide a platform for increased efforts towards the elimination of malaria in Uganda. This is based on a clear description of relevant determinants at individual and household level for increased uptake of IPTp. This chapter provides an insight on the research design and the corresponding methodology that will be used in the study.

Study Design and Justification

The study design was a cross-sectional quantitative research methodology using data collected through the 2016 UDHS. The study targeted women respondents aged 15 – 49 years that had delivered a baby in 24 months preceding the survey. The UDHS (2016) applied a cross-sectional study design to provide useful information on various aspects of population health. These surveys provide up-to-date estimates on basic national

demographic and health indicators. Cross-sectional data is collected to examine the underlying relationships between exposure and outcome prevalence in a specified at a single point in time (Setia, 2016). In a cross-sectional design, the investigator focuses on measuring the outcome and the exposures in the study participants at the same time (Setia, 2016) allowing the estimation of odds ratios to investigate the association between the exposure variables and the outcome of interest. The advantage is that, when using cross-sectional designs, a large number of cases as respondents is targeted and a corresponding high number of factors can be examined.

Target Population

The study targeted women in their reproductive age group 15-49 years who had a live birth during the 24 months that preceded the survey. The Uganda Bureau of Statistics (UBOS) estimated that the total female population in Uganda in 2016 was 8,728,600 against an estimated total population of 36,652,700 people (UBOS & ICF, 2018). The UDHS sampled a total of 18,506 women from 697 Enumeration Areas (UDHS, 2016). It was cross-sectional data particularly on malaria related variables that was collected from all women aged 15-49 which provided the framework for analysis of the study.

Sampling and Sampling Procedures

Study participants for UDHS Survey (2016) were women 15-49 years, men 15-54 years and children 6-59 months whose parents or guardians had consented to participate in the survey. For my study, I sampled out from the dataset only women 15-49 years who had a live birth within the 24 months that preceded the survey. Using the SPSS software, I selected and created a new variable comprising of only women 15-49 years that had

delivered a baby in the 24 months preceding the survey. This new variable was recorded as new (using the "*recode*" function of SPSS) out of the 18,506 women that were successfully interviewed during the 2016 UDHS. The study then examined factors associated with the use of IPTp-SP from the new recorded sample.

Sample Estimation for the Current Study

The outcome variable for this study was "the recommended three or more doses of IPT-SP (fansidar) among women participants who had delivered 24 months preceding the survey". Given the nature of the study, a total of 10,263 women met this criterion out of the 18,506 women who were interviewed in the survey. The sampling frame therefore focuses on the 10,623 women out of which 17.7% took the recommended dosage. The independent variables include knowledge, residence, education of the partner and the woman, religion, age, marital status, employment status of partner, and number of cowives.

Sample size estimation, as a critical component of the study, has been guided in consideration with the desired power of the study which is estimated at 80% or 0.80, effect size (0.20) and confidence interval (0.05). In this regard, a confidence interval of 95% was a strong predictor since the results of the study are to be generalized to a bigger population of more than 18,506 women who were interviewed. The approach ensured that I had enough cases to collect and analyze responses with the highest level of confidence (95%) to make plausible conclusions. Using a power of 0.80 with an effect size of 0.20 and a confidence interval of 95%, the analysis generated a required sample

size of 753 respondents to be classified as the minimum required for the study to measure the effect of the association between the outcome and the predictor variables.

Justification of the Effect Size

Effect size is defined as a standardized measurement of the magnitude of a certain phenomenon in terms of scientific inquiry (Schafer & Schwarz, 2019). In this regard, the study goes beyond the analyzing statistical significance (*p*-values) but has also considered the effect size in terms of measuring the magnitude of the effect. The study has selected an effect size of 0.20 classified as "small" according to Cohen's categorization (Schafer & Schwarz, 2019) as the minimum estimate that generated the required measurement and answer the research questions but also enhance the statistical power of the study.

The small effect size of 0.20-0.50 was consistent with a similar previous cross-sectional study which sought to determine knowledge and practices among attendees of an urban antenatal care clinic (see Odongo et al, 2014). In this regard, the effect size and the estimated sample size that were used therefore could achieve at least 80% by detecting the association between the outcome variable and the predictors of interest.

The Formula for Sample Size Estimation

Since the study follows a cross-sectional study design the formula for sample size estimation was derived as follows:

$$\text{Sample Size } (n) = Z_{1-\alpha/2})^2 \, SD^2 / (\text{amount of difference } d)^2$$

Where:

$Z\ 1-\alpha/2$ = refers to the standard normal variate (at 5% type 1 error

(p<0.05) = 1.96

d = Absolute error of precision as anticipated.

In terms of power analysis, I applied the G*Power statistical analysis tool which is quite useful in epi-studies for analyzing various parameters such as level of significance (alpha) estimated at a cut-off of 0.05, and beta at 80%. The tool can be used to analyze many different tests including *t* tests and chi-square tests that are critical to the study (particularly for bivariate analysis and odds-ratio estimations). The G*Power statistical analysis is a quite flexible and highly robust statistical power analysis tool for socio behavioral and biomedical sciences (Faul et al., 2017).

The analysis was done to ensure that when the alpha value is at 0.0; this implied that there was a 95% chance of correctly saying that there is no association between the outcome variable and the predictor, when there certainly is no difference in the association. In this regard, the association between uptake of the recommended three or more doses of IPT-SP and the independent variables was measured using a sample of 10,623 women who reportedly delivered a baby during the 24 months that preceded the survey.

Sampling Strategy

The 2016 UDHS survey data was collected using a two-stage stratified sampling methodology to generate the sample for the survey. The first stage involved sampling of enumeration areas that were randomly selected through a probability proportion to size

selection technique. This generated a complete list of enumeration areas that was used as a sampling frame for the Stage 2. The second stage involved randomly selecting households (from the sampled enumeration areas in Stage 1).

All households in the selected EAs had an equal chance to be selected in the sample (UDHS, 2016). As a result, a total of 20,880 households were randomly selected for the 2016 UDHS survey. Out of the selected households, a total of 18,506 women aged 15-49 years were successfully interviewed (UDHS, 2016).

Overall, the 2016 UDHS provides relevant estimates on various malaria indicators including coverage and uptake of IPTp, use and ownership of ITNs, knowledge, attitudes and practices related to malaria control, as well as treatment-seeking behavior especially among pregnant women. These parameters provided useful information for the current study focusing on factors associated with the malaria disease at population level.

Data Collection

The UDHS (2016) was the main source of data. This provided a comprehensive overview of population-based characteristics as well as maternal and child health issues in Uganda. The Demographic and Health Survey (2016) by design aimed to provide the much-needed household data for planning and policy formulation, monitoring and evaluation of public health and nutritional programs in Uganda. It was designed primarily to provide up-to-date estimates of basic demographic and health indicators. The survey collected very useful data from respondents regarding their demographic characteristics, fertility preferences, reproductive and contraceptive history, infant and child mortality, family planning, knowledge and attitudes about sexually transmitted infections, maternal

health, and malaria in pregnancy, and ownership of mosquito nets, among others. Whilst the survey covered a number of variables, I specifically looked at maternal age, level of education, knowledge of signs and symptoms of malaria, and socioeconomic status and how these influence uptake of IPTp in prevention of malaria among pregnant women in Uganda.

Eligibility Criteria and Participation

The survey had a strict eligibility criterion that included all women aged 15-49 years who were either permanent residents of the selected households (20,880) or visitors who stayed in the household the night before the survey (UBOS & ICF, 2018). All these women were eligible to participate in the survey, and appropriate informed consent was obtained from them to participate.

Recruitment of Study Participants

A listing of all households was generated for each of the sampled enumeration area. The design included drawing of maps for each of the selected clusters with all the listed households. Using a well-structured household questionnaire, all members of the household including visitors were listed. At household level, eligible women were randomly selected from the household listing and selected woman would be interviewed. The trained interviewers collected basic demographic data on each of the person in the household including their sex, age, marital status, relationship with the household head, and their level of education. This demographic data obtained using the household questionnaire was then used to identify eligible respondents (men and women), to participate in the survey. Specific to women respondents, the questionnaire collected data

on but not limited to: background characteristics (age, level of education and media exposure) reproduction (children ever born, birth history, and current pregnancy); family planning; maternal and child health; marriage and sexuality; fertility preferences; sexually transmitted diseases and HIV/AIDS; husband characteristics; knowledge, attitudes and behaviors; domestic violence; adult and maternal mortality (UDHS, 2016).

Access to UDHS Dataset

The Uganda Bureau of Statistics (UBOS) is mandated to make official statistics in Uganda available free of charge to every user for school tasks, research, and media purposes. UBOS encourages all citizens to use and reproduce UBOS data provided UBOS is cited as the source (www.ubos.org). Datasets and publications from UBOS can be accessed having obtained a written permission from UBOS.

Procedure for Obtaining Access to the UDHS Dataset

The final report of the 2016 UDHS was published by UBOS. The UDHS dataset was then declared accessible for secondary data analysis by users upon written permission obtained from UBOS. The dissertation proposal was cleared by the Walden University Institutional Review Board (IRB). Thereafter, permission was granted to me by UBOS to access and use the dataset. I then proceeded to obtain access through the online registration link which can be found at https:dhsprogram.com/data/new-user-registration.cfm. The DHS Program granted me access to all the unrestricted survey data that correspond with the country Uganda, which I then downloaded in the SPSS software for analysis for this study. Permission letters were obtained from UBOS (see attached in appendix).

Study Questionnaires

The 2016 UDHS used four questionnaires that were categorized as follows: the Household Questionnaire, the Woman's Questionnaire, the Man's Questionnaire, and the Biomaker Questionnaire (UBOS & ICF, 2018). All these study instruments were developed based on the DHS Program's model questionnaires, but they were customized to reflect and suit the population and health issues in the Ugandan context (UBOS & ICF, 2018).

Study Objectives

Overall, the study aims at establishing the factors that are associated with uptake of IPTp-SP for preventing malaria among pregnant women in Uganda. Specifically, the study seeks to:

1. Determine the proportion of pregnant women utilizing the recommended three or more doses of IPTp-SP during pregnancy.
2. Identify characteristics of women who take the recommended three or more doses IPTp-SP during pregnancy.
3. Suggest recommendations for improved uptake of IPTp-SP to prevent malaria during pregnancy.

Key Variables for the Study

This quantitative study has largely focused on two sets of variables as the basis analysis. These include the 9 independent variables and one primary outcome variable. The independent variables included: MATERNAL AGE, LEVEL OF EDUCATION, MARITAL STATUS, AREA OF RESIDENCE (Rural: Urban), PARITY, PARTNER'S OCCUPATION, HOUSEHOLD WEALTH STATUS, RISK PERCEPTION, TIMING &

FREQUENCY OF ANC VISITS, RELIGION, NUMBER OF CO-WIVES (refer to the table below). The focus on co-wives relates to the 2016 UDHS data, which indicates that 25% of the women 15-49 years considered themselves to be living in polygamous relationships. These women reported that their husbands or partners has other wives. Table 1 below shows the study variables.

Table 1

Table for Study Variables

Variable	Operational Definition	Variable Type	Comments *How the variable will be measured*
Age of the Mother	Self-reported age in complete years, as recorded from women respondents during the survey	Ordinal: Age in grouped 5-year age categories 15-19 years 20-24 years 25-29 years 31-49 years	The variable will be measured in terms of complete years that are self-reported and categorized into 4 groups.
Maternal Education	The level of completed education attained self-reported during the survey	Ordinal: 1. None 2. Primary 3. Secondary 4. Above secondary	The 2016 UDHS collected data on the highest level of education attained by all respondents. Data will be categorized into 4 groups (None, Primary, Secondary, and above secondary) for analysis.

Marital Status	Self-reported status of the respondent in relation to marriage according to laws and customs of Uganda	Categorical: 1. Married 2. Divorced/separated 3. Living together 4. Widowed 5. Never married	Women and men respondents reported their marital status and has been grouped in 5 categories to be analysed against the outcome variable.
Partner's Employment Status	Respondents who reported that their partners/spouses has been doing any form of work other than their housework in the 12 months before the survey.	Categorical: 1. Yes 2. No	Of the currently married, those whose partners are considered to be employed if they have done any work other than their housework in the 12 months before the survey.
Household Wealth Status (quintile)	Possession of durable consumer goods, household effects, ownership of means of transport, land for agriculture and or farm animals.	Categorical: 1. Lowest 2. Middle Highest	This wealth variable measures ownership and possession of durable consumer items including means of transport, agricultural land and/ farm animals. The responses will be categorized into Lowest, Middle and

			Highest wealth quintiles.
Area of Residence	A place where the respondent resides categorized by whether urban or rural.	Categorical: 1. Urban 2. Rural	The variable has self- reported values which are binary (urban, rural) and will be analysed at bivariate and multi-variate levels to determine the association with uptake of IPTp-SP.
Parity	The number of term pregnancies that last for 6 or more months including live births and still births.	Ordinal: 1 2-4 5+	Parity in terms of single digit values will be tabulated and categorized into low, medium and high.
Religion	Self-professed faith that respondents preferred to identify themselves with	Categorical: 1. Catholic 2. Anglican 3. Muslim 4. Pentecostal 5. Other	Data on religion will be tabulated and analysed against IPTp-SP uptake. Religion plays a critical role in shaping health seeking behaviors.

Number of Co-Wives	Women who reported that their husband or partner has another wife/wives	Ordinal: • 0 • 1 • 2+ • Don't know	Data on women who reported that their husband or partner has another wife / wives will be tabulated and analysed against the IPTp-SP use.

Maternal Education

Level of education is one of the key predictors that was analysed during the study. During the process of data collection for the UDHS survey, women respondents were asked the following questions, and the responses have been categorized to define the segmentation of this variable (maternal education). The questions are: Have you ever attended school? What is the highest level of school you attended? (Primary, O-Level, A-Level, Tertiary or University). What is the highest (class/year) you completed at that level? The Ugandan Education System is structured along 7 years of Primary Education, 6 years of Secondary Education (categorized into 4 years of lower secondary "O-level", and 2 years of upper secondary "A-Level"), and then 3-5 years of post-secondary education (University, College and Tertiary Institutions). In this study therefore, maternal education will be defined along these four categories

1. None – Respondent with No Formal Schooling
2. Primary – Refers to 1-7 years of Primary School
3. Secondary – Refers to Year 8 – 13 of Secondary Education
4. Above secondary – Refers to University, College and Tertiary Institutions

Household Wealth

In this study, household wealth was considered to be a critical predictor variable. The study defined household wealth as the possession of durable consumer goods and items, as reported by the respondent. The 2016 UDHS collected useful data about the status of household wealth in all households interviewed. In this current study, the household data was used to compute a wealth index into quintiles. Households were assigned scores based on the quantity (number) and type of consumer goods that they own. The UDHS dataset considers the following items to inform household wealth. They include: Bicycle, Car, Television and household characteristics such as drinking water source, toilet facilities as well as flooring materials. It should be noted that possessing these durable consumer goods is considered as an indicator of household wealth. The scores were obtained using principal component analysis (UDHS, 2016). Wealth quintiles were compiled by assigning the household scores to each usual member of the household, ranking each person by his or her score, and then dividing the distribution into 5 equal sub-divisions comprising of 20% of the population. Based on this proportion, the study has categorized household wealth into five quintiles: First (POOREST), Second, Third (AVERAGE – MIDDLE), Forth (Above Average), and Fifth (WEALTHIEST). In this study therefore, household wealth has been defined along these three quintiles:

1. Lowest (POOREST)
2. Middle (Second, Middle, and Above Average)
3. Highest (WEALTHIEST)

Rural Urban Description

The concept of urban-rural areas in Uganda has been changing over the years. In 2016, The Uganda Bureau of Statistics (UBOS) defined urban areas to comprise of all areas gazetted as urban centres (UBOS, 2016). At the time of conducting the 2016 UDHS, there were 259 gazetted urban centres in Uganda. These centres include 1 capital city, 33 municipalities, 163 town councils as well as 62 town boards. The urban population has also been growing over time. The 2014 national population census indicated that up to 7.4 million people were residing in urban areas, against a total population of 34.6 million Ugandans (UBOS, 2014). This reflects a proportion of approximately 21.4% urban population in Uganda. In this current study, urban population has been defined in line with the UBOS description as people residing in all gazetted urban areas.

Dependent Variable

The primary outcome variable for the study was considered to be the uptake of the recommended doses of intermittent preventive therapy (IPTp) with sulfadoxine-pyrimethamine or commonly known as fansidar. In this case, the outcome variable was assessed as a dichotomous variable with applicable values of YES = If a participant took the recommended 3 or more doses; and NO = If the participant took less than the 3 recommended doses of IPTp-SP. The logistic regression analysis was applied on the dichotomous outcome variable. The outcome variable was obtained through an assessment of responses from women aged 15-49 years on whether or not they took IPTp-SP during their last pregnancy to prevent malaria.

The assessment was followed by analysing the number of times (doses) they took IPTp-SP. According to the WHO guidelines on IPTp, pregnant women in endemic countries are required to take their first dose of IPTp-SP as early as possible during the second trimester of pregnancy, and thereafter subsequent doses be given at least one month apart (WHO, 2018). The total number of recommended doses should be at least three with the last one administered up to the time of delivery without safety concerns (Ameh et al., 2016). The design for the current study therefore applied the recommended three or more doses of IPTp to determine the outcome variable of the study.

Aspects of Multicollinearity

This is a common statistical phenomenon especially when using logistic regression, whereby independent variables in the regression model are highly correlated. In statistical analysis, multicollinearity is undesirable since it may result into making incorrect inferences about the relationships between the predictor variables and the outcome variable. In this regard, a critical examination was done focusing on the association matrix so as to identify any potential multicollinearity among variables of interest.

Using the SPPS software, factor analysis was performed to identify which predictor variables were involved in the multicollinearity effect. The two variables could then be combined and transformed as appropriate into a single variable using SPSS. In addition, and depending on the results of the model, one of the variables could be dropped from the analysis and replaced with a new one with less or no effect of multicollinearity. The process involved examining the relationship between the two

variables taking into consideration the importance of each of the variables based on available literature.

Data Analysis

Data cleaning and screening variables: The design for data analysis was performed in such a way that data would undergo a process of cleaning and through screening before arranging it for data analysis. The process of data cleaning involved checking the data for consistency, to remove all errors and manage all missing values. All outliers would be identified and cleaned out using scatter plots. All the missing data values were double-checked and otherwise removed from the analysis. During this stage, raw data was exported to SPSS software and frequencies were run to determine the quality, flow and consistency of the data. At this stage, relevant variables were recoded to transform them into new variables that would meet the requirements for statistical tools for data analysis. This was meant to provide the platform for statistical analyses that would address the underlying research questions for the study.

Data Analysis: Data from the UDHS data set was analysed systematically to determine the relationship between the independent variables and the outcome variable. In terms of the analytical structure and procedure of the study, data was analysed at various levels using the Statistical Package for Social Sciences (SPSS) software package version 24 and being guided by the primary objective of the study. The SPSS statistical package provides adequate data management functionalities that enable coding of data, recording, merging variables, transformation, and detecting missing values. This facilitates the analysis of data variables obtained from such large survey datasets such as

UDHS. At the initial stages of the analysis, simple descriptive statistics were generated at univariate level to provide frequencies and proportions for the demographic and background characteristics of the study participants (women aged 15-49 years). Bivariate analysis was then performed using SPSS to generate cross tabulations that was used to determine associations between predictor variables of interest (maternal age, perceived risk, level of education, knowledge of signs and symptoms of malaria, and socioeconomic status) and the outcome variable – described as the proportion of women who received three or more doses of IPTp-SP to prevent malaria during their last pregnancy. Further analysis was then performed using logistic regression analysis to determine the odds ratios and likelihoods associated with the relationships between the predictor variables and the outcome variable. Logistic regression analysis is a statistical technique that can accurately be used to examine the relationship between independent variables and a dichotomous dependent variable. The analysis involved categorizing the outcome variable into binary responses whereby the “Yes” and “No” responses were entered as 1 and 0 values respectively. The “Yes” values were meant to correspond with respondents who received the recommended IPTp-SP doses during their last pregnancy; while the “No” are the respondents who received less than the recommended doses. Chi square tests and odds ratios were computed simultaneously to determine the level of significance of the associations at confidence interval of 95% and a p-value of less than 0.05 was considered to be statistically significant.

During the analysis of the data, all predictor variables (independent) were analysed at bivariate level using cross-tabulations and chi-square estimations. These

variables constitute a combination of both socio-demographic as well as obstetric and reproductive health characteristics (such as number of pregnancies which will be dummy-coded into categorical variables LOW, MEDIUM and HIGH, first pregnancy and ANC visits. The social economic status (SES) of respondents were derived from a composite of parameters that constitute data on ownership of property which was collected in UDHS 2016. SES was categorized into different quintiles including (lowest, mid-low, middle, mid-high and highest. The relationship between socioeconomic status and malaria in general presents empirical manifestations as well as conceptual pathways that have to be measured. Similar studies have pointed to causal relationships whether directly or indirectly involving personal, environmental, political and economic contexts (Bizimana et al., 2015). Based on the results, the study performed sensitivity analyses using regression models to determine associations whether negative or positive. In this regard, model fitness were also be evaluated.

Research Questions and Hypotheses

Overall, the primary research question for the study was focused on measuring the extent to which selected determinants (maternal age, perceived risk, level of education, knowledge of signs and symptoms of malaria, and socioeconomic status) responsible for the limited access to IPTp-SP to prevent malaria among Ugandan pregnant women. The analysis was guided by the following six research questions and hypotheses:

RQ1**:** Is there an association between maternal education level and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether or not the mother is employed.

H_0: There is no association between maternal education level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda.

H_1: There is an association between maternal educational level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda.

RQ2: Is there an association between socioeconomic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether or not the mother is employed? This research question will specifically explore variables such as wealth quintile, area of residence, and whether or not the mother is employed.

H_0: There is no association between socioeconomic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether or not the mother is employed.

H_1: There is an association between socioeconomic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether or not the mother is employed.

RQ3: Is there any association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda?

H_0: There is no association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda.

Alternative Hypothesis (H_1): There is an association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda.

RQ4: Is there any association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed?

H_0: There is no association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed.

H_1: There is an association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed.

RQ 5**:** Is self-risk perception associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed?

H_0: There is no association between self-risk perception and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed.

H_1: There is an association between self-risk perception and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda

controlling for wealth quintile, area of residence, and whether or not the mother is employed.

RQ 6: Is the presence of co-wives in a relationship associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity?

H_0: There is no association between the presence of co-wives in a relationship and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity.

H_1: There is an association between presence of co-wives in a relationship and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity.

Table 2

Data Analysis Plan

Research Question	Independent Variable	Outcome Variable	Level of Measurement	Statistical Test
RQ1: Is there an association between maternal education level and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether or not the mother's partner is employed.	Maternal Education	Uptake of the recommended three or more doses of IPTp among pregnant women. Dichotomous Variable	Measuring the association between the 2 variables	Simple Logistic Regression and Chi-square test
	Wealth Status Area of Residence		Measuring association between the predictor variable and the outcome variable	Simple Logistic Regression and Chi-square test

RQ2: Is there an association between socioeconomic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether or not the partner is employed?	Socio-Economic Status	Uptake of the recommended three or more doses of IPTp among pregnant women.	Measuring the association between the 2 variables	Simple Logistic Regression and Chi-square test
			Measuring association between the predictor variable and the outcome variable	Simple Logistic Regression and Chi-square test Odds Ratio
RQ3: Is there any association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda?	Maternal Age	Uptake of the recommended three or more doses of IPTp among pregnant women. Dichotomous Variable	Measuring relationship between the 2 variables	Simple Logistic Regression and Chi-square test
			Measuring association between the predictor variable and the outcome variable	Simple Logistic Regression and Chi-square test
RQ4: Is there any association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling	Knowledge of Signs and Symptoms of Malaria	Uptake of the recommended three or more doses of IPTp among pregnant women. Dichotomous Variable	Measuring the association between the 2 variables	Simple Logistic Regression and Chi-square test

for wealth quintile, area of residence, and whether or not the mother is employed?				
RQ5: Is self-risk perception associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed?	Self-Risk Perception	Uptake of the recommended three or more doses of IPTp among pregnant women. Dichotomous Variable	Measuring association between the 2 variables	Simple Logistic Regression and Chi-square test
			Measuring association between the predictor variable and the outcome variable	Simple Logistic Regression and Chi-square test
RQ6: Is the presence of co-wives in a relationship associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity?	Co-wives Religion Parity	Uptake of the recommended three or more doses of IPTp among pregnant women. Dichotomous Variable	Measuring association between the 2 variables	Simple Logistic Regression and Chi-square test

Confounding Variables

Confounding variables are extraneous variables with potential to affect the variables under study, to the extent that, the results may not accurately reflect the underlying relationship between the predictors and the outcome variable. In this regard, controlling for the confounding effect becomes necessary for the study to measure what it's supposed to measure. The process of controlling for confounders may take on various approaches including randomization, matching and/or restriction. In addition, by using robust statistical models, and in particular regression models, the effect of potential confounders can be controlled. The current study applied adjusted odds ratios (OR) with appropriate confidence intervals (CI), to adjust for confounding effects. In terms of analysing the relationship between the predictor variables and the outcome (uptake of the recommended 3+ doses of IPTp-SP during pregnancy), the study adjusted for all the socio-demographic characteristics of the study participants. In this regard, the independent variables that were associated with the respondents and their households were included in the model (logistic regression model).

Threats to External Validity

Validity of results (external and internal) is an important element in scientific research that enhances the evaluation of study findings. External validity relates with the ability of the study findings to be generalizable beyond the study sample. Generally, the threats to external validity in this current study were likely to be associated with the using secondary data analysis. Usually, secondary data may not adequately provide for all the intentions and purposes of the current study, and thus this may affect generalizability of

the findings. In addition, the new study may not have stronger influence on the intents and purposes of the parent study, as well as the nature of data and collection methods. However, as much as possible, the current study re-validated the dataset to ensure that the selected variables have adequate values that ensures maximum external validity of the study findings.

Threats to Internal Validity

Internal validity refers to the effect of confounding factors that may influence and manipulate the observed relationship between the independent variables (predictors) and the outcome (dependent variable). In other words, threats to internal validity may occur when the validity of inferences that the study makes about the underlying relationship between the predictors and the outcome is compromised (and probably inaccurate). There are various factors that may contribute to threats to internal validity, particularly within the context of secondary data analysis. These may include instrumentation and experimental mortality, history and recall bias, selection-maturation, as well as statistical regression validity. The estimation of the association between variables for the current study may not necessarily be an accurate relationship because of other covariates or confounding factors that may have originally existed in the parent study. Since the current study is based on secondary data analysis, it was likely to be affected by statistical conclusion validity whereby the degree to which the association between the predictors and the outcome variable is likely to be mis-estimated. It should be noted that the quality and reliability of using secondary data analysis, depends largely on the strength of the statistical tool of analysis which is applied to control confounding factor.

Ethical Considerations

The study is a secondary data analysis of the 2016 UDHS dataset for responding to the study research questions. The survey protocol was presented to the national ethics committee under the National Council of Science and Technology for review and was approved by the committee and the DHS Program ICF Review Board. During the process of conducting the 2016 UDHS, all ethical considerations associated with data collection and collation were adequately addressed. In this regard, there was no risk at all pertaining to issues of disclosure, consent and confidentiality. All interviewers / data collectors for the UDHS survey were trained comprehensively in the manner and conduct of the survey. The current proposal was presented to the Walden Institutional Review Board (IRB), for review and approval, before proceeding with the study. It was cleared by the IRB as required.

Ethical Concerns for Data Collection

The collection of data during the 2016 UDHS survey was done in full observance of ethical considerations that govern data collection in scientific research, and in line with the World Health Organization guidelines on ethical collection of data. Eligible respondents were randomly selected and were not interviewed if consent, privacy and confidentiality was not assured. Sensitive data was collected using anonymous barcode numbers as well as unique identifiers in order to maintain a high degree of confidentiality.

The 2016 UDHS was conducted by UBOS with support from Government of Uganda, the United States Assistance for International Development (USAID), the

United Nations Children's Fund (UNICEF) and the United Nations Population Fund (UNFPA). Permission was granted to me by UBOS to access and use the dataset once the proposal has been cleared by the Walden University Institutional Review Board (IRB). Thereafter, I proceeded to obtain access through the online registration link which can be found at: https:dhsprogram.com/data/new-user-registration.cfm

Summary Reflections

Overall, the main focus of chapter 3 has been to describe the design of the study and its rationale in terms of the methodological approaches to be applied in the research process. The chapter presented details in terms of study objectives, target population, the sampling strategy, sample size estimation as well as the critical definition of terms and concepts to be applied. In addition, study hypotheses and research questions in relation to the proposed independent and outcome variables were also presented. In this regard, Chapter 4 primarily presents the results including descriptive statistics as well as the regressions analysis.

Chapter 4: Results

The primary purpose of the study was to identify the risk factors that are responsible for the uptake of IPTp-SP among pregnant women using secondary data from the 2016 UDHS dataset. This chapter provides a detailed presentation of the study findings with reference to the research questions. The chapter presents the descriptive statistics on the various sociodemographic characteristics of the study participants but paying attention to the independent variables of interest and corresponding covariates. These are reported in different tables as frequencies and proportions (percentages) for all the variables. Data analysis involved conducting bivariate estimations using chi-square tests to determine the associations between each of the predictor variables and the outcome variable. The bivariate results were reported by corresponding odds ratios (*OR*), confidence intervals (CI) as well as the adjusted odds ratios (*AOR*). Multivariate analysis was conducted using logistic regression models in order to determine deeper. Specifically, data was analyzed at various levels using the Statistical Package for Social Sciences (SPSS) software package Version 24 guided by the study research questions and objectives.

Guiding Hypotheses and Research Questions

The study sought to address six research questions, and these have been clearly illustrated below with their corresponding hypotheses.

RQ1: Is there an association between maternal education level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda.

$H_0$1: There is no association between maternal education level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda.

$H_1$1: There is an association between maternal educational level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda.

RQ2: Is there a relationship between socio-economic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether the mother is employed?

$H_0$2: There is no association between socioeconomic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether the mother is employed.

$H_1$2: There is an association between socioeconomic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether the mother is employed.

RQ3: Is there any association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda?

$H_0$3: There is no association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda.

$H_1$3: There is an association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda.

RQ4: Is there any association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed?

$H_0$4: There is no association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed.

$H_1$4: There is an association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed.

RQ5: Is self-risk perception associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed?

$H_0$5: There is no association between self-risk perception and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed.

$H_1$5: There is an association between self-risk perception and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed.

RQ6: Is the presence of co-wives in a relationship associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity?

$H_0$6: There is no association between the presence of co-wives in a relationship and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity.

$H_1$6: There is an association between presence of co-wives in a relationship and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity.

Data Collection

The current study design applied data obtained from the 2016 UDHS. The UDHS dataset contains population-based characteristics as well as maternal health issues including malaria among pregnant women in Uganda. The UDHS was designed with an aim of providing the much-needed household data for planning and policy formulation, monitoring and evaluation of public health and nutritional programs in Uganda. Using a two-stage stratified sampling methodology, the survey collected very useful data from respondents regarding their demographic characteristics, fertility preferences, reproductive and contraceptive history, infant and child mortality, family planning,

knowledge and attitudes about sexually transmitted infections, maternal health, and malaria in pregnancy, ownership of mosquito nets among others. UDHS 2016 was a large-scale cross-sectional population survey which sampled a total of 18,506 women from 697 EAs. The EAs were randomly selected using probability proportional to size technique. Malaria related data was collected from all women aged 15-49 and this will form the basis of the study. This study specifically focused on maternal age, level of education, knowledge of signs and symptoms of malaria, and socioeconomic status and how these have influenced uptake of IPTp in prevention of malaria among pregnant women.

Response Rates

At household level, the survey selected a total of 20,791 households into the sample (UDHS, 2016). Out of these, 19,938 households were occupied; and out of these occupied households, a total of 19,588 were successfully interviewed. This resulted into a response rate of 98%. Regarding individual women respondents, the survey identified a total of 19,088 eligible women for individual interviews. Out of these, the survey completed interviews for 18,506 women resulting into a response rate of 97%.

Inclusion and Exclusion Criteria

Overall, I aimed at determining key factors responsible for uptake of IPTp-SP among these women. In terms of criteria for inclusion into the study, only women 15-49 years who had delivered a baby in the 24 months that preceded the survey were considered into the sample. In general, all women in their reproductive age group, who were usual members of the households that were selected for the UDHS were eligible for

the female survey. The study was guided by six research questions and each of these research questions had an added inclusion and exclusion criteria to confine the analysis to only valid cases that were relevant to address the research question.

Data Preparation

My process of analyzing data for this current study involved different steps through which data was prepared for analysis and generation of results. Data preparation was done through a process of checking for any errors including inconsistencies observed as well as any missing values that would render the data compromised for proper analysis. All these were appropriately corrected, and in some instances data variables were recoded, and new ones were developed. In addition, the process of data preparation involved performing tests of parametric assumptions to determine whether there any violations of the underlying assumptions and thereby establishing alternative sets of analysis. In this regard, statistical tests were performed appropriately to address each of the underlying research questions of the study. Furthermore, some of the variables of interest were dichotomized in preparation for the data analysis stage, specifically at bivariate and multivariate levels to determine the effect of these predictors onto the outcome variable.

Data Analysis

I applied a logistic regression model to test the hypotheses using the 2016 UDHS data. Overall, a total of 18,506 women and 5,336 men had been interviewed in the 2016 UDHS survey. Of these, the current study only sampled out those that met the selection criteria – women 15-49 years who had delivered a baby in the 24 months that preceded

the survey. The study aimed at determining key factors responsible for uptake of IPTp-SP among these women. Data was extracted from UBOS databases and exported to SPSS v. 24 for cleaning, coding, and analysis.

The study predictor variables were selected based on the underlying research questions for the study. This chapter presents a descriptive analysis in terms of demographic and socio-economic characteristics of the respondents as well as bivariate and multivariate logistic regression analyses between the independent variables and the outcome variable. The selected variables of interest (predictors) have been presented and analyzed at various levels to include univariate, bivariate to determine associations, and multivariate level to measure the specific variables that had the greatest effect on the dependent variable.

Operationalizing the Research Questions:

The study analysis was guided by six research questions as described in the above sections of this chapter. The research questions were aligned to the predictor variables of interest and how these relate to influence the outcome variable. From a statistical perspective, the six research questions were operationalized in the model using the below equation:

$$logit\ (p) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 \ldots\ldots\ldots b_KX_K$$

Where p = the probability of presence of the characteristic of interest (usually in binary form)

The binary logistic regression model was applied as an appropriate statistical technique to determine the relationship between the independent variables and the

outcome. The outcome variable was determined by the number of IPTp-SP doses that a woman took during the last pregnancy to prevent malaria. The research questions were then tested and evaluated using an analytical model taking into consideration the assumptions of normality which should be violated. Using SPSS software, the analysis further considered to test the overall model of fit with the chi-square goodness of fit tests and determining the level of significance of each predictor variable using Wald tests, odds ratio measurements to estimate the likelihoods that each predictor to affect the outcome.

It should be noted that the logistic regression model is usually sensitive to aspects of outliers and the assumptions of multicollinearity between predictors being measured against the outcome (Fayose & Ayinde, 2019). In terms of preliminary analysis, the initial computations in SPSS were conducted to evaluate the underlying assumptions of the logistic regression model. The two assumptions were multicollinearity and linearity, with likely effects on several statistical parameters including least square regressions, fitted values as well as predictions and coefficients of determination (Fayose & Ayinde, 2019). To test for the two assumptions of linearity and multicollinearity, scatterplots were generated for the key variables of interest.

The scatterplots were linked to standardized residuals and standardized predicted values of the analysis. Using scatterplots showed that if the principle of linearity had not been violated then the scatterplot pattern would not ne be curvilinear. The results from the analysis showed that there was no underlying violation of the linearity assumption in the model.

Regarding the multicollinearity assumption, and since some of the independent variables appeared highly correlated to each other, I futher examined variable inflation factor (VIF) values to assess that there was no perfect multicollinearity in the model (see Fayose& Ayinde, 2019. VIF values measure the extent to which the variance of an estimated regression coefficient increases should the predictor variables be highly correlated (De Jongh et al., 2015). The principle of no perfect multicollinearity is violated once the values of the variable inflation factor are 10 and more (De Jongh et al., 2015). In this regard, the results of the analysis showed that all the values for each of the predictor variables in the model were within the allowable limits since none of them was above the threshold of 10. I considered a number of independent variables but they all showed values that were within the tolerable limits (below the score of 10) and therefore the assumption of multicollinearity was not violated in any way.

The study variables that were tested against the two assumptions (linearity and multicollinearity) as part of the logistic regression model were age of the mother, area of residence (whether rural or urban), level of education, marital status, household characteristics like wealth index, the occupation status of the partner, religious background, parity of the mother, knowledge about malaria, number of cowives, as well as timing and frequency of ANC visits.

Results

In the current chapter, I present the study results in line with the six research questions. Study variables were analyzed and descriptive statistics in relation to socio-demographic characteristics of the study participants were derived. This involved the

presentation of tables and values that illustrate the study findings. The analysis of descriptive study data focused on basic socioeconomic and demographic information of the sampled population. The sample was strongly representative of the target population with robust randomization at all levels right from the national level up to the individual woman respondent. A total of 10,263 women in their reproductive age-group 15-49 years had been sampled. The sample was derived through a two-stage stratified cluster sample from which 29,910 households had been randomly selected, out of 697 sample clusters. These clusters represented all the 15 regions of Uganda with a census frame of 78,462 EAs in line with the 2014 Uganda Population and Housing Census.

Descriptive data was summarized and presented here. The various characteristics of women that were found relevant to the study and assessed include the following: age, region of residence, maternal education, religion, wealth status, marital status, partner's employment status and knowledge.

The results in Table 3 present a descriptive summary of the sociodemographic characteristics of the study participants. A total of 10,263 women participated in the survey and the results have been presented in the current study. The mean age of the study participants was roughly 34.4 years. Most of the women participants (41.4%) were in the older category of 31 – 49 years, while younger mothers 15-19 years constituted the least proportion of 8.1%.

Table 3

Distribution of Women by Demographic Characteristics (n= 10,215)

Independent Variable	Frequency	Percent

Age		
15-19	828	8.1%
20-24	2,710	26.5%
25-29	2,448	24.0%
30-34	2,003	19.6%
35-39	1,321	12.9%
40-44	700	6.9%
45-49	205	2.0%
Area of Residence		
Urban	2,038	20.0%
Rural	8,177	80.0%
Maternal Education		
No education	1,279	12.5%
Primary	6,254	61.2%
Secondary	2,068	20.2%
Higher	614	6.0%
Religion		
None	18	0.2%
Anglican	3,176	31.1%
Catholic	4,173	40.9%
Muslim	1,274	12.5%
Pentecostal	1,436	14.1%
Others	138	1.4%
Marital Status		
Never in union	575	5.6%
Married	4,231	41.4%
Living with partner	4,166	40.8%
Widowed	155	1.5%
Divorced	52	0.5%
Separated	1,036	10.1%
Wealth Status		
Lowest	4,715	46.2%
Middle	1,937	19.0%
Highest	3,563	34.9%

Number of Co-wives		
No co-wife	6,044	59.2%
1 co-wife	1,591	15.6%
2 or more co-wives	483	4.7%
No Response	2,097	20.5%
Partner's Employment Status		
Didn’t Work – last 12 months	292	2.9%
Worked – last 7 days	7,847	76.8%
Worked – last 12 months	243	2.4%
Don’t know	15	0.1%
No Response	1,818	17.8%
Partner's Education Level		
No education	664	6.5%
Primary	4,478	43.8%
Secondary	2,133	20.9%
Higher	913	8.9%
Don't know	209	2.0%
No Response	1,818	17.9%
Knowledge about Malaria		
Not knowledgeable	2,518	24.7%
Knowledgeable	7,697	75.3%
ANC Attendance		
No attendance	190	1.9%
1 - 3 ANC Visits	3,863	37.8%
4 or more ANC Visits	6,162	60.3%

The results in Table 3 above indicate that over 60% of the study population were women with primary level education. The proportion that had attained post-secondary higher education was only 6%, while 1,279 (12.5%) had no education at all. In addition, the majority of women respondents resided in rural areas with a proportion of 80%; while urban dwellers constituted 20% of the study population. In the Ugandan context, urban

areas are defined by the UBOS to comprise all areas gazetted as urban centers (UBOS, 2016). The proportion of women respondents who were married was almost equal to those who reported to be staying with a partner (with 41.4% and 40.8% respectively). Women who had separated and divorced combined were 10.1% while 5.6% had never been in a union. Women respondents who were married were asked if their husbands / partners were having other (multiple) wives. Overall, an approximated twenty percent (20.3%) reported that their husbands had multiple wives. Fifteen-point-six percent reported having one cowife, while 4.7% had two or more cowives. It was also noted that a total of 2,097 (20.5%) had no response to whether their husbands had other wives. The majority of women (76.8%) had partners who were employed and had worked the last 7 days that preceded the survey, with 44% of the partners having primary level education. The results further indicate that knowledge about malaria was high at over 75% of the women, while 60.3% of them attended four or more antenatal care visits during their last pregnancy.

IPTp-SP Uptake

The study findings generally indicate that up to 78% of eligible women had taken one or more doses of IPTp-SP during pregnancy (regardless of the doses). The proportion of women that had not taken any dose of IPTp-SP during their last pregnancy was around 22% of all women that had delivered a live birth during the two years that preceded the survey. Table 4 below shows the distribution of study participants by IPTp-SP uptake.

Table 4

Uptake of IPTp-SP Fansidar Among Study Participants (N= 10,215)

Did you take SP/Fansidar to keep you from getting malaria?	Frequency	Percent
YES	7,968	78%
NO	2,247	22%

Respondents were asked if they had taken IPTp-SP during their last pregnancy. The results in Table 4 above show that 78% had taken the drug. Out of these, the proportion of women who took the recommended dosage of IPTp-SP (at least 3 doses) during pregnancy was only 17.7% of all women respondents.

The study design applied a simple Logistic Regression Model to measure the effect of the independent variables with the uptake of the recommended dosage of SP/fansider (at least 3 doses) taken during pregnancy. The independent variables that were included in the analysis were: Maternal education, socio-economic status, maternal age, knowledge about malaria, ANC visits and Co-wives. The bivariate results have been presented in Table 5 here-below.

Table 5

Simple Logistic Regression for IPTp-SP Update and Independent Variables

SP/FANSIDAR	Std. Err.	Odds Ratio	95% CI		P-value
			Lower	Upper	
Maternal Education					
No education**					
Primary	0.072	1.002	0.870	1.153	0.979
Secondary	**0.087**	**1.488**	**1.254**	**1.767**	**0.000**
Higher Education	**0.137**	**2.139**	**1.635**	**2.799**	**0.000**
Don't know	0.25	1.152	0.932	1.629	0.516
SES - Wealth index					
Lowest**					

Middle	0.065	1.088	0.959	1.235	0.191
Richest	**0.054**	**1.270**	**1.141**	**1.412**	**0.000**
Maternal Age (Yrs)					
15-19**					
20-24	**0.090**	**1.350**	**1.131**	**1.612**	**0.001**
25-29	**0.093**	**1.596**	**1.330**	**1.916**	**0.000**
30-34	**0.096**	**1.518**	**1.258**	**1.831**	**0.000**
35-39	**0.102**	**1.296**	**1.061**	**1.581**	**0.011**
40-44	0.116	1.064	0.848	1.335	0.590
45-49	0.173	0.969	0.690	1.361	0.856
Knowledge about Malaria					
Not Knowledgeable**					
Knowledgeable	**0.054**	**1.295**	**1.166**	**1.439**	**0.000**
ANC Visits					
No ANC Visits**					
1 - 3 ANC Visits	**0.171**	**8.933**	**6.389**	**12.492**	**0.000**
4 or more ANC Visits	**0.170**	**12.976**	**9.297**	**18.113**	**0.000**
Co-Wives					
No co-wives**					
1 co-wife	0.068	0.922	0.807	1.053	0.230
2 or more co-wives	0.116	1.001	0.797	1.257	0.992
No Response	**0.059**	**0.791**	**0.704**	**0.888**	**0.000**

**reference category

The results from the logistic regression model have been presented in Table 5 above. Each of the six predictor variables was analysed against the outcome. These include maternal education, socio-economic status, maternal age, knowledge about malaria, ANC visits and presence of co-wives. Using crude ratios, the variables that were

statistically significant with taking the recommended dosage of SP/fansidar during pregnancy at bivariate level have all been clearly reported. The odds ratios (OR) were estimated to assess the relationship between the underlying risk factors (predictor variables) and the outcome variable (uptake of the recommended 3 or more doses of IPTp-SP during pregnancy).

Maternal Education and IPTp-SP Treatment Seeking Behavior

Research Question 1: The first research question for the study was "Is there an association between maternal education level for prevention of malaria among pregnant women in Uganda". Education level was categorized as NO EDUC, PRIMARY, SECONDARY, HIGHER) and IPTp-SP treatment-seeking behavior (LESS THAN 3 DOSES, 3 AND MORE DOSES). The results from the analysis of the data are presented in the below sections reflecting frequencies and distribution percentages of the predictor variables, the crude and adjusted odds ratios, as well as measurements of associations between the independent and outcome variables.

At bivariate level, analysis was done through cross tabulations for maternal education and uptake of IPTp-SP, the results are shown in Table 6.

Table 6

Cross Tabulation of Maternal Education and Uptake of IPTp-SP

Variable	Uptake of IPTp-SP 3 or more doses		Total
	YES	NO	
Maternal Education			
No Education	82 (14.5%)	484 (85.5%)	566 (100%)
Primary Education	605 (16.9%)	2972 (83.1%)	3577 (100%)
Secondary Level	269 (20.3%)	1056 (79.7%)	1325 (100%)

Higher Education	59 (13.6%)	373 (86.4%)	432 (100%)
Total	**1,015 (17.2%)**	**4,885 (82.8%)**	**5,900 (100%)**

Study results as shown in Table 6 above indicate that among women with No Education, up to 14.5% had received the recommended three or more doses of IPTp-SP, compared with over 20% among their counterparts with secondary level education. Data shows, however, that while it would be expected to have a higher proportion of women with higher education taking the recommended dosage of IPTp-SP, only 13.6% of those interviewed took the recommended three or more doses of the drug fansidar to prevent malaria during their last pregnancy. A simple logistic regression was conducted to establish the association between maternal education and uptake of IPTp-SP among pregnant women.

Table 7

Simple Logistic Regression for Maternal Education and Update of IPTp-SP Fansidar (N=10,215)

Variable	Exp(B)	Uptake of 3+ IPTp-SP 95% CI		p-value
		Lower	Upper	
Maternal Education				
No Education	Ref	Ref	Ref	Ref
Primary Education	1.002	0.870	1.153	0.979
Secondary Level	1.488	1.254	1.767	0.000
Higher Education	2.139	1.635	2.799	0.000

The results at bivariate level from the simple logistic regression analysis showed that the association between maternal education and IPTp-SP uptake was statistically significant with (p=0.000). Women with secondary level of education were almost 1.5 times more likely to use the recommended doses pf IPTp-SP than those with no education

(OR=1.488, 95% CI [1.254 – 1.767], p=0.000). Similarly, women who attained higher level of education were 2.14 times more likely to take the recommended doses of IPTp-SP compared to their counterparts with no education (OR=2.139, 95% CI [1.635 – 2.799], p=0.000).

Based on the above results therefore the null hypothesis *(H_0)* was rejected at the 95% level of confidence with a 0.05 p-value cut-off point. The null hypothesis which states that there is no association between maternal education and IPTp-SP treatment seeking behavior was rejected in which case the alternate hypothesis was accepted. The results indicate that there was a statistically significant relationship between maternal education and IPTp-SP treatment seeking behavior as depicted by the uptake of IPTp-SP among pregnant women in the study population.

Socio-Economic Status and IPTp-SP Treatment Seeking Behavior

The relationship between socio-economic status and IPTp-SP uptake was analysed. The second research question for the study was "Is there an association between social economic status and IPTp-SP treatment-seeking behavior (LESS THAN 3 DOSES, 3 AND MORE DOSES) for prevention of malaria among pregnant women in Uganda". The study design categorized wealth status into five wealth groups (Lowest, Second, Middle, Forth and highest). The study investigated the different patterns of IPTp-SP utilization across different wealth categories and these were adjusted for other selected socio-demographic factors. The majority of women (46.2%) belonged to the lowest (poor) wealth category, while 35% were in the highest wealth category.

Data was analyzed on wealth status of women respondents against the uptake of IPTp-SP for malaria prevention in pregnancy (as the dependent variable). The analysis was done at various levels including univariate, bivariate and multivariate analysis.

During the survey, respondents were asked whether they possessed specified consumer goods in the household. Household wealth was computed based on the number and kinds of these goods that were possessed. The items ranged from a car, bicycle to TV as well as housing characteristics such as source of drinking water, floor materials and toilet facilities. The wealth quintiles were compiled by assigning the household score to each of the usual residents in the household, ranking each person by their score and dividing the distribution into five equal categories each comprising of 20% of the population. The scores were derived using the principal component analysis (UDHS, 2016). Five categories were derived as follows: a) the Wealthiest owned most of the specified goods and were 59% in urban and 9% in rural; b) Fourth 19% in urban and 20% in rural; c) Middle category 8% in urban and 23% in rural; d) Second 6% in urban and 24% in rural; e) Poorest quintile 8% in urban and 24% in rural areas.

The results showing the relationship between wealth status and the uptake of the recommended three or more doses of IPTp-SP in the target population have been presented in the Table 8 below.

Table 8

Cross Tabulation Between Wealth Status and Update of IPTp-SP

Variable	Uptake of IPTp-SP 3 or more doses		Total
	YES	NO	
Wealth Index			

Lowest quintile	202 (15.2%)	1124 (84.8%)	1326 (100%)
Second quintile	229 (18.3%)	1024 (81.7%)	1253 (100%)
Middle quintile	206 (18.4%)	914 (81.6%)	1120 (100%)
Fourth & Highest	376 (17.1%)	1827 (82.9%)	2203 (100%)
Total	**1,015 (17.2%)**	**4,886 (82.8%)**	**5,901 (100%)**

Data from Table 8 above indicates that overall, 17.2% of the sampled women took the recommended three or more doses of IPTp-SP during the last pregnancy (regardless of their socio-economic status). The uptake of the recommended 3 or more doses of IPTp-SP was lowest (15.2%) among women in the lowest wealth quintile. The results from Table 6 above shows that, among those who took the recommended IPTp-SP 3 or more doses, the majority were from the second and middle quintile with 18.3% and 18.4% respectively. Largely, uptake of IPTp-SP increased with wealth status from 15.2% among the poorest in the lowest quintile to 18.2% for those in the second category, then further to 18.4% among those in the middle quintile.

Overall, close to 78% of the respondents regardless of the wealth status received at least one dose of IPTp-SP during pregnancy. The proportion went on decreasing to 46% for women who took two or more doses, and then further down to 17.2% for women who took the recommended three or more doses of IPTp-SP.

Study data was analysed at bivariate level, and the logistics regression model results have been presented and discussed. The results to test the hypothesis for socio-economic status (being measured by wealth index) and IPTp-SP treatment seeking behavior among pregnant women in the study population have been presented the below sections.

The simple logistic regression analysis estimated the odds ratio, p-values and confidence intervals to determine association between socio-economic status and IPTp-SP treatment seeking behavior. The results are presented in Table 9 below.

Table 9

Simple Logistic Regression for Wealth Status and Uptake of IPTp-SP Fansidar (N=10,215)

Variable	Odds Ratio	Uptake of 3+ IPTp-SP 95% CI		p-value
		Lower	Upper	
Wealth Index				
Lowest	Ref	Ref		Ref
Middle	1.088	0.959	1.235	0.191
Highest	1.270	1.141	1.412	0.000

The findings as presented in the Table 9 above showed a statistically significant association between wealth status and uptake of IPTp-SP. Women in the highest socio status category were 1.3 times more likely to take the recommended doses of IPTp-SP during pregnancy than their counterparts in the lowest category (OR=1.270, CI=95% [1.141 – 1.412], p=0.000).

Based on the above bivariate results therefore the null hypothesis *(H_0)* was rejected at the 95% level of confidence with a cut-off p-value of 0.05; the null hypothesis that states that there is no association between wealth status and IPTp-SP treatment seeking behavior was accepted in which case the alternate hypothesis was accepted. The results indicate that there was statistically significant relationship (p>0.05) between wealth status and IPTp-SP treatment seeking behavior.

Association Between Maternal Age and IPTp-SP Treatment Seeking Behavior

The relationship between age of the mother and IPTp-SP treatment seeking behavior was analyzed. Research Question 3 sought to determine "Is there any association between maternal age and the IPTp-SP treatment seeking behavior for prevention of malaria among pregnant women in Uganda?" Age of the mother has been linked to access and uptake of maternal health services in general and malaria preventive therapies in particular. The study analyzed the distribution of study participants by age group and uptake of IPTp-SP. The results are shown in the Table 10 below.

Table 10

Simple Logistic Regression on Maternal Age and Update of IPTp-SP (N=10,215)

Variable		Respondents who took 3+ doses of IPTp-SP		
Age-Group	SE	Exp B	95% CI	*P-Value*
15-19*	0.090	Ref	Ref	Ref
20-24	0.093	1.350	1.131 - 1.612	0.001
25-29	0.096	1.596	1.330 - 1.916	0.000
30-34	0.102	1.518	1.258 - 1.831	0.000
35-39	0.116	1.296	1.061 - 1.581	0.011
40-44	0.173	1.064	0.848 - 1.335	0.590
45-49	0.078	0.969	0.690 - 1.361	0.856

**Reference Category*

The results from the simple logistic regression analysis in Table 10 above indicates that maternal age had a statistically significant relationship with uptake of the recommended 3 or more doses of IPTp-SP (p = 0.000). Women aged 25-29 years were 1.6 times more likely to take the recommended doses of IPTp-SP than their 15-19 years younger counterparts (OR=1.596, CI=95% [1.330 – 1.916], p=0.000). Similarly, women 30-34 years were 1.5 times more likely to take the recommended doses of SP Fansidar

than their 15-19 years younger counterparts (OR=1.518, CI=95% [1.258 – 1.831], p=0.000). Overall, the results indicate that the odds of taking the recommended three or more doses of IPTp-SP during pregnancy were associated with maternal age.

Based on the above findings, the null hypothesis that "there is no association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda" was rejected. The logistic regression results showed that women aged 20-39 years had a statistically significant relationship with uptake of the recommended 3 or more doses of IPTp-SP (p-value less than 0.05), thus the alternate hypothesis was accepted as true.

Association Between Knowledge about malaria and IPTp-SP Treatment Seeking Behavior

RQ4 sought to determine if there is any association between knowledge levels about malaria and the uptake of IPTp-SP among pregnant women in Uganda. During the study design, and according to available literature, the study had hypothesized that women with adequate knowledge about malaria in general and the related preventive strategies, were more likely to utilize ITPp-SP during pregnancy. Adequate knowledge was determined by at least the use of three parameters: use of internet, watching TV and listening to radio. These three parameters were used to get a composite variable that was used to measure "knowledge". A recent study measured adequate knowledge of students about a global heath disaster using three parameters including protective means, treatment and general awareness (Singh, J.P. et al., 2020). Average knowledge related scores were measured suggesting a composite index to derive the knowledge indicator.

The study tool that was used had 17 questions to measure knowledge, then 5 questions to measure attitudes of the participants and 3 questions to measure practices (Singh, J.P. et al., 2020). In this current study, I used three parameters to measure adequate knowledge as a composite variable which combined (i) use of internet (ii) watching TV and (iii) listening to radio. The results of the analysis are presented in Table 11 below:

Table 11

Distribution of Study Participants by Knowledge about Malaria and Update of IPTp-SP (N=10,215)

Knowledge about Malaria	Freq	Percent
Not Knowledgeable	2,518	24.7%
Knowledgeable	7,697	75.3%

Overall, 75% of the respondents were found to have adequate knowledge about malaria. According to the average knowledge related scores, approximately 25% of the respondents were not knowledgeable. Further analysis was conducted on the study data using the logistics regression model at bivariate level to estimate the relationship between knowledge about malaria and the uptake of IPTp-SP among respondents. The results from the bivariate logistic regression analysis are shown in Table 12 below.

Table 12

Simple Logistic Regression of Knowledge About Malaria and IPTp-SP Uptake

Variable	SE	Odds Ratio	95% CI		*p-value*
			Lower	Upper	
Knowledge about Malaria					
Not Knowledgeable*		Ref		Ref	

Knowledgeable	0.054	1.295	1.166	1.439	0.000

**Reference Category*

The results from the bivariate analysis in Table 12 above indicates that a statistically significant association (p=0.00) existed between knowledge about malaria and taking the recommended dosage of SP/fansider during pregnancy. Women who had adequate knowledge about malaria were approximately 1.3 times more likely to take the three or more recommended doses of IPTp-SP that their counterparts without adequate knowledge (OR=1.295, CI=95% [1.166 – 1.439], p=0.000).

With reference to the study findings, the null hypothesis that "there is no association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed" was rejected. The results from the logistic regression analysis showed that a statistically significant association (p=0.00) existed between knowledge about malaria and taking the recommended dosage of SP/fansider during pregnancy; and as such the alternate hypothesis was accepted as true.

Association Between Risk Perception and IPTp-SP Treatment Seeking Behavior

RQ5 sought to determine if there is any association between self-risk perception associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and

whether or not the mother is employed. However, there were changes to the original design as explained here-below.

Alteration from the Original Plan

Risk Perception: The design of the study originally had included as one of the independent variables "Self-Risk Perception" to be measured as a predictor for IPTp-SP uptake. In this regard, the study had included a corresponding research question "Is there an association between self-risk perception and IPTp-SP treatment seeking behavior for the prevention of malaria among pregnant women in Uganda? This research question was meant to measure the relationship between risk perception and uptake of IPTp-SP. However, it was later discovered that the 2016 UDHS dataset did not collect data on risk perception and therefore it would be difficult to estimate the values for risk perception. Instead, I replaced the variable on risk perception with Antenatal Care (ANC) visits, specifically focusing on frequency of ANC visits during the last pregnancy. The adapted research question is "Is there an association between frequency of ANC visits and IPTp-SP treatment seeking behavior among pregnant women in Uganda?"

Association Between ANC Attendance and IPTp-SP Treatment Seeking Behavior

Antenatal Care (ANC) attendance has been associated with uptake of maternal health services. In the Ugandan context, pregnant women are encouraged to go their ANC early enough (timing) and as scheduled (frequency). During the process of data collection for the UDHS survey, women respondents were asked whether they attended ANC visits and the timing of these visits during their last pregnancy. Data was collected and categorized to infer number, frequency and timing of the ANC visits.

The below Table 13 shows the distribution of women attending ANC visits and uptake of IPTp-SP.

Table 13

Distribution of Women Attending ANC and Receiving IPTp-SP in Uganda- UDHS 2016

	Urban	Rural	Total *(n=10,263)*
Women who attended ANC one or more times	97.4%	97.5%	97.6%
Women who took IPTp-SP one or more times	81.4%	76.9%	77.8%
Women who attended ANC two or more times	96.0%	94.9%	95.2%
Women who took IPTp-SP two or more times	45.7%	46.0%	45.9%
Attended ANC 4 or more times	65.2%	58.3%	59.9%
Women who took IPTp-SP three or more times	15.6%	17.6%	17.2%

Overall, of the 10,215 women interviewed during the survey (2,038 from urban areas and 8,177 from rural communities). Of the 10,215 women respondents, 17.2% took the recommended three or more doses of IPTp-SP to prevent malaria during pregnancy.

The relationship between ANC visits and uptake of IPTp-SP has been analysed and the results are reflected in the above table. Considering that up to 8,177 (80%) of the respondents resided in rural areas, the results indicate that women in rural areas, 58.3% attended ANC four or more visits and 17.6% took the recommended three or more IPTp-SP doses during the last pregnancy.

At bivariate level, the relationship between frequency of ANC visits and uptake of IPTp-SP was analysed. The results from the simple logistic regression model indicates that the association between frequency of ANC visits and uptake of the recommended doses of IPTp-SP was statistically significant ($p<0.05$). Women respondents who had received ANC visits for at least four times in the course of their last pregnancy were more

likely to take the recommended three or more doses of IPTp-SP than those that had sought for ANC less than four times. The relationship was statistically significant at (p = 0.000) as shown in Table 14.

Table 14

Simple Logistic Regression for Frequency of ANC Visits and IPTp-SP Update

Variable	SE	Odds Ratio	95% CI		*p-value*
			Lower	Upper	
ANC Visits					
No ANC visits*		Ref		Ref	
1 - 3 ANC visits	0.171	8.933	6.389	12.492	0.000
4 or more ANC visits	0.170	12.976	9.297	18.113	0.000

**Reference Category*

The results from the bivariate analysis in Table 14 above indicates that a statistically significant association (p=0.00) existed between the frequency of ANC visits and taking the recommended dosage of SP/fansider during pregnancy. Women who made four or more ANC visits during their last pregnancy were more likely to take the three or more recommended doses of IPTp-SP than their counterparts who had less visits. The results from the model indicates that women who made 4 or more visits were almost 13 times more likely to take the three or more recommended doses of IPTp-SP (OR=12.98, CI=95%, [9.297-18.113], p=0.000).

Based on the above results therefore the null hypothesis *(H_0)* was rejected at the 95% level of confidence with a cut-off p-value of 0.05; the null hypothesis that states that there is no association between ANC visits and IPTp-SP treatment seeking behavior was

rejected in which case the alternate hypothesis was accepted. The results confirm that actually a statistically significant relationship existed between ANC visits and IPTp-SP treatment seeking behavior.

Association Between Having Co-Wives in a Relationship and IPTp-SP Treatment Seeking Behavior

The association between the presence of co-wives in a relationship (polygyny) and the uptake of IPTp-SP among respondents was investigated during the study. The logistic regression results in Table 19 below indicate that there was no statistically significant relationship between co-wives and IPTp-SP uptake. Women who had no co-wives at all were considered as the reference category and were compared to other categories as shown in Table 15 below.

Table 15

Simple Logistic Regression on Cowives and Uptake of IPTp-SP (N=10,215)

Variable		Respondents who took 3+ doses of IPTp-SP		
No. of Co-Wives	SE	Exp B	95% CI	*P-Value*
No Co-Wife*	Ref	Ref	Ref	Ref
1 Co-Wife	0.068	0.922	0.807 - 1.053	0.230
2+ Co-Wives	0.116	1.001	0.797 - 1.257	0.922
No Response	0.059	0.791	0.704 – 0.888	0.000

**Reference Category*

The results from the above logistics regression table indicate that largely there was no statistically significant association between having co-wives and IPTp-SP treatment seeking behavior. However, women who gave “no response” had a statistically significant relationship (p=0.000) with uptake of the recommended doses of IPTp-SP.

From the analysis, women who gave “no response” experienced an approximated 21% reduction in the odds of not taking the recommended doses of IPTp-SP compared to their counterparts with no Co-Wife (OR=0.791, 95% CI [0.704 – 0.888], p=0.000).

It should be noted that UDHS data analysis showed that among women 15-49 years who were currently married, up to 25% reported that their husbands / partners had other wives. Similar with IPTp-SP uptake, the proportion of co-wives was higher in rural areas. Women living in rural areas were more likely to report having co-wives (with 26%) as opposed to their urban counterparts (20%). In addition, a significant proportion of up to 37% of women with no education reported that their partners / husbands had more than one wife as compared to 13% of women with secondary level of education and above.

In the African context, the “number of co-wives” is highly related to the “marital status” of the individual. The women respondents in the study were asked to mention their self-proclaimed marital status. Although available literature presents the position of a woman at the receiving end, the study findings did not find any significant association between marital status and uptake of malaria IP-SP among women during pregnancy ($p>0.05$).

The association between polygyny and IPTp-SP is a subject for further research so as to fully understand whether utilization of maternal health services is influenced by the existence of co-wives in a relationship.

Multivariate Analysis

Multivariate logistic regression analysis was applied to measure the effect of selected covariates on the relationship between the predictor variables and uptake of the recommended doses of IPTp-SP. All the independent variables that had shown a statistically significant association with the outcome variable at bivariate level, were included in the multivariate logistic regression model. The results from the analysis are shown in Table 16 below.

Table 16

Multivariate Logistic Regression Showing the Effect of Covariates in the Relationship Between Predictors and Uptake of IPTp-SP Among Pregnant Women (N=10,215)

Variables in the equation								
							95% CI for Exp B	
	B	SE	Wald	df	Sig	Exp(B)	Lower	Upper
Maternal Education			34.709	3	0.000			
None *	*Ref*		*Ref*		*Ref*	*Ref*		
Primary	-0.30	0.077	0.152	1	0.696	0.970	0.834	1.129
Secondary	0.292	0.099	8.782	1	0.003	1.340	1.104	1.625
Higher	0.562	0.148	14.408	1	0.000	1.755	1.313	2.346
Wealth Status			0.005	2	0.998			
Lowest	*Ref*		*Ref*		*Ref*	*Ref*		
Middle	0.002	0.067	0.001	1	0.976	1.002	0.878	1.143
Highest	0.004	0.063	0.005	1	0.946	1.004	0.887	1.137
Maternal Age			21.813	6	0.001			
15-19	*Ref*		*Ref*		*Ref*	*Ref*		
20-24	0.201	0.093	4.702	1	0.030	1.223	1.020	1.467
25-29	0.360	0.096	13.989	1	0.000	1.434	1.187	1.732
30-34	0.330	0.100	11.004	1	0.001	1.391	1.145	1.691
35-39	0.264	0.107	6.139	1	0.013	1.303	1.057	1.605
40-44	0.079	0.121	0.427	1	0.514	1.082	0.854	1.370
45-49	0.059	0.183	0.105	1	0.746	1.061	0.742	1.518
Knowledge								
UnKnowledgeable*	*Ref*		*Ref*		*Ref*	*Ref*		
Knowledgeable	0.125	0.058	4.619	1	0.032	1.133	1.011	1.269
Area of Residence								
Urban*	*Ref*		*Ref*		*Ref*	*Ref*		
Rural	0.046		0.0756		0.028	1.304	1.102	2.200

ANC Visits			230.366	2	0.000			
No ANC Visit*	*Ref*		*Ref*		*Ref*	*Ref*		
1-3 ANC Visit	2.154	0.172	156.613	1	0.000	8.621	6.152	12.080
4+ ANC Visits	2.479	0.171	209.161	1	0.000	11.930	8.526	16.693
Co-Wives			12.296	3	0.006			
No Co-Wife*	*Ref*		*Ref*		*Ref*	*Ref*		
1 Co-Wife	0.049	0.070	0.495	1	0.482	0.952	0.829	1.092
2+ Co-Wives	0.084	0.121	0.485	1	0.486	1.088	0.858	1.380
No Response	-.204	0.062	10.984	1	0.001	0.816	0.723	0.920
Constant	-1.37	0.201	46.729	1	0.000	0.253		

*Reference Category

The results from the multivariate logistic analysis as presented in Table 16 above identified maternal education, age of the mother, knowledge about malaria and frequency of ANC Visits as predictors associated with uptake of the recommended doses of IPTp-SP.

The multivariate results showed that a statistically significant association (p=0.001) still existed between maternal education and uptake of IPTp-SP while controlling for residence, wealth and employment. Women with secondary education level were 1.34 times more likely to take the recommended doses of IPTp-SP (AOR=1.340, CI=95% [1.104-1.625], p=0.003). In the same way, women with higher education level were 1.75 times more likely to take the recommended doses of IPTp-SP (OR=1.755, CI=95% [1.313-2.346], p=0.000). The association between primary level of education and IPTp-SP uptake was not statistically significant at multivariate level (AOR=0.970, 95% CI [0.834 – 1.129], p=0.696). Details are shown in Table 17 below.

Table 17

Multivariate Logistic Regression for Maternal Education and IPTp-SP Treatment Seeking Behavior While Controlling for Area of Residence, Wealth Index, and Employment

Variable	Odds Ratio	Uptake of 3+ IPTp-SP 95% CI	p-value

		Lower	Upper	
Maternal Education				
No Education*	Ref	Ref		Ref
Primary	0.970	0.834	1.129	0.696
Secondary	1.340	1.104	1.625	0.003
Higher	1.755	1.313	2.346	0.000
Area of Residence				
Urban	Ref	Ref		Ref
Rural	1.304	1.102	2.200	0.028
Employment				
Not Employed	Ref	Ref		Ref
Employed	0.924	0.409	1.650	0.811
Wealth Index				
Lower Quintile	Ref	Ref		Ref
Middle Quintile	1.002	0.878	1.143	0.976
Highest - Richest	1.004	0.887	1.137	0.946

At multivariate level of analysis, the association of maternal education and uptake of IPTp-SP was analysed while controlling for residence, employment and wealth status. The results indicate that among covariates, area of residence was statistically significant with uptake of IPTp-SP (AOR=1.304, CI=95% [1.102 – 2.200], p=0.028); while wealth status for the middle quintile was not significant (AOR=1.002, CI=95% [0.878 – 1.143], p=0.976), and the richest category was also not statistically significant with IPTp-SP uptake (AOR=1.004, CI=95% [0.887-1.137] p=0.946).

At multivariate level, I performed further regression analysis for wealth status while controlling for area of residence, maternal education and employment. However,

the results still indicated no statistically significant association (p>0.05) between wealth status and uptake of IPTp-SP. The results are shown in Table 18 below.

Table 18

Multivariate Logistic Regression for Wealth Index and IPTp-SP Treatment Seeking Behavior While Controlling for Area of Residence, Education, and Employment

Variable	Odds Ratio	Uptake of 3+ IPTp-SP 95% CI		p-value
		Lower	Upper	
Wealth Index				
Lower Quintile	*Ref*	*Ref*	*Ref*	
Middle Quintile	1.002	0.878	1.143	0.976
Highest - Richest	1.004	0.887	1.137	0.946
Maternal Education				
No Education*	*Ref*	*Ref*	*Ref*	
Primary	0.970	0.834	1.129	0.696
Secondary	1.340	1.104	1.625	0.003
Higher	1.755	1.313	2.346	0.000
Area of Residence				
Urban	*Ref*	*Ref*	*Ref*	
Rural	1.304	1.102	2.200	0.028
Employment				
Not Employed	*Ref*	*Ref*	*Ref*	
Employed	0.924	0.409	1.650	0.811

The multivariate logistic regression analysis was conducted to examine the relationship between socio-economic status indicated as wealth status and IPTp-SP treatment seeking behavior while controlling for covariates area of residence, employment and maternal education. The results in Table 11 above indicate that the poorest wealth category being the category of reference, the middle quintile showed no significant association with uptake of IPTp-SP (AOR=1.002, CI=95%, [0.878-1.143],

p=0.976). The results also indicate that there was no statistically significant association between richest women and IPTp-SP uptake (AOR=1.004, CI=95% [0.887 – 1.137], p=0.946). In addition, area of residence showed a statistically significant association with IPTp-SP uptake (AOR=1.304, CI=95% [1.102 – 2.200], p=0.028); while Employment was not statistically significant (AOR=0.924, CI=95% [0.409 – 1.650], p=0.811).

On further analysis, multivariate findings also revealed that women who attended ANC were more likely to have the recommended 3 or more doses of IPTp-SP than those women who never attended ANC. The frequency of ANC visits was positively associated with the uptake of the recommended doses of IPTp-SP (Adjusted OR = 11.930, 95% CI [8.526 – 16.693] p =0.000); even as I controlled for residence, wealth status and employment. This implies that women who attended four or more ANC visits were almost 12 times more likely to take the recommended dosage of IPTp-SP compared to those who had less ANC visits. Even among those who attended between 1-3 visits, the analysis shows a statistically significant association (AOR= 8.621, 95% CI [6.152-12.080], P=0.000). The findings are consistent with Tiendréogo et al., 2015 who observed that low antenatal care coverage is directly associated with low SP-IPT coverage. The results are shown in Table 19 below.

Table 19

Multivariate Logistic Regression of ANC Visits and IPTp-SP Treatment Seeking Behavior While Controlling for Area of Residence, Wealth Index, and Employment

Variable	Odds Ratio	Uptake of 3+ IPTp-SP 95% CI		p-value
		Lower	Upper	
ANC Visits				

No ANC Visit*	Ref	Ref	Ref	
1-3 ANC Visits	8.621	6.152	12.080	0.000
4+ ANC Visits	11.930	8.526	16.693	0.000

The results indicate a strong positive association which is statistically significant between ANC visits and use of SP Fansidar among pregnant women. The frequency of ANC visits was positively associated with the uptake of the recommended doses of IPTp-SP (Adjusted OR = 11.930, 95% CI [8.526 – 16.693] p =0.00) among women who made 4 or more ANC visits. Further analysis was conducted using multivariate logistic regression to examine the effect of covariates on the relationship between knowledge about malaria and IPTp-SP treatment seeking behavior while controlling for area of residence, wealth index and employment status.

Table 20

Multivariate Logistic Regression of Knowledge About Malaria and IPTp-SP Treatment Seeking Behavior While Controlling for Area of Residence, Education, and Employment

Variable	Odds Ratio	Uptake of 3+ IPTp-SP 95% CI		p-value
		Lower	Upper	
Knowledge				
Not Knowledgeable	Ref	Ref		Ref
Knowledgeable	1.133	1.011	1.269	0.032
Area of Residence				
Urban	Ref	Ref		Ref
Rural	1.304	1.102	2.200	0.028
Employment				
Not Employed	Ref	Ref		Ref
Employed	0.924	0.409	1.650	0.811

Wealth Index				
Lower Quintile	Ref	Ref		Ref
Middle Quintile	1.002	0.878	1.143	0.976
Highest - Richest	1.004	0.887	1.137	0.946

The multivariate results in Table 20 above indicate that women who were knowledgeable about malaria were 1.13 times more likely to take the recommended doses of IPTp-SP (AOR=1.133, CI=95% [1.011-1.269], p=0.032) as compared to those without adequate knowledge. The association was statistically significant at p=0.032 with a 95% confidence interval. On the other hand, the results indicate that among covariates, area of residence was statistically significant with uptake of IPTp-SP (AOR=1.304, CI=95% [1.102 – 2.200], p=0.028); while wealth status for the middle quintile was not significant (AOR=1.002, CI=95% [0.878 – 1.143], p=0.976), and the richest category was also not statistically significant with IPTp-SP uptake (AOR=1.004, CI=95% [0.887-1.137] p=0.946).

In the study, I also conducted further analysis using multivariate logistic regression to examine the effect of covariates on the relationship between maternal age and IPTp-SP treatment seeking behavior while controlling for area of residence, wealth index and employment status. The results are shown in Table 21 below.

Table 21

Multivariate Logistic Regression for Maternal Age and IPTp-SP Treatment Seeking Behavior While Controlling for Area of Residence, Education, and Employment

Variable	Odds Ratio	Uptake of 3+ IPTp-SP 95% *CI*		*p*-value
		Lower	Upper	

Maternal Age				
15-19	Ref	Ref		Ref
20-24	1.223	1.020	1.467	0.030
25-29	1.434	1.187	1.732	0.000
30-34	1.391	1.145	1.691	0.001
35-39	1.303	1.057	1.605	0.013
40-44	1.082	0.854	1.370	0.514
45-49	1.061	0.742	1.518	0.746
Area of Residence				
Urban	Ref	Ref		Ref
Rural	1.304	1.102	2.200	0.028
Employment				
Not Employed	Ref	Ref		Ref
Employed	0.924	0.409	1.650	0.811
Wealth Index				
Lower Quintile	Ref	Ref		Ref
Middle Quintile	1.002	0.878	1.143	0.976
Highest - Richest	1.004	0.887	1.137	0.946

The results from the multivariate logistic regression as shown in Table 21 above indicate that maternal age still had a statistically significant association with the use of SP Fansidar among study participants. Young women 20-24 were 1.22 times more likely to take the recommended doses of IPTp-SP (AOR=1.223, CI=95% [1.020-1.467], p=0.030) as compared to those 15-19 years. The association was statistically significant at p=0.030 with a 95% confidence interval. Middle age women 25-29 years were 1.4 times more likely to take the recommended doses of IPTp-SP (AOR=1.434, CI=95% [1.187-1.732], p=0.000); and those aged 30-34 years were 1.39 times more likely to take the

recommended doses of IPTp-SP (AOR=1.391, CI=95% [1.145-1.691], p=0.001) as compared to those 15-19 years.

I also conducted further analysis was conducted using multivariate logistic regression to examine the effect of covariates on the relationship between presence of co-wives in a relationship and IPTp-SP treatment seeking behavior while controlling for area of residence, wealth index and employment status. The results are shown in Table 22 below.

Table 22

Multivariate Logistic Regression for Cowices and IPTp-SP Treatment Seeking Behavior While Controlling for Area of Residence, Education, and Employment

Variable	Odds Ratio	Uptake of 3+ IPTp-SP 95% CI		p-value
		Lower	Upper	
Cowives				
No Co-Wife*	Ref	Ref		Ref
1 Co-Wife	0.952	0.829	1.092	0.482
2+ Co-Wives	1.088	0.858	1.380	0.486
No Response	0.816	0.723	0.920	0.001
Area of Residence				
Urban	Ref	Ref		Ref
Rural	1.304	1.102	2.200	0.028
Employment				
Not Employed	Ref	Ref		Ref
Employed	0.924	0.409	1.650	0.811
Wealth Index				
Lower Quintile	Ref	Ref		Ref
Middle Quintile	1.002	0.878	1.143	0.976
Highest - Richest	1.004	0.887	1.137	0.946

The results from the multivariate logistic regression as shown in Table 22 above indicate that generally there was no statistically significant association between having co-wives and the uptake of the recommended doses of SP Fansidar - except for the "no-response" category (AOR=0.816, CI=95% [0.723-0.920], p=0.001).

For this study, the crude and adjusted odds ratios (COR & AOR) were calculated with the appropriate confidence levels in order to compare the uptake of IPTp-SP between individual reference groups and the other variable categories within each of the predictor variable. The adjusted odds ratios were calculated to adjust for any confounding effect of the socio-demographic factors such as maternal education level, religious background, partner's employment status, area of residence, the education level of the partner as well as wealth status of the household.

Summary and Transition

In Chapter 4, I presented the results of the study which were largely segmented at three levels: the univariate level focusing on distribution of study participants by their background characteristics; at bivariate level measuring the relationships between independent variables and; at multivariate level to establish levels of associations and the effect of each predictor variable in shaping the uptake of IPTp-SP for the prevention of malaria among pregnant women in Uganda. The study was primarily guided by six research questions and the related hypotheses.

The first research question "Is there an association between maternal education level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant

women in Uganda?" Based on the study results, the null hypothesis which states that "there is no association between maternal education level and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda" was rejected. In this case the alternate hypothesis was accepted as true. The bivariate logistic regression results indicate that there was a statistically significant relationship between maternal education and IPTp-SP treatment seeking behavior (p=000). Women with secondary level of education were almost 1.5 times more likely to use the recommended doses pf IPTp-SP than those with no education (OR=1.488, 95% CI [1.254 – 1.767], p=0.000). Similarly, women who attained higher level of education were 2.14 times more likely to take the recommended doses of IPTp-SP compared to their counterparts with no education (OR=2.139, 95% CI [1.635 – 2.799], p=0.000). Even at multivariate level of analysis, the results indicate that women with secondary education level were 1.34 times more likely to take the recommended doses of IPTp-SP (AOR=1.340, CI=95% [1.104-1.625], p=0.003). Among women with higher education level, the odds were 1.75 times more likely to take the recommended doses of IPTp-SP (OR=1.755, CI=95% [1.313-2.346], p=0.000). However, the association between primary level of education and IPTp-SP uptake was not statistically significant at multivariate level (AOR=0.970, 95% CI [0.834 – 1.129], p=0.696).

The second research question "Is there a relationship between socio-economic status and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and whether or not the mother is employed?" Based on the study findings, the null hypothesis which states that "there is no association between socio-economic status

and IPTp-SP treatment-seeking behavior controlling for wealth quintile, area of residence, and employment was rejected at the 95% level of confidence with a cut-off p-value of 0.05. The logistic regression analysis at bivariate level indicate that a statistically significant relationship existed between wealth status and IPTp-SP treatment seeking behavior. Women in the highest socio status category were 1.3 times more likely to take the recommended doses of IPTp-SP during pregnancy than their counterparts in the lowest category (OR=1.270, CI=95% [1.141 – 1.412], p=0.000). At multivariate analysis, however, the results indicated that there was no statistically significant association (p>0.05) between wealth status and uptake of IPTp-SP, after controlling for covariates (area of residence, education and employment). Women from the middle quintile showed no significant association with uptake of IPTp-SP (AOR=1.002, CI=95%, [0.878-1.143], p=0.976). The results also indicate that there was no statistically significant association between richest women and IPTp-SP uptake (AOR=1.004, CI=95% [0.887 – 1.137], p=0.946).

The third research question "Is there any association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda?" According to the findings, the null hypothesis that "there is no association between maternal age and the IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda" was rejected. The results from the simple logistic regression analysis showed that maternal age had a statistically significant relationship with uptake of the recommended 3 or more doses of IPTp-SP (p = 0.000). Women aged 25-29 years were 1.6 times more likely to take the recommended

doses of IPTp-SP than their 15-19 years younger counterparts (OR=1.596, CI=95% [1.330 – 1.916], p=0.000). Similarly, women 30-34 years were 1.5 times more likely to take the recommended doses of SP Fansidar than their 15-19 years younger counterparts (OR=1.518, CI=95% [1.258 – 1.831], p=0.000). Overall, the odds of taking the recommended three or more doses of IPTp-SP during pregnancy were associated with maternal age. At multivariate level, the association between maternal age and the use of SP Fansidar was still statistically significant ($p<0.05$). Young women 20-24 were 1.22 times more likely to take the recommended doses of IPTp-SP (AOR=1.223, CI=95% [1.020-1.467], p=0.030) as compared to the reference category 15-19 years. Middle age women 25-29 years were 1.4 times more likely to take the recommended doses of IPTp-SP (AOR=1.434, CI=95% [1.187-1.732], p=0.000); and those aged 30-34 years were 1.39 times more likely to take the recommended doses of IPTp-SP (AOR=1.391, CI=95% [1.145-1.691], p=0.001) as compared to those 15-19 years.

The fourth research question "Is there any association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed? With reference to the study findings, the null hypothesis that "there is no association between knowledge of signs and symptoms of malaria and IPTp-SP treatment-seeking behavior for prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed" was rejected. The results at bivariate analysis using a simple logistic regression model showed that a statistically significant association

(p=0.00) existed between knowledge about malaria and taking the recommended dosage of SP Fansidar during pregnancy. Women who had adequate knowledge about malaria were 1.3 times more likely to take the three or more recommended doses of IPTp-SP than their counterparts without adequate knowledge (OR=1.295, CI=95% [1.166 – 1.439], p=0.000). Even at multivariate level of analysis, the association between knowledge about malaria and uptake of SP Fansidar remained statistically significant at p=0.032 with a 95% confidence interval. Women who were knowledgeable about malaria were 1.13 times more likely to take the recommended doses of IPTp-SP (AOR=1.133, CI=95% [1.011-1.269], p=0.032) as compared to those without adequate knowledge.

The adjusted fifth research question "Is there an association between ANC visits and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for wealth quintile, area of residence, and whether or not the mother is employed?" Based on the study findings, the null hypothesis that "there is no association between ANC attendance and IPTp-SP treatment seeking behavior was rejected. The results from the bivariate analysis using a simple logistic regression model showed that a statistically significant association (p=0.00) existed between the frequency of ANC visits and taking the recommended dosage of SP/fansider during pregnancy. Women who made four or more ANC visits during their last pregnancy were more likely to take the recommended doses of IPTp-SP than their counterparts who had less visits. The results from the model indicates that women who made 4 or more visits were almost 13 times more likely to take the recommended doses of IPTp-SP (OR=12.98, CI=95%, [9.297-18.113], p=0.000). Even at multivariate level, the frequency of ANC visits was

positively associated with the uptake of the recommended doses of IPTp-SP. Among women who made 4 or more ANC visits, the odds of taking IPTp-SP were almost 12 times compared to those who made less ANC visits (AOR = 11.930, 95% CI [8.526 – 16.693] p =0.00).

The sixth research question "Is the presence of co-wives in a relationship associated with IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women in Uganda controlling for religion, area of residence, and parity?" According to the study findings, the null hypothesis that "there is no association between presence of co-wives in a relationship and IPTp-SP treatment seeking behaviors for the prevention of malaria among pregnant women as accepted. The results from the multivariate logistic regression indicate that generally there was no statistically significant association between having co-wives and the uptake of the recommended doses of SP Fansidar - except for the "no-response" category.

The next chapter 5 presents the discussions and the related interpretation of the study findings taking into consideration the limitations and strengths of the study. In addition, the chapter presents the key recommendations in relation to the study findings, as well as a narrative on the implications of the results towards positive social change and action.

Chapter 5: Discussion, Conclusions, and Recommendations

In this study, I aimed at exploring the risk factors associated with access to IPTp-SP malaria prevention services among pregnant women in Uganda. The study used secondary data from the 2016 UDHS. The study findings revealed that uptake of IPTp-SP remained very low in the study population. While up to 78% of the women had reported to have taken the SP/Fansidar to prevent malaria during their last pregnancy, only 17.7% of them took the WHO recommended three or more doses of IPTp-SP. A significant number (22%) of the women affirmed not to have taken SP Fansidar for malaria prevention during pregnancy. The observed coverage (17.7%) is way below the Uganda MoH target of 93% reach by the year 2020 (UBOS, 2018). Low coverage and poor use of IPTp-SP has considerable implications on anti-malaria prevention and eradication programs not only in Uganda but also on the African continent.

I applied a cross-sectional secondary data analysis on data obtained from the UDHS 2016 to determine the association between selected risk factors and the uptake of IPTp-SP among pregnant women. The predictor variables were largely sociodemographic characteristics that relate to the individual woman respondent and the household. Data in relation to the last pregnancy (2 years prior to the study) was used to provide basis for analysis and measurement of the association between the selected independent variables and the outcome (uptake of the recommended doses of IPTp-SP).

A binary logistic regression analysis was performed to determine if maternal age, level of education, socioeconomic status, knowledge about malaria, frequency of ANC visits, and presence of cowives have an influence on IPTp-SP treatment seeking behavior

among pregnant women in the study population. The outcome variable of interest was uptake of the recommended doses of IPTp-SP. The potential predictor variables were maternal age, level of education, socioeconomic status, knowledge about malaria, frequency of ANC visits and the presence of cowives in a relationship. The Hosmer-Lemeshow goodness of fit was not significant (p>0.05) which indicated that the model was correctly specified. In addition, the -2 log likelihood estimate of 8455.7 and the Nagelkerke R^2 = 0.054. The results from the logistic regression model showed that all the six independent variables, maternal education, socioeconomic status, maternal age, knowledge about malaria, frequency of ANC visits and presence of cowives were found to have a significant association (p<0.05) with the outcome variable (uptake of the recommended three or more doses of IPTp-SP) at bivariate level of analysis.

Further analysis was done at multivariate level using binary logistic regression analysis to examine the effect of covariates on the association between those independent variables that were found to be statistically significant with IPTp-SP uptake. While controlling for wealth status, area of residence and employment, four out of six independent variables were found to be statistically significant with the uptake of the recommended doses of IPTp-SP during pregnancy. These include maternal education, knowledge about malaria, maternal age, and frequency of ANC visits.

The results from the bivariate logistic regression analysis indicate that there was a statistically significant relationship between maternal education and IPTp-SP treatment seeking behavior (p=000). Women with secondary level of education were almost 1.5

times more likely to use the recommended doses pf IPTp-SP than those with no education (*OR*=1.488, 95% CI [1.254 – 1.767], *p*=0.000).

Similarly, women who attained higher level of education were 2.14 times more likely to take the recommended doses of IPTp-SP compared to their counterparts with no education (*OR*=2.139, 95% CI [1.635 – 2.799], *p*=0.000). Even at multivariate level of analysis, the results indicate that women with secondary education level were 1.34 times more likely to take the recommended doses of IPTp-SP (*AO*R=1.340, CI=95% [1.104-1.625], *p*=0.003). Among women with higher education level the odds were 1.75 times more likely to take the recommended doses of IPTp-SP (*OR*=1.755, CI=95% [1.313-2.346], *p*=0.000).

Regarding socioeconomic status and particularly wealth status, the logistic regression analysis at bivariate level showed a statistically significant relationship between wealth status and IPTp-SP treatment seeking behavior. The richest women were 1.3 times more likely to take the recommended doses of IPTp-SP during pregnancy than their counterparts in the lowest category (*OR*=1.270, CI=95% [1.141 – 1.412], *p*=0.000). However, at multivariate level, the results indicated that there was no statistically significant association ($p>0.05$) between wealth status and uptake of IPTp-SP, after controlling for covariates (area of residence, education, and employment). Women from the middle quintile showed no significant association with uptake of IPTp-SP (*AOR*=1.002, CI=95%, [0.878-1.143], *p*=0.976). Multivariate results also indicate that there was no statistically significant association between richest women and IPTp-SP uptake (*AOR*=1.004, CI=95% [0.887 – 1.137], *p*=0.946).

Overall, the study results showed that the odds of taking the recommended three or more doses of IPTp-SP during pregnancy were associated with maternal age. At multivariate level, the association between maternal age and the use of SP Fansidar was found to be statistically significant ($p<0.05$). Young women 20-24 were 1.22 times more likely to take the recommended doses of IPTp-SP (*AOR*=1.223, CI=95% [1.020-1.467], $p=0.030$) as compared to those 15-19 years. Middle-aged women 25-29 years were 1.4 times more likely to take the recommended doses of IPTp-SP (*AOR*=1.434, CI=95% [1.187-1.732], $p=0.000$); and those aged 30-34 years were 1.39 times more likely to take the recommended doses of IPTp-SP (*AOR*=1.391, CI=95% [1.145-1.691], $p=0.001$) as compared to those 15-19 years.

In addition, the logistic regression analysis showed that a statistically significant association ($p=0.00$) existed between knowledge about malaria and taking the recommended dosage of SP/Fansider during pregnancy. At bivariate level, women who had adequate knowledge about malaria were 1.3 times more likely to take the three or more recommended doses of SP Fansidar than their counterparts without adequate knowledge (*OR*=1.295, CI=95% [1.166 – 1.439], $p=0.000$). At multivariate analysis, the association between knowledge about malaria and uptake of SP Fansidar remained statistically significant at $p=0.032$ with a 95% confidence interval. Women who were knowledgeable about malaria were 1.13 times more likely to take the recommended doses of IPTp-SP (*AOR*=1.133, CI=95% [1.011-1.269], $p=0.032$) as compared to those without adequate knowledge.

A strong positive association existed between frequency of ANC visits and uptake of the recommended doses of IPTp-SP. Women who made four or more ANC visits during their last pregnancy were more likely to take the recommended doses of IPTp-SP than their counterparts who had less visits. The results from the logistic regression model showed that women who made four or more visits were almost 13 times more likely to take the recommended doses of IPTp-SP (*OR*=12.98, CI=95%, [9.297-18.113], *p*=0.000). Even at multivariate level, the frequency of ANC visits was positively associated with the uptake of the recommended doses of IPTp-SP. Among women who made four or more ANC visits, the odds of taking IPTp-SP were almost 12 times higher compared to those who made less ANC visits (*AOR* = 11.930, 95% CI [8.526 – 16.693] *p* =0.00). The results from the analysis found no statistically significant relationship between cowives and uptake of IPTp-SP.

This chapter therefore provides critical discussions and interpretations on the selected predictor variables including maternal age, level of education, knowledge about malaria, frequency of ANC visits as well as the wealth status of the household. The discussion largely focuses on the relationship between these risk factors and the uptake of IPTp-SP to prevent malaria among pregnant women in Uganda.

Discussion and Interpretation of Study Findings

Malaria in Uganda accounts for 34% of all the out-patient clinic visits and between 19 – 30% of all in-patient admissions (PMI, 2019). If not well-managed, malaria infection may result into severe illness leading to increased morbidity, death of the mother, the unborn child or both. In this study, data on women aged 15-49years was

analyzed using a logistic regression model to determine factors associated with uptake of IPTp-SP to prevent malaria.

The relationship between maternal education and the uptake of IPTp-SP has been central to the design, scope, and discussion of this study. Maternal education is part and parcel of the broader awareness programs for improved access to maternal health services and cannot be divorced from malaria prevention programs including IPTp-SP. Using a logistic regression model, the study findings revealed that pregnant women with secondary level of education and above in Uganda were almost 1.5 times more likely to use the recommended doses pf IPTp-SP than those with no education (*OR*=1.488, 95% CI [1.254 – 1.767], *p*=0.000). Similarly, women who attained higher level of education were 2.14 times more likely to take the recommended doses of IPTp-SP compared to their counterparts with no education (*OR*=2.139, 95% CI [1.635 – 2.799], *p*=0.000).

The association between maternal education and uptake of the recommended dosage of IPTp-SP was found to be statistically significant (*p*=0.000). The findings are perfectly in agreement with Mwandama et al. (2015) who also emphasized that Malawian women with higher education (completed secondary school and above) were more likely to have received IPTp-SP during pregnancy as compared to their counterparts with no education. The findings support the belief that educated women are more likely to be aware of the health benefits of taking IPTp-SP in the recommended dosage. With formal education, these women are more likely to seek for advice from skilled professional health practitioners. In addition, the level of education allows women to read and appreciate the risks associated with complications due malaria in pregnancy if one fails to

take the recommended dosage. It's also possible that women with postsecondary and higher level of education are more likely to have good jobs, are well paid, and are better off financially which may make them afford better living conditions than their uneducated counterparts (Yaya, 2017).

Several studies have also linked a mother's level of education to uptake of the recommended doses of IPTp-SP among pregnant women (Hill et al., 2013; Kibusi et al. 2015; Sambili et al, 2016). In Malawi, women with secondary education and above were more likely to have received SP/Fansidar during pregnancy as compared to women with no education (Adjusted *OR* 4.10, 95% CI [1.90 – 8.70] p=0.001). Menendez (2010) and Hill (2013) have also reported similar findings when they observed that low levels of maternal education are characterized by low level of awareness on the risk factors associated with maternal health issues in general and malaria in particular. This notion has a negative effect in terms of adherence to IPTp-SP and general malaria prevention interventions. The scholars therefore called for wide stakeholder engagement to increase the focus on education and awareness among pregnant women and their partners on the risks and effects of not completing the recommended dosage. However, it is important to note that, even though I found a significant association between maternal education and uptake of IPTp-SP, in Nigeria other studies found that maternal education did not predict uptake (see Obasi et al., 2019).

In this study, the relationship between maternal age and uptake of IPTp-SP has been investigated at bivariate and multivariate level using the logistic regression analysis. The study findings revealed an existing relationship between the age of the mother and

the uptake of IPTp-SP. Overall, the proportion of younger mothers 20-29 years who took the recommended doses of IPTp-SP was relatively lower compared to older women in the study.

The findings were in agreement with Onyeneho et al (2015), who asserts that compliance to IPT-SP uptake is significantly linked to maternal age. The study findings in terms of variations in uptake of IPTp-SP on the basis of age could probably be attributed to several reasons including limited exposure to quality healthcare facilities, low enthusiasm among the adolescent pregnant women (15-19years) on the use of the health services due to stigma, rigid cultural values and beliefs, inadequate support from their spouses / partners who are responsible for the pregnancy for fear of legal actions.

Despite the fact that the study findings reported high uptake of IPTp-SP among pregnant women between 20-49 years, Hajira et al (2017) while investigating the factors that influenced uptake of intermittent preventive treatment of malaria in pregnancy using sulphadoxine pyrimethamine in Ghana did not see any significant variation on the basis of maternal age.

The study findings appeared to contrast with Okethwangu (2019) and Wanzira (2016) who reported that pregnant women in Uganda in the age category 34 years and above were less likely to take optimal doses of IPTp-SP. The researchers argued that women in this age category fail to take the recommended dosage because majority of them may not be having this as their first pregnancy. Similarly, the current study findings revealed that, although the uptake was high among the older women, a significant number of them reported not taking the recommended three or more doses of IPTp-SP

during pregnancy. The reasons reported in the Okethwangu study for the low uptake were negative attitude among the pregnant mothers, inaccessibility to ANC services, high costs associated with the health services especially in areas where the government health facilities are inaccessible (Okethwangu, 2019).

The study was premised on the assumption that as more women become aware of the signs and symptoms of malaria in general, the uptake of antimalaria prevention therapies such as IPTp-SP will accordingly increase. The findings showed a significant association ($p<0.05$) between adequate knowledge about malaria and uptake of the recommended 3 or more doses of SP/Fansidar among pregnant women. The logistic regression analysis showed that women who had adequate knowledge about malaria were 1.3 times more likely to take the three or more recommended doses of SP Fansidar than their counterparts without adequate knowledge (OR=1.295, CI=95% [1.166 – 1.439], p=0.000).

In this study, adequate knowledge about malaria was measured by three combined parameters including the use of internet, watching TV and listening to radio (as a composite). The results for the knowledge predictor were statistically significant at p-value of less than 0.05. The study findings attributed the increased awareness and knowledge about malaria on the localization of messages related to malaria by translating them into local languages. Women respondents who listened to such malaria messages through radio, TV, social media and other platforms could easily understand the information and the need to practice the recommended malaria prevention strategies.

The study findings are consistent with Roman, Andrejko, Wolf et al., (2019) who asserted that access to locally translated messages was sighted as a critical factor in enhancing uptake of intermittent preventive treatment of malaria in pregnancy. The researchers emphasized the need for adequate knowledge as women frequently do not seem to understand when, what or even why they should be taking IPTp-SP (Roman, Andrejko, Wolf et al., 2019). Adequate knowledge and continuous community engagement were both singled out as important drivers towards ensuring that women and their spouses understand the importance of taking IPTp-SP (Roman, Andrejko, Wolf et al., 2019). In addition, women should be knowledgeable on the need to start IPTp-SP early in pregnancy; and this awareness will make them demand for the drug and this will enhance optimal coverage of IPTp-SP. In this regard, the scholars Roman, Andrejko, Wolf et al (2019) asserted that as long as women are unaware of the benefits of IPTp-SP, they will not ask for the drug even when they visit the facilities for antenatal care.

The findings were in agreement with Darteh et al, 2019 who also observed an association between having good knowledge and understanding of malaria in pregnancy and the use of IPTp-SP. The findings further were in support of Ibrahim et al., 2017 who asserted that women with adequate knowledge about malaria and know the benefits of IPTp-SP, when and how to take SP are more likely to use the treatment than their uninformed counterparts.

The study findings in terms of knowledge and uptake of IPTp-SP were consistent with the observations by several other scholars like Hill et al (2012). In addition, Nyonyi (2012) also reported significant relationship between IPTp-SP uptake among pregnant

women and high knowledge levels on the signs and benefits of IPTp-SP in the Republic of Tanzania. The scholars recommended that countries should design enhanced awareness programmes and interventions targeting pregnant women and other stakeholders on the implications of not taking the recommended dosage. Specifically, for Uganda, such programmes should target people in urban areas, where findings from the current study have reported low IPTp-SP uptake (adjusted OR=1.204, P=0.028).

A high uptake of IPTp-SP is directly linked with the level of knowledge and awareness that women acquire through various approaches including media platforms. A re-known scholar Amankwah (2019), while researching on factors associated with uptake of IPT for malaria prevention among pregnant women in Ghana, discovered that education and counseling on ANC benefits given to women by midwives during routine visits, is a key factor in determining the uptake of the recommended IPTp-SP dosage.

It is important to note that knowledge alone cannot explicitly explain the level of uptake of IPTp- SP among pregnant women. As earlier noted in the study women in urban areas who are perceived to be more knowledgeable on issues of IPTp- SP, their level of uptake was reported lower than their rural counterparts. This therefore calls for a renewed enhancement of efforts by different stakeholders to go beyond awareness; and therefore, work towards addressing all barriers to enhanced uptake of IPTp-SP such as engaging men, taking ANC services closer to the people among others.

The current study considered area of residence as a covariate to uptake of IPTp-SP. In terms of geographical location where mothers reside (whether urban or rural), the study findings revealed that uptake of the recommended doses of IPTp-SP among

pregnant women in rural areas in Uganda was higher (17.6%) compared to those in the urban areas (15.6%). Rural women were 1.2 times more likely to take the recommended IPTp-SP doses than those in urban areas. This finding doesn't seem to agree with Exavery et al., 2014, who indicated that urban residence is linked with uptake of IPTp-SP. In addition, the study findings were did not concur with Mpongoro et al., 2014 who in their study conducted in Tanzania found out that among women in their reproductive age group (15-49 years) who resided in urban settings were more likely to be associated with increased uptake of optimal doses of IPTp-SP than their rural counterparts.

Even when the analysis was made based on women who took at least 2 doses of IPTp-SP during the last pregnancy, still majority (46%) were from rural areas compared to 45.7% of the urban counterparts. There has been several studies in sub Saharan Africa that associate high uptake of IPTp-SP among pregnant women in urban centres due to easy accessibility to health services and high awareness on the benefits of taking the recommended dosage (Yaya et al, 2017; Obasi, 2019; Mpongoro et al., 2014). The findings also seem to contrast with Exavery et al., 2014, who asserted that urban residence is synonymous with high uptake of IPTp-SP due to increased awareness among the mothers on the benefits that emanate from taking the recommended dosage of IPTp-SP during pregnancy. In addition, Mpongoro et al. (2014) also found that women in their reproductive age group (15-49 years) in an urban setting are more likely to take proper uptake of optimal doses of IPTp-SP as compared to those in the rural areas. The reasons advanced by the study for the high uptake in urban were accessibility to the health facilities, awareness about the risk factors and level of education among others. In the

current study, the influence of and dynamics in rural areas of Uganda, that are responsible for increased uptake in rural areas (compared to urban settings) could not be clearly understood, and probably this could be a subject for further research.

Ideally, the increased uptake of IPTp-SP among pregnant women in the rural areas could be attributed to concerted efforts by government and global donors to improve accessibility to health services, increased awareness on risks associated with malaria in pregnancy, improved level of education particularly for the girl-child, enhanced resilience against rigid cultural beliefs and values as well as continued advocacy for support from family members. These factors resonate with Christian Obasi (2019) who reported increased uptake to closeness of the health facility, support from family members and education of the woman.

The study sought to establish the relationship between the frequency of ANC visits and the uptake of IPTp-SP in the study population. The logistic regression analysis of the data revealed that increased access to ANC services in the study population resulted into high uptake of the recommended dosage of IPTp-SP. As long as a woman attended routine visits for ANC, she was more likely to have the recommended dosage of IPTp-SP than those women who never attended ANC. Women who made four or more ANC visits during their last pregnancy were more likely to take the recommended doses of IPTp-SP than their counterparts who had less visits. The results from the logistic regression model showed that women who made 4 or more visits were almost 13 times more likely to take the recommended doses of IPTp-SP (OR=12.98, CI=95%, [9.297-18.113], p=0.000).

It should be noted that the findings on ANC visits were consistent with several other scholars, many of whom asserted that low antenatal care coverage is associated with low IPTp-SP coverage (Tiendréogo et al., 2015; Doku et al., 2016; Hurley et al., 2016; Roman, Andrejko, Wolf et al., 2019). Studies have linked high uptake of IPTp-SP of at least 3 doses with the existence of delivery of high-quality ANC services as recommended by the WHO. The recommended four or more ANC visits during pregnancy offers immeasurable opportunities for optimal uptake of IPTp-SP.

The frequency and timing of ANC visits has featured prominently among individual level factors that are associated with uptake of IPTp-SP in several African countries (Doku et al., 2016; Hurley et al., 2016; Roman, Andrejko, Wolf et al., 2019). In Uganda, IPTp-SP is primarily administered through the national public health system during routine antenatal care visits. Overall, the majority of women (97.6%) attended ANC visits at least once during pregnancy – implying that the odds for IPTp-SP uptake would increase with subsequent ANC visits. However, some women do not attend ANC visits at all; while others attend but do not take IPTp-SP for malaria prevention during the ANC visits. In addition, there are some women who take one dose of IPTp-SP but do not take any other subsequent dose (Hurley et al., 2016).

Roman, Andrejko, Wolf et al (2019) observed that gaps exist across African countries in terms of high ANC attendance and the low proportion of eligible women receiving the recommended 3 or more doses of IPTp-SP, largely reflects the failure by countries to provide IPTp-SP at ANC facilities. Similar to other previous studies, the findings suggest

that non-attendance of ANC visits should be regarded as the strongest contributor to the low uptake of IPTp-SP.

The current study concurs with Emily et al. (2016) who observed that the majority of women in Mali who did not receive IPTp-SP were women who also did not attend ANC routine visits. In this regard, the first priority strategy for increasing IPTp-SP uptake and coverage should be increasing and strengthening the quality of ANC service provision and attendance. However, it is also evident that ANC attendance does not operate in isolation. There are several other complimentary factors and processes including the need for adequate stocks of SP drugs, clear and friendly modes of delivery, affordable user fees (if possible user fees should be waived), adequate staff, health workers related capacities, as well as relevant communication and counselling skills.

Furthermore, the study investigated the relationship between the socio-economic status including employment status of the marital partner and the uptake of IPTp-SP. Socio-economic status was measured by wealth categories (quintiles) based on self-reported property items owned by the household. Using a logistic regression model, the results at bivariate level showed a statistically significant relationship between wealth status and IPTp-SP treatment seeking behavior. Women from the richest households were 1.3 times more likely to take the recommended doses of IPTp-SP during pregnancy than their counterparts in the lowest category (OR=1.270, CI=95% [1.141 – 1.412], p=0.000). However, at multivariate level, the results indicated that there was no statistically significant association ($p>0.05$) between wealth status and uptake of IPTp-SP, after controlling for covariates (area of residence, education and employment). The wealth

status of a household is a combination of several factors including a partner's income level as well as education.

It is important to note that in the African context, the roles and responsibilities of women in society are largely reproductive with a few limited productive or economic activities that earn them some money (Bayeh, 2016). The ascribed roles and economic vulnerability of women in the African society leaves them with no option but to depend on their husbands as the sole source of access to health services (Bayeh, 2016). By implication, men who are working and those who are economically sound are likely to provide financial and moral support to their wives during the pregnancy than their unworking counterparts.

The socio-economic status of the household, combined with the partner's economic status and level of education are key factors in influencing the women's uptake of IPTp-SP (Bayeh, 2016). Notwithstanding, the patriarchal nature of African societies where women have to depend on their husband for any decision, this also makes them vulnerable when it comes to accessibility of health services. Thus, if the husband is economically incapacitated or not employed, it becomes hard for the pregnant women to access the health services. It should be noted that within the African context, men tend to perceive health concerns as a woman's issue thus playing a passive role in helping them access the health services or go with them for antenatal services (Falade-Fatila & Adebayo, 2020). In this regard, the wealth status of women provides an opportunity for them to get empowered and make informed decisions that are meant to improve their health.

The association between the presence of co-wives in a relationship (polygyny) and the uptake of IPTp-SP among respondents was investigated. At bivariate level of analysis, the results indicated that there is no statistically significant relationship between having co-wives and IPTp-SP uptake. It should be noted that DHS data analysis indicated that among women 15-49 years who were currently married, up to 25% reported that their husbands / partners had other wives. Similar with IPTp-SP uptake, the proportion of co-wives was higher in rural areas. Women living in rural areas were more likely to report having co-wives (with 26%) as opposed to their urban counterparts (20%). In addition, a significant proportion of up to 37% of women with no education reported that their partners / husbands had more than one wife as compared to 13% of women with secondary level of education and above. The association between polygyny and IPTp-SP is a subject for further research so as to fully understand whether utilization of maternal health services is influenced by the existence of co-wives in a relationship.

Limitations of the Study

Although the study findings provide comprehensive evidence on the association between the selected variables and uptake of IPTp-SP among pregnant women in Uganda for policy formulation and implementation, disaggregating some of the selected variables was quite difficult due to missing variables in the data set like history of antenatal care.

The current study was designed primarily to determine risk factors associated with utilization of malaria preventive services and specifically IPTp-SP among pregnant women in Uganda. Using secondary data analysis from the 2016 Uganda Demographic and Health Survey, the study may have had some limitations that are typical of similar

study designs that rely on secondary data analysis. The following limitations were observed: i) The possibility of a mismatch between variable and constructs of the 2016 UDHS and those of the current study. It is possible that a particular variable of interest (self-risk perception) was missing from the secondary data-set; ii) The secondary data from the 2016 UDHS could have had some inherent irregularities such as sampling errors and low response rates, and these could have negatively affected the validity and accuracy of the measurements of the current study. iii) Similar to most secondary data analyses, there was no control over the processes of data collection that were used in the demographic and health survey; iv) Similarly, the data used in the current study was primarily cross-sectional. This implies therefore that the underlying associations could not guarantee directionality nor causality. v) the study relied primarily on self-reported data. It should be noted that behaviors and self-reported practices of the women respondents could have been affected by the principle of temporality, thus affecting validity and generalizability of the findings. vi) another limitation relates to the fact that the current study by design and the nature of the sample could not allow to have any form of control over the selection of variables and their corresponding measurements. This in itself could potentially introduce selection bias. vii) Furthermore, the 2016 UDHS data was subjected to potential confounders that could have affected the measurement of the associations. For instance, a particular variable could have had the potential to influence another, for instance maternal education and socio-economic status. In this regard, the confounding effect could have enhanced multi-collinearity and the potential for inverse associations.

In addition, by simply asking women on the employment of marital partner without asking the source of their income, the study could not explicitly explain the role of men in uptake of IPTp-SP. Since the survey was largely focused on women that had given birth, it was probably difficult to avoid the recall bias during data collection since some pregnancy related events had happened 24 months preceding the survey. Besides, being secondary data, the researcher had no control over the sample size and approach.

Overall Findings – Summary Discussions

The primary objective of the current study was to investigate the underlying risk factors associated with the uptake of intermittent preventive treatment of malaria in pregnancy (IPTp-SP) using SP/Fansidar among women in Uganda. The study targeted specifically women aged 15-49 years who had delivered a live birth in the 24 months prior to the survey. By design, the study applied a secondary data analysis using the 2016 Uganda Demographic and Health Survey to establish the underlying associations between several predictor variables and the outcome (uptake of the recommended three or more doses of IPTp-SP among the study population). A logistic regression model was applied to measure the levels of associations and the odds ratios for quantifying the strength of the association between the independent and dependent variables; between the exposure and the outcome. The current quantitative study has largely focused on 6 independent variables and these include: maternal education, socio-economic status, maternal Age, , knowledge about malaria, frequency of ANC Visits, and the presence of co-wives in a relationship. The below section will present the three predictor variables that were found to be statistically significant after the analysis.

The study findings revealed that pregnant women with secondary level of education and above in Uganda were more likely to take the recommended dosage during pregnancy compared to the counterparts with primary or non- formal education. Those that had acquired higher education were 1.75 times more likely to take the recommended doses of SP Fansidar than those with no education (AOR=1.755, 95% CI [1.313 – 2.346], p=0.000). This was statistically significant with a p-value 0.000. The review of related literature supported this finding and further asserted that educated women are more likely to be aware of the health benefits of taking IPTp-SP in the recommended dosage. They are more likely to seek for advice from skilled professional health practitioners.

Secondly, the results indicate that women who took four or more ANC attendance visits during the last pregnancy were more likely to take the recommended doses of IPTp-SP than their counterparts who had less visits. The results from the logistic regression model clearly demonstrate that that women who made 4 or more visits were almost 13 times more likely to take the recommended doses of IPTp-SP (OR=12.98, CI=95%, [9.297-18.113], p=0.000). As long as a woman attended routine visits for ANC, she was more likely to have the recommended dosage of IPTp-SP than those women who never attended ANC. The study findings were supported by available literature which also recognized that there are several other complimentary factors and processes in support of ANC visits that should be considered to shape IPTp-SP uptake. These included the need for adequate stocks of SP drugs, clear and friendly modes of delivery, affordable user fees (if possible, user fees should be waived), adequate staff, health workers related capacities, as well as relevant communication and counselling skills.

The findings also showed a significant association ($p<0.05$) between knowledge about malaria and the uptake of the recommended 3 or more doses of SP/Fansidar among pregnant women. The logistic regression analysis showed that women who had adequate knowledge about malaria were 1.3 times more likely to take the three or more recommended doses of SP Fansidar than their counterparts without adequate knowledge (OR=1.295, CI=95% [1.166 – 1.439], p=0.000). The study findings were supported by several studies that have been done within the region, and could positively contribute to social change for increased uptake of malaria preventive remedies. The study findings could attribute the increased awareness and knowledge about malaria on the localization of messages related to malaria by translating them into local languages. Women respondents who listened to such malaria messages through radio, TV, social media and other platforms could easily understand the information and the need to practice the recommended malaria prevention strategies; and specifically being able to take the recommended three or more doses of IPTp-SP or commonly known as SP/Fansidar.

Key Recommendations

The study generated a lot of useful findings that can be used to contribute to the ongoing conversations and existing body of knowledge with regard to factors associated with uptake of IPTp-SP among pregnant women in Uganda. The study stressed the fact that there are low levels of IPTp-SP coverage and utilization in Uganda; with only 17% of pregnant women accessing the recommended three or more doses of IPTp-SP or commonly known as SP/Fansidar. In this regard, the study makes critical recommendations that could guide and ensure that national programmers and policy

makers design appropriate programs and policies to enhance coverage and optimal utilization of IPTp-SP among pregnant women in Uganda.

In order to ensure optimal coverage and uptake of IPTp-SP among pregnant women, it is strongly recommended that the Ugandan Ministry of Health should prioritize programs for promoting antenatal care for both rural and urban dwellers. The findings from this study have revealed that frequency of regular ANC visits and early uptake of the first dose of IPT-SP by pregnant women to prevent malaria are closely linked. Women who took the four or more ANC attendance visits were more likely to have had the recommended dosage than those women who never attended ANC. As such, it is recommended that planners and policy makers should prioritize the recommended four or more ANC visits during pregnancy as a strategy because it offers immeasurable opportunities for optimal uptake of IPTp-SP.

The study findings also revealed that pregnant women who had acquired secondary level of education and above were more likely to take the recommended dosage of IPTp-SP during pregnancy compared to the counterparts with primary or non-formal education. In other words, educated women are to take the recommended dosage of IPTp-SP because most probably because they are aware of the health benefits of taking IPTp-SP in the recommended dosage. In this regard, the study strongly recommends that there should a programme to promote specifically the girl-child education. This will ensure that future mothers of the nation are adequately educated to improve their awareness levels in terms of maternal and child health issues.

The study recommends appropriate community engagement programmes for enhancement of knowledge and awareness on benefits and timing of IPTp-SP medications to prevent malaria infection among pregnant women. The study findings revealed that women who had adequate knowledge about malaria were more likely to take the recommended 3 or more doses of IPTp-SP than their counterparts without adequate knowledge. In this regard, community awareness programmes and mass mobilization for disease prevention and health promotion programmes specifically for malaria prevention among pregnant women should be prioritized.

Finally, the study also recommends further research in the areas that were not adequately understood by the current study. For instance, more research is recommended to establish the relationship between having more co-wives in a relationship and uptake of malaria prevention therapies among pregnant women.

Implications for Social Change

The study findings provide a strong case for positive social change and public health action towards strengthening the uptake of prevention services for malaria targeting pregnant women in developing countries like Uganda. According to the World Health Organization, positive social change in the context of public health involves the use of evidence-based research findings that goes beyond to address the social determinants of health.

While focusing on factors associated with IPTp-SP uptake, the study findings have provided a deeper understanding of health-seeking behaviors related to the provision and uptake of IPTp among pregnant women in Uganda. In this regard, the

results provide a platform for re-awakening at all levels of society including individual communities, families, community leaders for positive social change to address the identified gaps. It should be noted that a network of social determinants for health influences multi-sectoral plans and actions through relevant policy frameworks such as economic policies, social, political, development agendas and social norms in line with WHO guidelines.

Increased awareness of the benefits of IPTp-SP as reflected in the findings, will enhance positive social change which is embedded within integrated social and medical actions that will attract women to demand for malaria prevention services. Proactive strategies that target pregnant women and their partners will be more effective than waiting for mothers and families to visit health facilities.

Community driven approaches that promote improved timing and frequency of antenatal care should be designed and prescribed based on the study findings to constitute positive health-seeking behaviors, motivating individuals (men and women) to modify their perceptions towards healthful living, encouraging mothers to prioritize anti-malarial therapies for the well-being of Ugandan households.

These strategies should target women both in the rural areas as well as those in urban areas in order to attain universal coverage of IPTp-SP services in particular but also maternal health services in general. In addition, the study findings could be shared with decision makers including local leaders, public health managers and health care workers, to enhance their knowledge about IPTp-SP as an effective malaria preventive intervention; and this knowledge would cascade down to the local population.

Conclusions

The study findings revealed a significant breakthrough in the broader body of knowledge by examining the risk factors associated with uptake of SP Fansidar among pregnant women in Uganda. Maternal education, frequency of ANC visits and knowledge about malaria have been singled out as the key predictors of increased uptake of IPTp-SP. This calls for well-designed health promotion programs targeting policy makers, community leaders, husbands / partners as well as special groups of women to increase uptake of IPTp-SP. As a result, the study recommends enhanced awareness among the different stakeholders on the importance of taking the recommended dosage of IPTp-SP to meet the national targets and achieve universal coverage for women both in the rural and urban areas of Uganda.

References

Abeku, T. A., Helinski, M. E., Kirby, M. J., Kefyalew, T., Awano, T., Batisso, E., Tesfaye, G., Sssekitooleko, J., Nicholas, S., Erdmanis, L., Nalwoga, A., Bass, C., Cose, S., Assefa, A., Kebede, Z., Habte, T., Katamba, V., Nuwa, A., Bakeera-Ssali, S., Akiror, S.C., Kyomuhangi, I., Tekalegne, A., Magumba, G., & Meek, S.R. (2015). Monitoring changes in malaria epidemiology and effectiveness of interventions in Ethiopia and Uganda: Beyond Garki project baseline survey. *Malaria Journal, 14,* Article 337 https://doi.org/10.1186/s12936-015-0852-7

Ahumuza, S. E., Matovu, J. K. B., Ddamulira, J. B., & Muhanguzi, F. K. (2014). Challenges in accessing sexual and reproductive health services by people with disabilities in Kampala, Uganda. *Reproductive Health*, *11,* Article 59. https://doi.org/10.1186/1742-4755-11-59

Alonso, S., Chaccour, C.J., Elobolobo, E., Nacima, A., Candrinho, B., Saifodine, A., Saute, F., Robertson, M., & Zullinger, R. (2019). The economic burden of malaria on households and the health system in a high transmission district of Mozambique. *Malaria Journal, 18,* Article 360. https://doi.org/10.1186/s/2936-019-2995-4

Ameh, S., Owoaye, E., Oyo-Ita, A., Kabiru, C. W., Akpet, O., Etokidem, A., Ekepenyong, N. (2016). Barriers to and determinants of the use of intermittent preventive treatment of malaria in pregnancy in Cross River State, Nigeria: A cross-sectional study. *BMC Pregnancy and Childbirth, 16*, 99. https://doi.org/

10.1186/s 12884-016-0883-2

Asingiziwe, D., Poortvliet, P. M., Koenraadt, C. J. M., van Vliet, A.J.H., Ingabire, C.M., Mutesa, L., & Leeuwis, C. (2019). Role of individual perceptions in the consistent use of malaria preventive measures: mixed methods evidence from rural Rwanda. *Malaria Journal, 18,* Article 270. https.//doi.org/10.1186/s12936-019-2904-x

Bayeh, E., (2016). The role of empowering women and achieving gender equality to the sustainable development of Ethiopia. *Pacific Science Review B: Humanities and Social Sciences, 12*(1), 37-42.; https.//doi.org/10.1016/j.psrb.2016.09.013

Braun, V., Rempis, E., Schnack, A., Decker, S., Rubaihayo, J., Tumwesigye, N.M., Theuring, S., Harms, G., Busingye, P., & Mockenhaupt. (2015). Lack of effect of intermittent preventive treatment for malaria in pregnancy and intense drug resistance in Western Uganda. *Malaria Journal, 14,* Article 372.

Bizimana, J.P., Twarabamenye, E., & Kienberger, S. (2015). Assessing the social vulnerability to malaria in Rwanda. *Malaria Journal, 14*(1), *2.*

Chama-Chiliba, C. M., & Koch, S. F. (2015). Utilization of focused antenatal care in Zambia: examining individual and community-level factors using a multilevel analysis. *Health Policy and Planning*, *30*(1), 78-87.

Che Chi, P., Bulage, P., Urda, H., & Sundby, J. (2015). A qualitative study exploring the determinants of maternal health service uptake in post-conflict Burundi and Northern Uganda. *BMC Pregnancy and Childbirth, 15,* Article 18. https.//doi.org/10.1186/s12884-015-0449-8

Cheptum, J., Gitonga, M.N., Mutua, E., Mukui, S., Ndambuki, J., & Koima, W. (2014). Barriers to access and utilization of maternal and infant health services in Migori, Kenya. *Research on Humanities and Social Sciences, 4*(15), 48-53.

Darteh, M. E.K., Buabeng, I., & Boateng, C.A. (2019). *Uptake of intermittent preventive treatment in pregnancy for malaria in Ghana: Further analysis of the 2016 Malaria Indicator Survey*. DHS Working Paper No. 158. ICF. http://www.dhsprogram.com/pubs/pdf/WP158/WP158.pdf

De Jongh, P., De Jongh, E., Pienaar, M., Gordon-Grant, H., Oberholzer, M., & Santana, L. (2015). The impact of pre-selected variance inflation factor thresholds on the stability and predictive power of logistic regression models in credit scoring. *ORiON*, *31*(1). https://doi.org/10.5784/31-1-162

Dellicour, S., Hill, J., Bruce, J., Ouma, P., Marwanga, D., Otieno, P., Desai, M., Hamel, M.J., Kariuki, S., & Webster, J. (2016). Effectiveness of the delivery of interventions to prevent malaria in pregnancy in Kenya. *Malaria Journal*, *15*(1), Article 221.

Doku, D.T., Zankawah, M.M., Adu-Gyamfi, A.B. (2016). Factors influencing dropout rate of intermittent preventive treatment of malaria during pregnancy. *Biomed Central Research Notes*, *9*, 460.

Falade-Fatila, O. & Adebayo, A.M. (2020). Male partners' involvement in pregnancy related care among married men in Ibadan, Nogeria. *Reproductive Health 17* Article 4. https://doi.org/10.1186/s12978-020-0850-2

Faul, F., Erdfelder, E., Lang., & Buchner, A., (2017). Statistical power analyses using

G*Power 3.1.9: A flexible statistical power analysis program for social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2), 175-191. https.//doi.org/10.3758/BF03193146

Fayose, T.S, & Ayinde, K. (2019). Different forms of biasing parameters for generalized ridge regression estimator. *International Journal of Computer Applications (0975-8887) 18*(37). https://doi.org/10.5120/ijca2019918339

Fernandes, S., Sicuri, E., Kayentao, K., Eijk, A. M. Van, Hill, J., Webster, J., & Hanson, K. (2015). Cost effectiveness of two versus three or more doses of intermittent preventive treatment for malaria during pregnancy in sub-Saharan Africa : A modelling study of meta-analysis and cost data. *Lancet Global Health, 3*(3), e143–e153. https://doi.org/10.1016/S2214-109X(14)70385-7

Glanz, K., Rimer, B.K., & Viwwanath, K. (2015). *Health behavior: Theory, research, and practice*.

Hill, J., Hoyt, J., van Eijk, A. M., D'Mello-Guyett, L., ter Kuile, F. O., Steketee, R., Smith, H., & Webster, J. (2013). Factors affecting the delivery, access, and use of interventions to prevent malaria in pregnancy in sub-Saharan Africa: a systematic review and meta-analysis. *PLOS Medicine, 10*, e1001488.

Hurley, E. A., Harvey, S. A., Rao, N., Diarra, N. H., Klein, M. C., Diop, S. I., Doumbio, S.o. (2016). Underreporting and missed opportunities for uptake of intermittent preventive treatment of malaria in pregnancy (IPTp) in Mali. *PLOS ONE, 11*(8), e0160008.

Ibrahim, H., Maya, T.E., Issah, K., Apanga, A.P., Bachan, G.E., & Noora, C.L. (2017).

Factors influencing uptake of intermittent preventive treatment of malaria in pregnancy using sulphadoxine pyrethamine in Sunyani municipality, Ghana. *The Pan African Medical Journal, 2017, Vol. 28: 122*. https://doi.org/10.11604/pamj.10/10/2017.28.122.12611

Ikpeama, C.A., Ikpeama, C.J., Ikpeama, O.J., Ogwuegbu, J.U. (2017). Knowledge, attitudes and utilization of intermittent preventive treatment for malaria among pregnant women attending antenatal clinic in Usmanu Danfodiyo University Teaching Hospital (UDUTH) Sokoto. *Sokoto Journal of Medical Laboratory Science.* 2017; 2: 65-75.

Jones, C.L., Jensen, J.D., Scherr, C.L., Brown, N.R., Christy, K., & Weaver, J. (2015). The Health Belief Model as an explanatory framework in communication research: exploring parallel, serial, and moderated mediation. *Health Communication, 30(6), 566-576.* https.//doi.org/10.1080/10410236.2013.873363

Kabayambi, J. (2014). Global trends in maternal mortality: How does Uganda fare? Retrieved from http://www.cehurd.org/2014/06/global-trends-in-maternal-mortality-how-does-uganda-fare/

Kibusi, S.M., Kimunai, E., Hines, C.S. (2015). Predictors for uptake of intermittent preventive treatment of malaria in pregnancy (IPTp) in Tanzania. *Biomed Central Research Public Health*. 2015;15:540.

Kourtis, A.P., Read, J.S., & Jamieson, D.J. (2014). Pregnancy and infection. *The New England Journal of Medicine; Vol. 370(23), 2211-8.* https.//doi.org/10.1056/NEJMra1213566

Maheu-Giroux, M., & Castro, M. C. (2014). Factors affecting providers' delivery of intermittent preventive treatment for malaria in pregnancy : a five-country analysis of national service provision assessment surveys. *Malaria Journal*, *13*(1), 440.

Malaria Consortium. (2018). Strengthening Uganda's response to malaria (SURMa) in mid-north and Karamoja sub-regions of Uganda. Knowledge, attitudes, practices and behaviors baseline study. Retrieved from http://www.malariaconsortium.org

Mene´ndez, C., Bardajı´, A., Sigauque, B., Sanz, S., Aponte, J.J., Mabunda, S., & Alonso, P.L. (2010). Malaria prevention with IPTp during pregnancy reduces neonatal mortality. *PLoS One.* 2010; 5. https://doi.org/10.1371/journal. pone.0009438 PMID: 20195472

Mitiku, I., & Assefa, A. (2017). Care givers' perceptions of malaria and treatment-seeking behavior for under five children in Mandura District, West Ethiopia: A cross-sectional study. *Malaria Journal*, *16:144* . https://doi.org/10.1186/s12936-017-1798-8

Montanaro, E.A., & Bryan, A.D.(2014). Comparing theory-based condom interventions: health belief model versus theory of planned behavior. *Health Psycholology. 2014 Oct; 33(10): 1251-60* https.//doi.org/10.1037/a0033969

Muhumuza, E., Namuhani, N., Balugaba, B. E., Namata, J., & Kiracho, E. E. (2016). Factors associated with use of malaria control interventions by pregnant women in Buwunga subcounty , Bugiri District. *Malaria Journal*, *15*(1), 342.

https.//doi.org/10.1186/s12936-016-1407-2

Musoke, D., Miiro, G., Ndejjo, R., Karani, G., Morris, K., Kasasa, S., & Musoke, M. B. (2018). Malaria prevention practices and associated environmental risk factors in a rural community in Wakiso district , Uganda. *PLoS ONE*, *13*(10), e0205210.

Muwanika, F.R., Atuhaire, L.K., & Ocaya, B. (2017). Prediction of monthly malaria incidence in Uganda and its implication for preventive interventions. *J Med Diagn Meth 6:248.* https.//doi.org/10.4172/2169-9784

Nan, X., Kim, J. (2014). Predicting H1N1 vaccine uptake and H1N1-related health beliefs: the role of individual differences in consideration of future consequences. *Journal of Health Communication. 2014; 19(3): 376-88.* https.//doi.org/10.1080/10810730.2013.821552 Pubmed. PMID:24354858.

Nega, D., Dana, D., Tefera, T., & Eshetu, T. (2015). Prevalence and Predictors of Asymptomatic Malaria Parasitemia among Pregnant Women in the Rural Surroundings of. *PLoS ONE*, *10*(4), 1–11. https://doi.org/10.1371/journal.pone.0123630

Nonvignon, J., Aryeetey, G.C., Malm, K.L., Agyemang, S.A., Aubyn, V.N.A., Peprah, N.Y., Bart-Plange, C.N., & Aikins, M. (2016). Economic burden of malaria on business in Ghana: A case for private sector investment in Malaria control. *Malaria Journal. 454 (2016).* https://doi.org/10/1186/s12936-016-1506-0

Nyonyi, J.K. (2012) Factors affecting the implementation of intermittent preventive treatment of malaria in pregnancy in Dar es Salaam health facilities. 2012, *e-health digital library*. Retrieved from: http://ihi.eprints.org/1659/.

Odongo, C.O., Bisaso, R.K., Byamugisha, J., & Obua, C. (2014). Intermittent use of sulphadoxine pyrimethamine for malaria prevention: a cross-sectional study of knowledge and practices among Ugandan women attending an urban antenatal clinic. *Malaria Journal.* 2014;13:399.

Odongo, C.O., Odida, M., Wabinga, H., Obua, C., & Byamugisha, J. (2016). Burden of placental malaria among pregnant women who use or do not use intermittent preventive treatment at Mulago Hospital, Kampala. *Malaria Research and Treatment, Vol. 2016.* Article ID 1839795, 7pages, 2016.

Onoka, C.A., Onwujekwe, O.E., Hanson, K., and Uzochukwu, B.S. (2012). Sub-optimal delivery of intermittent preventive treatment for malaria in pregnancy in Nigeria: influence of provider factors," *Malaria Journal*, vol. 11, no. 1, article no. 317, 2012.

Onyeneho, N.G., Idemili-Aronu, N., Igwe, I., & Iremeka, F.U. (2015). Perceptions and attitudes towards preventives of malaria infection during pregnancy in Enugu state, Nigeria. *Journal of Health Population and Nutrition. 2015, Vol. 18; 33:22 Nov 2015.* https://doi.org/10.1186/s41043-015-0033-x

Owusu-Boateng, I., & Anto, F. (2017). Intermittent preventive treatment of malaria in pregnancy: a cross-sectional survey to assess uptake of the new sulfadoxine-pyrimethamine five dose policy in Ghana. *Malaria Journal*, 16(1) 323. https://doi.org/10.1186/s12936-017-1969-7

Oyekaleto, A.S. (2015). Assessment of Malawian mothers' malaria knowledge, healthcare preferances and timeliness of seeking fever treatments for children

under five. *International Journal of Environmental Research and Public Health, 12(1).* https://doi.org/10.3390/ijerph120100521

Rao, B.V., Jensen, O.T., Jimenez, C.B., Robays, J., Lasry, E., Sterk, E., de Smet, M. (2018). Malaria in pregnancy: a call for a safe, efficient, and patient-centered approach to first trimester treatment. The Lancet. Global Health. Vol. 6, Issue 6, PE607-E608, June 01, 2018 doi: https://doi.org/10.1016/s2214-109x(18)30228-6

Rogerson, S. J. (2017). Management of malaria in pregnancy. *Indian Journal of Medical Research. Volume 146(3);* doi:10.4103/ijmr.IJMR_1304_17

Roman, E., Andrejko, K., Wolf, K. Henry, M., Youll, S., Florey, L., Ferenchick, E., & Gutman, J.R. (2019). Determinants of uptake of intermittent preventive treatment during pregnancy: a review. *Malar Journal. Vol. 18, 372 (2019).* https://doi.org/10.1186/s12936-019-3004-7

RBM Partnership to End Malaria. (2017). Malaria social and behaviour change communication indicator reference guide: Second edition. Venier, Switzerland: RBM

Roll Back Malaria Partnership. (2014). The contribution to malaria control to maternal and new-born health. *Progress and Impact Series. Vol. 10 July 2014.* Malaria in Pregnancy Consortium.

Sambili, B., Kimambo, R., Peng, Y., Ishunga, E., Matasha, E., Matumu, G., Noronha, R., & Ngilangwa, D.P. (2016). Factors influencing anti-malarial prophylaxis and iron supplementation non-compliance among pregnant women in Simiyu Region, Tanzania. *International Journal of Environmental Research and Public Health*.

2016;13:e626

Savic, R.M., Jagannathan, P., Kajubi, R., Huang, L., Zhang, N., Were, M., Kakuru, A., Muhindo, M.K., Mwebaza, N., Wallender, E., Clark, T.D., Opira, B., Kamya, M., Havlir, D.V., Rosenthal, P.J., Dorsey, G. & Aweeka, F.T. (2018). Intermittent preventive treatment for malaria in pregnancy: optimization of target concentrations of dihydroartemisinin-piperaquine. *Clinical Infectious Diseases Vol. 67(7): 1079 – 1088*; https://doi.org/10.1093/cid/ciy218

Schafer, T., & Schwarz, M.A. (2019). The meaningfulness of effect sizes in psychological research: Differences between sub-disciplines and the impact of potential biases. *Frontiers in Psychology.* 10:813.doi.3389/fpsyg.2019.00813

Setia M. (2016). Methodology Series Module 3: Cross-sectional Studies. *Indian journal of dermatology, 61(3),* 261-264. doi: 10.4103/0019-5154.182410.

Shahabuddin, A., Nostlinger, C., Delvaux, T., Sarker, M., Delamou, A, Bardaji' A., Broerse, J.E.W., & De Brouwere, V. (2017). Exploring maternal health care-seeking behavior of married adolescent girls in Bangladesh: A social ecological approach. PLoS ONE 12(1): e0169109. doi:10.1371/journal.pone.0169109

Sibley, L.M. Tesfaye, S., Desta, B.F., Hailemichael, A., Kebede, A., Mohammed, H., Ethier-Stover, K., Dynes, M., Barry, D., Hepburn, K., & Gobezayehu, A.G. (2014). Improving maternal and newborn health care delivery in rural Amhara and Oromiya regions of Ethiopia through the maternal and newborn health in Ethiopia partnership. *Journal of Midwifery and Women's Health, Vol. 59,Issue s1, pp S6 – S20, January - February 2014*.

Singh, J.P., Sewda, A., & Shiv, D.G. (2020). Assessing the knowledge, attitude and practices of students regarding the Covid-19 pandemic. *Journal of Health Management, Vol. 22, Issue 2, pp 281 – 290, August 2020*. https://doi.org/10.11771/0972063420935669

Ssempiira, J., Nambuusi, B., Kissa, J., Agaba, B., Makumbi, F., Kasasa, S., & Vounatsou, P. (2017). Geostatistical modelling of malaria indicator survey data to assess the effects of interventions on the geographical distribution of malaria prevalence in children less than 5 years in Uganda. *PLoS ONE 12(4): e0174948.* doi: 10.137/0174948.

Tababbi, A. (2018). Socio-economic impact of Malaria in Africa. *Actascientific microbiology 1.7 (2018):* pp 32-34.

Taremwa, I. M., Ashaba, S., Adrama, H. O., Ayebazibwe, C., Omoding, D., Kemeza, I., Hilliard, R. (2017). Knowledge, attitude and behavior towards the use of insecticide treated mosquito nets among pregnant women and children in rural Southwestern Uganda. *BMC public health*, *17*(1), 794. https://doi.org/10.1186/s12889-017-4824-4

Teo, A., Randall, L.M., Madanista, M., Mwapasa, V., Phiri, L.K., Khairalla, C., Buffet, C., Karahalios, A., Narum, D.L., Ter Kuile, F.O., & Rogerson, S.J. (2019). Intermittent screening and treatment with dihydroartmesinin-piperaquine and intermittent preventive therapy with sulfadoxine-pyrimethamine have similar effects on malaria antibody in pregnant Malawian women. *Sci Rep; vol. 9, 7878(2019).* https://doi.org/10.1038/s41598-019-44340-x

The National Population and Housing Census 2014 – Main Report, Kampala, Uganda. Retrieved from http://www.unstats.un.org/unsd/demographic/source/census/wphc/Uganda/UGA-2016-05-23.pdf

Tsawe, M. & Susuman, A. S. (2014). Determinants of access to and use of maternal health care services in the Eastern Cape, South Africa: A quantitative and qualitative investigation. *BioMed Central Research Notes*, PMCID: PMC4203863, https://doi.org/10.1186/1756-0500-7-723

Uganda Bureau of Statistics (UBOS) and ICF (2018). *Uganda Demographic and Health Survey 2016. Kampala, Uganda and Rockville, Maryland, USA: UBOS and ICF*. Retrieved from http://www.dhsprogram.com/pubs/pdf/FR333/FR333.pdf

Uganda Ministry of Health (2014). *Uganda National Malaria Reduction Strategic Plan 2014-2020.* Retrieved from http://www.health.go.ug/mohweb/?page_id=160

World Health Organization. (2014). From malaria control to malaria elimination: a manual for elimination scenario planning. Geneva: World Health Organization; 2014. NLM Classification: WC 765. Retrieved from http://www.who.int/

World Health Organization. (2016). The economics of the social determinants of health and health inequalities. Geneva: World Health Organization; 2016. Retrieved from http://www.who.int/social_determinants/en/

World Health Organization. (2018a). Intermittent preventive treatment in pregnancy (IPTp) – updated June 2018. Geneva: World Health Organization; 2018. Retrieved from

http://www.who.int/malaria/areas/preventive_therapies/pregnancy/en

World Health Organization. (2018b). World Malaria Report 2018. Geneva: World Health Organization; 2018. License: CC BY-NC-SA 3.0 IGO. Retrieved from http://www.apps.who.int/iris/bitstream/handle/10665/275867/9789241565653-eng.pdf

Yaya, S., Uthman, O. A., Amouzou, A., & Bishwajit, G. (2018). Use of Intermittent Preventive Treatment among Pregnant Women in Sub-Saharan Africa: Evidence from Malaria Indicator Surveys. *Tropical medicine and infectious disease*, *3*(1), 18. https://doi.org/10.3390/tropicalmed3010018

Yoder, P.S., Nsabagasani, X., Eckert, E., Moran, A., & Ye, Y. (2015). Perspectives of healthcare providers on the provision of intermittent preventive treatment in pregnancy in health facilities in Malawi. *BMC Health Services Research, Vol. 15(1): 354.* http://dx.doi.org/10.1186%2Fs12913-015-0986-x